

Study on Relationship Between the Financial Index of Corporations and ESG Performance: Based on the Perspective of Investors of A-shares

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Abstract. After China proposed to achieve the goal of "double carbon", the concept of ESG gradually become popular in China's securities market. According to the relevant data disclosed by the CSRC, the returns of ESG related theme funds and stocks will lead the market after 2018, and the returns of high ESG enterprises and ESG theme funds will be higher than the annualized growth rate of the main board index. However, the vast majority of participants in China's securities market are mainly individual investors, and their return rates are low. Based on the above facts, this paper analyzes the correlation between ESG performance and financial indicators frequently used by listed companies, and uses the correlation coefficient analysis method to calculate the correlation coefficient between the two variables to get the final results. Furthermore, this paper hope to be able to make some practical suggestions for A-shares investors based on the data and conclusions obtained in this study.

Keywords: ESG; Financial index; Correlation coefficient; Investment.

1. Introduction

As it is announced by China Security Regulatory Commission, which is the authoritative institution aimed for supervising Chinese security market, the number of Chinese investors' account in the stock market has been approximately approaching 200 million. Comparatively, the statistic was only half of that 6 years ago. The giant leapfrog development indicates that Chinese security market has huge potential. However, two significant properties deserve to be highlighted are, firstly, among all the registered accounts, 97% of them are hold by family or individual investors and, secondly, there are only 55% of the investors have a nonnegative return rate, while the annualized market return rate for 2021 is 4.80% [1]. All the figures above illustrate private investors is in dominant role in Chinese market, and there seems no transparent evidence manifests average revenue level of them beats the market yield.

To examine whether a corporation is conducive or threatening to the social public welfare, the prevailing measurement approach is to refer the enterprise's action to as Environmental, Social and Governance (ESG). The earliest ESG concept was raised in the 1980s, and the precise definition was proposed by "Who Cares Wins" in 2005 [2]. For China, the investment referring the ESG rates or performance is introduced and applied relatively late. But the thriving tendency among the main security companies to build up ESG asset portfolios and ESG theme funds is non-negligible and impressive, especially after 2020, the time when Chinese authority claimed that China would be aimed to have carbon dioxide emissions peak before 2030 and achieve carbon neutrality before 2060.

For Chinese capital market, government policy, one of the most significant factors affecting the main board market, can widely influence investors' expectations by sending the market an indicative signal, the result of which will eventually be responded to stocks face values. Furthermore, in theory, numerous research projects indicate that a strong relationship exists between firms' investment value and the firm's corresponding ESG performance in market economies countries, especially in the developing countries [3]. Combined with the actual figures which reveals that from 2014 to 2021, the annualized weighted average return rate of the active ESG theme funds is approximately 23.9%, which is evidently higher than the capital market return. Enhance, these correlated theories do be able to establish in China.

Analyzing from the perspective of corporate finance and judging from the ESG performance, all the potentially valuable enterprises in the same trade of business, surely have some mutual financial properties, which are eventually presented as the financial index of corporations.

Therefore, according to the former facts mentioned above, this article is targeted at providing the investors with a practical strategy to establish a green instruments portfolio which can efficiently enhance the investment return rate, based on the relationship between the specific corporate financial index and the firm's ESG performance.

2. Literature Review

Nowadays, there are plenty of literatures illustrate a correlation exists between the firm's financial index and ESG performance in various countries' capital markets. However, the influence direction of the two variables is contradictory. Both negative and positive correlations are attained by different scholars [4-8]. Joscha Nollet, George Filis and Evangelos Mitrokostas use S&P500 firms as samples to do the research. It leads to a result suggesting that there is a negative linear relationship between corporate social performance (CSP) and corporate financial performance (CFP) [4]. On the other hand, a study that is proposed by Gunnar Friedea, Timo Buschb and Alexander Bassen and combines the findings of about 2200 individual studies since 1970s draws a conclusion that roughly 90% of former studies find a nonnegative ESG–CFP relation. More importantly, the large majority of these studies reports positive findings. Additionally, the results also show that the positive ESG impact on CFP gradually appears to be more and more stable over time [5].

