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Article

Environmental, social, and governance ratings and firm performance: Evidence from the Chinese stock market

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SUMMARY

Environmental, social, and governance (ESG) evaluation criteria, which measure a company's comprehensive performance in three dimensions of environmental, social responsibility, and corporate governance based on the company's operational stability and long-term economic value, have developed rapidly. We report a statistical study that investigated whether there were differences in ESG ratings of listed companies in different industries and whether there were differences in market value and financial performance of listed companies with different ESG ratings. We selected all listed companies that have ESG ratings in the Chinese A-share stock market on January 31, 2021 and used Huazheng ESG ratings to reflect their comprehensive performance and sustainable development ability of listed companies. We found significant differences in ESG ratings of listed companies in different industries and significant differences in valuation and financial indicators of listed companies with different ESG ratings. Overall, the ESG ratings of companies in the financial industry are higher and more balanced than in other industries. Except for the finance industry, all other industries had lower overall ESG ratings with E ratings ranking the lowest among the 3 scores. Moreover, we found that listed companies with higher ESG ratings are prone to perform better financially.

INTRODUCTION

Environmental, social, and governance (ESG) criteria are a set of standards for a company's operations that socially conscious investors use to screen potential investments (1). Based on the company's operational stability and long-term economic value, ESG criteria measures a company's comprehensive performance of environmental, social responsibility, and corporate governance. Environmental criteria consider how well a company takes the environment into consideration. Social criteria examine how a firm manages relationships with employees, suppliers, customers, and the communities where it operates. Governance deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights. Different from the traditional financial indicators of listed companies that mainly evolve around profit, ESG criteria focus on societal considerations. ESG criteria provide a more comprehensive, systematic, quantifiable, and applicable company value measurement standard from the perspective of the sustainable development of a company.

The United Nations Environment Program Finance Initiative (UNEP FI) strongly promotes the development of sustainable investment and hopes that financial institutions consider ESG factors in their decision-making process. ESG evaluation has gradually become an important reference for investment decisions of many investment funds and pension funds. International organizations, countries, enterprises, and their stakeholders have paid more and more attention to the development of the ESG system (1-4). As ESG evaluation has developed rapidly on a global scale since it was first formally proposed by the United Nations Environment Program in 2004, theories that explain the advantages and disadvantages of applying the ESG evaluation criteria. From the perspective of stakeholder theory, enterprises that seek to obtain a high ESG rating establish good relationships with employees, customers, partners, and other stakeholders to obtain a good reputation, social credit, and brand recognition and improve enterprise value in the long term (5-7). However, from the perspective of principal-agent theory, ESG's criteria has encouraged company managers to exaggerate their investment in environmental protection and social welfare and cover up their bad behavior and even deliberately hide negative information (8, 9). Based on these theories, some scholars have begun to explore the relationship between a company's ESG ratings and its financial performance as well as the effect of enterprise ESG information disclosure.

A previous study showed that the costs of fulfilling social responsibility may exceed the benefits of doing so, resulting in the mismatch of resources and the reduction of corporate value (10). However, a study investigating the relationship between the three individual aspects of ESG and firms' financial performance found that there was no cost of ESG investment (11). Clark *et al.* proposed that fulfilling social responsibility helps to improve financial performance (12) and subsequent work has shown that ESG factors have a direct positive impact on the companies' innovation ability and sustainable development from the perspective of stakeholder theory (13). Some scholars have studied the effect of ESG information disclosure on firm value and found that there is a positive correlation between ESG information disclosure and companies' social responsibility performance (14). Others have demonstrated that the greater the authority of the company's general manager, the more significant the positive impact of ESG information disclosure on enterprise value (15).

Although ESG evaluation criteria and the concept of sustainable investment have developed rapidly, they are still in the primary stage, and there were relatively few studies

on the role and impact of ESG evaluation on firm value. In China and other developing countries, the implementation of the ESG evaluation system started late, and the ESG information disclosure and full coverage of ESG ratings of all listed companies have not been achieved. Therefore, using all listed companies that had ESG ratings in China's A-share stock market on January 31, 2021, we explored two areas of significance. Firstly, we aimed to identify whether significant differences were present between different industries' performances in each area. We found significant differences across most industries and the reason could be due to the variation in firms' sizes and the types of their products. We believed the results would possibly provide a significant reference for society and government in China and other developing countries to pay attention to in the future and further improve the implementation of the ESG system. Secondly, we aimed to identify the relationship between ESG ratings and firms' financial performances. As with previous studies, we found a positive correlation between ESG ratings and firms' performances (11-15). If the results confirmed our hypothesis, it would have practical significance to encourage investors to establish an ESG investment concept and guide firms to incorporate more holistic development strategies that take the environment and social responsibility into account.