Besides the relationship existing between financial indicators and corporations ESG scores, there are also a great many literatures indicate that ESG performance is related to industry division [9, 10]. Borghesi et al found the average ESG level of some industries is significantly higher than that of other industries, such as consumer goods production industry and computer hardware processing industry. While the average ESG level of some industries is significantly lower than that of other industries, such as natural energy development industry [11]. On this basis, this paper also focuses on the correlation between ESG performance and the company's investment value. At present, there are a great number of studies analyze how a corporation's market value will be impacted from the dimensions of environment, social responsibility and corporate governance. For China, Xu Mingyu, Liu Cancan, Hu Yixiang take Chinese enterprises as samples and observe that there is a positive correlation between Chinese ESG performance and enterprise value [12].

Therefore, the research logic of this paper that hope to give A-shared investors investment suggestions by analyzing correlation between ESG performance and financial indicators of firms in different industries is generally persuasive, because the derivation of various relationships has been proved by previous scholars.

3. Data

In this study, Wind database is selected as the resource of all the statistics which mainly includes the financial data of A-share listed companies and Wind ESG rating data from 2018 to 2021. In order to ensure the integrity and accuracy of the data, some enterprises are removed, for whose financial sheets has serious data loss, such as firms with "ST" and "* ST" and other enterprises with abnormal financial conditions during the research period. And this paper finally selected 3206 enterprises as samples. Considering the differences of ESG management in different industries, Wind ESG rating sets different measuring indicators and weights targeted to different industries to ensure no obvious industry tendency existing in the rating results. Under the Wind ESG rating system, the final score, also called comprehensive rate, equals to the sum of the score of management practice (7 points in total) and the score of disputed events (3 points in total). For the score of management practice, it can be further subdivided into environmental dimension score, social dimension score and governance dimension score. Since the paper's purpose is to identify the relationship between the financial index

of corporations and ESG performance, financial information of 3206 listed companies is collected from Wind database from 2018 to 2021, corresponding to their respective Wind ESG rates. A general view of all data is presented in Table 1.

Table 1. A general view of statistics

	Min	Med	Max	Var	Std
Wind ESG	2.74000	5.850000	9.850000	0.662095	0.813660
Asset liability ratio	0.00836	0.444477	178.3455	2.594620	1.610720
Total Assets Turnover	-0.05021	0.501889	13.91353	0.302507	0.549985
Rate of return on total assets	-30.6882	0.031232	7.446082	0.160853	0.401050
Capital accumulation rate	-223.753	0.051341	68.00622	9.527603	3.086561

4. Methodology

The basic idea of constructing the model in this paper is to give investors corresponding financial judgment reference according to the analyzing results of which corporate financial indicators are transparently correlated with ESG. Apart from that, after further study on how the impact of ESG rating on the valuation of companies varies among different industries, investors will be given more specific and practical investment suggestions based on the different extent of how company valuations are affected by ESG in different industries.

The inference process of achieving the set goal will be completed in follow steps. Firstly, whether the observed financial index is highly correlated with Wind ESG scores will be calculated by the correlation coefficient matrix. Correlation coefficient is a statistical index reflecting the degree of close relationship between variables and its calculation formula is:

$$\rho_{X,Y} = \frac{cov(X,Y)}{\sigma_X \sigma_Y} = \frac{E[(X-EX)(Y-EY)]}{\sigma_X \sigma_Y} \quad (1)$$

Then, the formula is used to calculate the correlation coefficient between each observed financial indicator and every dimension of ESG score. All calculation results and relevant relationships will be tabulated in a correlation coefficient matrix. Table 2 lists the general results which are not distinguished by industries as an example of charts in further research of correlation coefficients.

Table 2. No industry distinguished correlation coefficients

	Lev	TAT	ROA	CA
Wind ESG 2018	-0.05515	-0.01421	0.02392	-0.04442
Wind ESG 2019	-0.09162	-0.00375	0.06901	0.06441
Wind ESG 2020	-0.05318	0.00310	0.06634	0.08754
Wind ESG 2021	-0.15634	0.01650	0.10665	0.04448

Afterwards, the correlation coefficient is classified according to the correlation strength division standard proposed by David S. Moore. He divided the correlation coefficient of absolute value between 0-0.2 into very weak correlation or no correlation, 0.2-0.4 into weak correlation, 0.4-0.6 into medium correlation, 0.6-0.8 into strong correlation, and 0.8-1.0 into very strong correlation [13]. Table 3 shows the detailed classification standard of this correlation degree.

Table 3. David S. Moore's correlation strength division standard

Degree of correlation between two variables	Range of absolute values of $\rho_{X,Y}$
Very weak correlation or no correlation	0.0-0.2
Weak correlation	0.2-0.4
Medium correlation	0.4-0.6
Strong correlation	0.6-0.8
Very strong correlation	0.8-1.0

Finally, based on the different characteristics of different industries shown in the statistical data, further investment principles can be obtained and summarized for the A-shares' investors to adjust their investment decisions.

5. Analysis

It can be seen from the researches of Zhao Weidong and Huang Xiaodan that due to the heterogeneity of different industries, enterprises in different industries have different responses to ESG [10]. Therefore, the research objects are divided into three major industries and their corresponding subdivided industries, according to the International Standard Industrial Classification issued by the United Nations. Then, this paper will analyze and explain the correlation between corporate financial indicators and ESG scores in the subdivided fields of each industry in the order of the first industry, the secondary industry and the tertiary industry.

In addition, in order to ensure the universality of this study, this paper selects financial indicators from four widely received measuring dimensions. They are: capital structure, operating capacity, profitability and development ability. To specifically quantify these capability indicators, this paper selects: asset liability ratio (Lev), turnover rate of total assets (TAT), return on assets (ROA) and capital accumulation rate (CA) to represent the ability of these four dimensions respectively. Further, this paper winsorize the continuous variables in the model at the level of 1% and 99% to eliminate the influence of outliers on the research results.

5.1 The First Industry

The main sectors of the first industry include agriculture, forestry, animal husbandry and fishery. The correlation coefficients can be obtained by calculating the correlation coefficient between the ESG rating and four dimensions financial indicators of each subdivided department under the first industry, which is shown in the following table.

Table 4. Pearson correlation coefficient between the first industry and ESG score

		Lev	TAT	ROA	CA
ESG	Agriculture	-0.11341	0.07629	0.06818	0.021275
	Forestry	-0.42979	0.010014	0.306578	-0.01304
	Animal husbandry	-0.1653	0.219162	0.252099	-0.02053
	Fishery	-0.55256	0.148725	0.324309	0.371605
	Average	-0.31527	0.113548	0.237792	0.089828

From the perspective of asset liability ratio indicators, the asset liability ratio of agriculture and animal husbandry is not significantly correlated with ESG, while the asset liability ratio of forestry and fishery is significantly correlated with ESG ratings, and shows a significant negative correlation. The reason for this result is that compared with forestry and fishery, agriculture and animal husbandry are typical heavy asset industries, and most listed companies in this industry maintain a debt ratio of about 50%-100%, so the correlation between ESG rating and asset liability ratio is not strong.

Another financial indicator worthy of attention is the turnover rate of return on assets (ROA). For forestry and fishery, this indicator has a certain degree of correlation with the ESG rating. As the maintenance and management costs of storage in these two industries are extremely high, the reason why the return on assets is related to ESG may, to some extent, be related to the size of energy consumption and the level of corporate governance.

And what can also be observed is that according to the data, for turnover rate of total assets (TAT) and capital accumulation rate (CA), their correlation with ESG performance is not significant for the first industry.

5.2 The Secondary Industry

The secondary industry refers to the processing and manufacturing industry that uses the basic materials provided by nature and the first industry to process and produce finished or semi-finished products. It mainly includes: mining industry, manufacturing industry, electric power, heat, gas and water supply industry and construction industry. The correlation coefficients can be obtained by calculating the correlation coefficient between the ESG rating and four dimensions financial indicators of each subdivided department under the secondary industry, which is shown in the following table.