RESULTS

Descriptive analysis

We obtained 4143 valid samples as the research data for this paper (**Table 1**). We described the variables in Materials and Methods (**Table S1**). We reported the descriptive statistics of the variables and showed the value of the 25th percentile, mean, median, 75th percentile, and standard deviation to observe the average level and fluctuation of the variables (**Table 1**). According to the ESG ratings of 4143 Chinese A-share listed companies given by Sino-Securities Index Information Service (Shanghai) Co. Ltd. on January 31, 2021, we found that companies performed better in the aspect of corporate governance and social responsibility but were poor in environmental protection (**Table 1**).

Variable	Obs	Mean	SD	Min	P25	Median	P75	Max
ESG	4143	6.357	1.289	1.000	6.000	6.000	7.000	9.000
E	4143	4.350	1.702	1.000	3.000	4.000	5.000	9.000
S	4143	6.903	1.399	1.000	6.000	8.000	8.000	9.000
G	4143	7.314	1.865	1.000	8.000	8.000	8.000	9.000
MV	4143	217.016	896.641	11.62	30.971	54.952	136.809	3157.7
PE	4143	26.311	692.885	-262.71	13.143	27.264	50.462	502.43
EPS	4143	0.516	1.390	-2.00	0.107	0.349	0.771	4.01
IPS	4143	7.329	12.811	0.09	2.124	4.248	8.217	56.35
CFOPS	4143	0.699	1.804	-2.258	0.091	0.413	0.951	6.12

Table 1: Descriptive Statistics.
ESG: Huazheng ESG rating data, E: E (Environmental) rating data, S: S (Social) rating data, G: G (Governance) rating data, MV: Total market value (100million), PE: Price-to-Earnings Ratio = Share Price/Earnings per share, EPS: Earnings per share, IPS: Operating income per share, CFOPS: Net cash flow from operating activities per share, Obs: Observation, SD: Standard Deviation, Min: Minimum, P25: 25th percentile, P75: 75th percentile, Max: Maximum.

The sample companies involved all walks of life, and the data of each variable had a wide range. Therefore, we decided to group the sample data by industry categories as defined by the China Stock Market and Accounting Research (CSMAR). We showed the mean statistics on ESG ratings, company valuation, and financial indicators of different industries (**Table 2 and Figure 1**). After the sample companies are grouped according to their industry categories, we found clear differences in ESG ratings, valuation, and financial indicators among listed companies in different industries. The ESG, E, and S ratings of listed companies in the financial industry (ESG=7, E=7.18, S=7.88) are higher than those of utilities, real estate, comprehensive, industrial and commercial, except for the S rating of commercial companies (S=8.64) which is higher than that of financial companies (**Figure 1**). In contrast, the G ratings for financial companies are lower than other industries (**Figure 1**). The total market value of listed companies in the financial industry (MV=1564.72) is much higher than that of companies in other industries (Avg MV = 145.92, **Table 2**). Earnings per share and net cash flow from operating activities per share (EPS=0.71, CFOPS=0.96, **Table 2**) are also slightly higher in finance than those of listed companies in other industries. Comprehensive and commercial listed companies had the best performance in P/E ratio (PE=88.13) and operating income per share (IPS=23.32), respectively (**Table 2**).

Industry category	MV	PE	EPS	IPS	CFOPS
Finance	1564.72	34.73	0.71	4.42	0.96
Real estate	167.98	14.87	0.35	9.50	0.88
Business	101.12	45.24	0.39	23.32	0.65
Utilities	152.12	28.16	0.36	5.51	0.53
Industry	190.23	23.30	0.58	6.85	0.73
Comprehension	118.17	88.13	0.26	5.70	0.41

Table 2: Mean value of variables of listed companies in different industries. The mean statistics on ESG ratings, company valuation, and financial indicators of different industries after grouping the sample data by the CSMAR industry category. Comprehension denotes the industry category besides Finance, Utilities, Real estate, Industry, and Business. ESG: Huazheng ESG rating data, E: E (Environmental) rating data, S: S (Social) rating data, G: G (Governance) rating data, MV: Total market value (100million), PE: Price-to-Earnings Ratio = Share Price/Earnings per share, EPS: Earnings per share, IPS: Operating income per share, CFOPS: Net cash flow from operating activities per share.

We compared the relative performance of listed companies in various industries in environmental, social responsibility, and corporate governance aspects (**Figure 1**). Generally, the ESG ratings of listed companies in the financial industry are higher than that of listed companies in other industries with each component relatively balanced. As for other industries, E ratings are significantly lower than the S and G ratings. For many companies, the ones in the industrial sector, for example, high Environmental ratings are hard to achieve.
The ESG ratings of real estate and commercial listed companies were satisfactory, while comprehensive and industrial listed companies performed poorly (**Figure 1**). Specifically, listed companies in the financial industry performed best in terms of social and corporate governance, and companies in other industries performed worst in the

aspects of the environment. Real estate and commercial companies performed better in terms of social responsibility, and utilities and comprehensive and industrial companies performed better in terms of corporate governance (**Figure 1**).

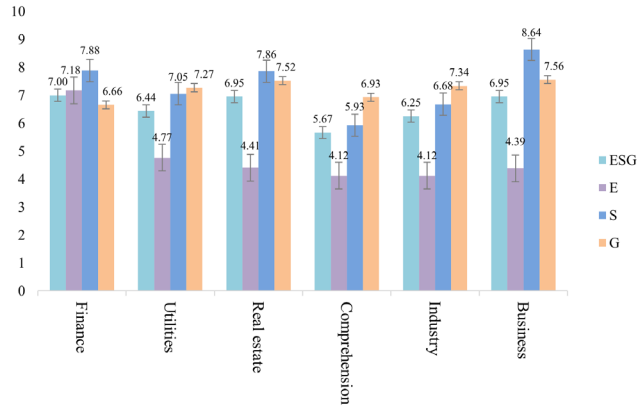

Figure 1. Mean of ESG ratings of listed companies in different industries. We compared the relative performance of listed companies in various industries in environmental (E), social responsibility (S), and corporate governance (G) aspects. Bars shown as mean ± SD.

ESG rating differences among multiple industries

We grouped the sample data by CSMAR industry category including Finance, Utilities, Real estate, Comprehension, Industry, and Business. Then, we tested whether there were differences in ESG ratings among listed companies in different industries (**Table 3**).

After grouping the sample data by CSMAR industry category, we gave evidence that there were differences in ESG ratings among listed companies in different industries. Generally, ESG ratings between most different industries differ significantly ($p<0.001$, **Table 3**). There was no significant difference between ESG ratings of financial industry and real estate industry ($p=0.761$, **Table 3**), financial industry and commercial listed companies ($p=0.293$, **Table 3**) real estate industry and commercial listed companies ($p=0.991$, **Table 3**). we found ESG ratings differ significantly between most industries (**Table 3**).

Industry	Finance	Utilities	Real estate	Comprehension	Industry	Business
Finance						
Utilities	<0.001 (4.320)					
Real estate	0.761 (0.302)	<0.001 (-4.541)				
Comprehension	<0.001 (6.589)	<0.001 (4.460)	<0.001 (6.804)			
Industry	<0.001 (6.631)	<0.001 (3.264)	<0.001 (6.834)	<0.001 (-3.409)		
Business	0.770 (0.293)	<0.001 (-4.583)	0.991 (-0.012)	<0.001 (-6.505)	<0.001 (-7.409)	

Table 3: Significance of ESG rating differences of listed companies in different industries. We tested whether there are differences in ESG ratings among listed companies in different industries by T-Statistics. We found that not only ESG rating indicators, E ratings, S ratings, and G rating indicators also have significant differences among companies in different industries. We reported p-test values and t-values (in parentheses). No shading represents a non-significant result; light grey, $p < 0.05$; dark grey, $p < 0.01$.

Additionally, a one-way ANOVA was conducted to test whether there were differences in ESG ratings among listed companies in different industries. We found that there were significant differences in ESG ratings ($p<0.001$) among listed companies in different industries. We further provided statistical evidence to support that not only ESG rating indicators, E ratings ($p<0.001$), and S ratings ($p<0.001$) differ significantly, but also G rating ($p<0.001$) indicators also had significant differences among companies in different industries (**Table S2**).

ESG rating differences in valuation and financial indicators among companies

After the sample companies were grouped according to their ESG ratings, the mean value of valuation and financial indicators of listed companies in different ESG rating groups were calculated. We choose the AA, BB, and CC rating groups from levels A, B, and C of ESG rating groups to test whether there are differences in valuation and financial indicators among companies with different ESG ratings by using T-Statistics. Our results support that there are significant differences **(**$p<0.05$, **Table 4)**. Generally, higher ESG ratings of listed firms can reflect higher market value and better financial performance (**Table 4**).