Table 5. Pearson correlation coefficient between the secondary industry and ESG score

		Lev	TAT	ROA	CA
ESG	Coal mining industry	-0.33681	0.169503	0.150477	0.195038
	Oil and gas exploitation	-0.03231	0.162434	0.190728	0.199932
	Ferrous metal mining industry	-0.35127	0.054961	0.125336	0.235114
	Pharmaceutical manufacturing	-0.05243	-0.03245	-0.0101	0.058034
	Beverage manufacturing	-0.04734	-0.16050	0.07604	0.267865
	Food manufacturing	-0.10600	-0.03327	0.021531	0.003097
	Transport equipment manufacturing	-0.02559	-0.03480	-0.12281	-0.15423
	Footwear industry	-0.32851	0.168522	0.286427	0.474266
	Furniture manufacturing	-0.36326	-0.01356	0.359673	0.218082
	Stationery manufacturing	0.058871	-0.33053	-0.3441	0.003043
	Architectural decoration	-0.41351	0.373708	0.364593	0.391017
	Utilization of waste resources	-0.46560	0.639350	0.425370	0.366360
	Average	-0.20531	0.080281	0.12693	0.188135

In term of the asset liability ratio data, most sections in the secondary industry have a negative correlation between this financial index and ESG. Among them, the correlation between two variables is relatively strong in five industries, which respectively are coal mining industry, footwear industry, furniture manufacturing, architectural decoration and utilization of waste resources. It is not difficult to find that compared with the light industry, the asset liability ratio of resources development industries and construction industry has a stronger correlation with the company's ESG rating, and shows a negative correlation, especially in architectural decoration and ferrous metal mining industry. Although the correlation between manufacturing industry and ESG rating is relatively weak on the whole, there is a certain degree of correlation between daily necessities manufacturing industry and ESG rating, especially footwear manufacturing and furniture manufacturing.

As far as the total asset turnover rate is concerned, this financial indicator for most industries in the secondary industry is not relevant to ESG ratings, except for arts, sports and entertainment products manufacturing, architectural decoration utilization of waste resources industry. Due to the special property of the environmental protection industry, the higher the turnover rate, the more waste and garbage will be converted and recycled. However, because the stationery manufacturing industry is limited by its low gross profit which may cause low input to improve production efficiency, it often consumes more nonrenewable natural resources when processing and producing, such as wood.

Return on assets is an indicator to measure how much net profit each unit of assets creates. The higher the index is, the better the asset utilization effect of the enterprise is, which indicates that the enterprise has achieved good results in increasing income and saving the use of funds. For return on assets, this financial indicator of utilization of waste resources industry has a significant correlation with ESG rating. Besides, ROA of architectural decoration, furniture manufacturing and stationery manufacturing is also weakly correlated with ESG scores and two variables changes in the same direction, except stationery manufacturing.

Based on what mentioned in this part, it is not difficult to conclude that for the capital structure and future growth, apart from a few individual industries showing a certain degree of correlation with

them, these two indicators are not convincing enough for explaining the correlation between the secondary industry and Wind ESG scores.

5.3 The Tertiary Industry

The tertiary industry refers to various service industries or businesses not included in the primary and secondary industries. The tertiary industry in China includes circulation and service departments, which are specifically that it is easier for pollutant treatment industry and light industry in manufacturing to link their daily operating conditions with ESG ratings divided into three levels: circulation department, production and life service department, and department to improve scientific and cultural level and residents' quality service. In this paper, representative industries are selected from these departments for data analysis. The correlation coefficients can be obtained by calculating the correlation coefficient between the ESG rating and four dimensions financial indicators of each subdivided department under the tertiary industry, which is shown in the following table.

Table 6. Pearson correlation coefficient between the tertiary industry and ESG score

		Lev	TAT	ROA	CA
ESG	Railway transportation industry	0.374454	-0.21122	-0.37586	-0.49902
	Handling and transportation agency	-0.62267	0.322464	-0.09193	-0.07687
	Accommodation industry	0.062184	-0.48325	-0.6095	-0.13641
	Catering industry	0.02046	-0.31424	-0.08988	-0.36602
	Education	-0.61387	0.134878	-0.08099	-0.46117
	Culture and art industry	-0.63046	0.103222	0.377645	0.248104
	Sports	-0.80761	0.827595	0.615071	-0.43865
	Leasing industry	-0.49098	0.248117	-0.25391	-0.29122
	Insurance	-0.53662	0.622780	-0.01162	-0.00512
	Financial business	0.334791	0.055788	0.006265	-0.12051
	Average	-0.29103	0.130613	-0.05147	-0.21468

For asset liability ratio, it can easily draw a conclusion that a majority of sections in the tertiary industry has comparatively obvious correlation between this financial index and ESG scores. Among them, some of the industries has a positive correlation while others are positive. For culture and sports industry such as education industry, culture and art industry and sport industry, the negative correlation between the two variables is significant. For the business industry, the absolute values of the correlation coefficients in the subdivided industries are high, which indicates the significant correlation between ESG and Lev in business industry. Furthermore, what needs to be highlighted is that, taking the sake of capital security into consideration, for the financial industry, a lower capital liability ratio is more conducive to improving the ESG score.

As for the indicator of capital turnover rate, it does not show a wide range of high relevance as Lev. However, industries with significant correlation between the two variables still exist, such as sports and insurance. This conclusion can be clearly demonstrated by the positive externalities of these two industries. But for the accommodation industry, the chart shows an inverse relation between ESG scores and total assets turnover rates. After exploring the data which is released by the National Tourism Statistics Bureau, the main reason can be revealed. According to the data on energy consumption and carbon emissions of beds in China's star rated hotels in 2019, the annual energy consumption and carbon emissions of beds in mid-scale hotels are relatively larger than other sections in the tertiary industry.

For ROA and CA, the positive and negative signs of the correlation coefficients of most tertiary industries in these two indicators are consistent, except the sport industry and finance. The industry with high correlation between these two financial indicators and ESG is railway transportation industry. In view of the fact that China's railway transport is generally a state-owned enterprise and China's economy has been growing rapidly in recent years, the growth of the railway transport

industry has a significant positive correlation with the improvement of social welfare and environmental protection level. However, due to the huge amount of fixed cost input in the early stage, the capital accumulation rate and net profit margin of this industry have not increased year by year, and even declined due to the impact of the epidemic. Therefore, the correlation coefficient of the two variables in the railway industry is negative.

6. Conclusion

Based on the data of more than 3000 A-share listed companies in China from 2018 to 2021 and Wind ESG ratings, this paper constructs a series of correlation coefficient tables to examine the relationship between ESG performance and various financial indicators of A-share listed companies. In general, over time, the correlation between ESG ratings and various financial indicators has increased in most cases. This shows that the comprehensive explanatory power of wind ESG rating is gradually improved and the range of factors which are considered when rating individual corporation's ESG is gradually expanded. Therefore, if investors want to take ESG ratings into account when selecting investment targets, the financial indicators presented in this paper will more effectively reflect the comprehensive ESG performance of a company that has not disclosed ESG ratings.

By industry, the current correlation between ESG rating and asset liability ratio is reflected in the primary, secondary and tertiary industries. Among them, the absolute value of the correlation coefficient of the primary industry is the highest, showing a high degree of correlation between the two. For the secondary industry, there is a certain consistency between ESG rating, ROA and CA. Among them, the waste and garbage comprehensive utilization industry has the most significant correlation due to its own nature. In addition, there is also a certain degree of correlation between industry financial indicators that are highly related to people's daily necessities and ESG ratings. For the tertiary industry, the average correlation value of the entire tertiary industry is low, but in the subdivided fields, there is an obvious correlation between each financial indicator and ESG rating.

Now, China is gradually implementing measures related to the dual carbon goals. As these policies will be implemented continuously for a long time, it is not difficult to predict that ESG ratings (especially environmental dimensions) will play a more significant role in the market value of enterprises that have been or will be covered by carbon markets such as energy and industry. Therefore, A-share investors should pay more attention to ESG ratings and the correlation between ESG ratings and the company's financial indicators.

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