Variables	AA-BB	AA-CC	BB-CC
Market Value	<0.001 (8.102)	<0.001 (9.552)	0.363 (0.911)
P/E Ratio	0.105 (-1.624)	0.345 (0.945)	0.570 (0.568)
EPS	<0.001 (7.267)	<0.001 (4.961)	0.040 (2.020)
IPS	<0.001 (8.707)	<0.001 (13.433)	<0.001 (7.656)
CFOPS	<0.001 (6.301)	<0.001 (7.944)	0.366 (0.906)

Table 4: Variable differences of companies with different ESG ratings. There are significant differences in the valuation and financial indicators of listed companies with different ESG ratings after grouping the sample companies according to their ESG ratings. We conducted the T-test between the AA rating group, BB rating group, and CC rating group. We reported p-test values and t-values (in parentheses). No shading represents a non-significant result; light grey, $p < 0.05$; dark grey, $p < 0.01$.

The higher the ESG ratings the better the performance of listed companies in all aspects except P/E. There was a significant difference in the market values of listed companies in different ESG rating groups (**Figure 2A**). However, there was no significant difference in the P/E ratio group (**Figure 2B**)., and the difference in earnings per share of listed companies with different ESG ratings is very significant (**Figure 2C**). The operating income per share (**Figure 2D)** and net cash flow from operating activities per share (**Figure 2E)** of listed companies with different ESG ratings show a positive co-movement trend with the ESG ratings of listed companies.

DISCUSSION

ESG criteria is a comprehensive evaluation indicator of a company's environmental responsibility, social responsibility, and corporate governance, which are playing a more important role in measuring the performance of listed companies and helping investors make decisions. We selected all listed

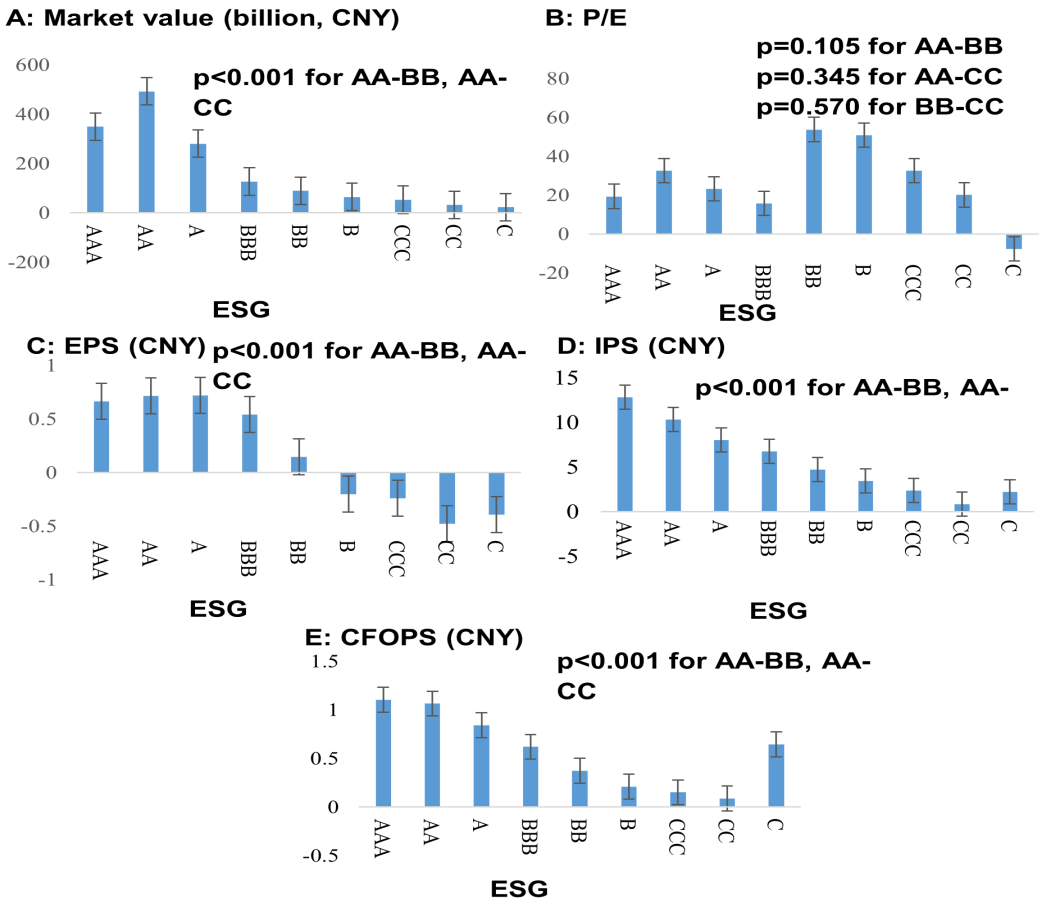

Figure 2. Mean value of valuation and financial indicators of listed companies with different ESG ratings. The mean value of valuation and financial indicators of listed companies in different ESG rating groups after grouping companies according to their ESG ratings. There are significant differences in the valuation and financial indicators of listed companies with different ESG ratings. Bars shown as mean ± SD.

companies with ESG ratings in the Chinese A-share stock market on January 31, 2021, to explore whether there were significant differences in ESG ratings of listed companies in different industries and whether there were significant differences in valuation and financial indicators of listed companies with different ESG ratings.

We found significant differences between the combined and separate ESG ratings across industries which supported our hypothesis. Compared to other industries, the financial industry achieves higher and more balanced individual E, S, and G ratings. As the market values of firms in the finance industry are generally higher than other industries in the Chinese A stock market, this result matched the established finding that stated firms' size and profitability enhanced the growing ESG scores of financial firms. Also, the finance industry, from the nature of its products, involves less tangible work that will lead to environmental pollution, resulting in its higher E rating among all industries. On the other hand, all other industries display overall lower ESG ratings and especially weakness in the environment rating. Under this conclusion, it is also crucial for firms and governments to pay more attention to environmental protection, which will be even more significant in grappling with the currently deteriorating environment. It is still beneficial for both the society and firm to seek improvement in the area of environment. With firms actively seeking to improve this rating, society is one step closer to sustainable development and investors are more willing to invest in firms with higher ESG ratings.

Moreover, our research confirmed that there were significant differences in valuation and financial indicators between firms with AA, BB, and CC ESG ratings. This finding also confirmed our expected result stated previously. Despite the P/E ratio, which had no obvious correlation with ESG ratings of firms, our study indicated that MV, EPS, IPS, and CFOPS all had a positive co-movement trend with ESG ratings. The lack of correlation between the P/E ratio and firms' ESG ratings may have resulted from the trend that larger firms generally had higher ESG ratings. As the P/E ratio was calculated by share price over earning per share, larger companies, which usually had the highest ESG ratings, may have higher share prices that proportionally cancel the increase in earnings per share. However, it can still be concluded that companies with higher ESG ratings do perform better in the market no matter which industry they are from. This conclusion can possibly be a signal and an incentive for investors to invest in companies with higher ESG ratings and company decision-makers to manage companies to perform well in all three aspects of ESG. Under the current social situation where the ESG system is popularizing but not yet fully established, this study shows the significance to encourage a virtuous cycle where the three aspects of ESG are not viewed by firms as dispensable numbers or burdens

but as a crucial factor that affects investments. Therefore, investors and companies can be guided to pay more attention to the coordination and unity of company development and social and environmental impacts in the future.

Our results suggest that it was beneficial for relevant national and international government authorities to promote the development of ESG evaluation systems. Support for the development of ESG indexed products may also be the key to ensuring the implementation of the ESG rating system in the market as a common investment indicator soon.

MATERIAL AND METHODS

We used Huazheng ESG ratings which are calculated by Sino-Securities Index Information Service (Shanghai) Co. Ltd., an independent third-party professional service agency. To reflect the comprehensive performance and sustainable development ability of listed companies, we coded Huazheng ESG ratings into numerical equivalents from 1 to 9: 1("C"), 2("CC"), 3("CCC"), 4("B"), 5("BB"), 6("BBB"), 7("A"), 8("AA"), 9("AAA"). We selected all listed companies that had ESG ratings in the Chinese A-share stock market on January 31, 2021, as samples. The Huazheng ESG rating data of listed companies and the valuation and financial data of listed companies were obtained from the Wind database, and the industry information was obtained from the China Stock Market and Accounting Research (CSMAR) database. To make results more accurate, the sample data was processed as follows: (1) Excluded the sample of companies in the financial industry; (2) Excluded the ST or * ST stock; and (3) Excluded samples with missing or abnormal data. After deleting these three types of data, we obtained 4143 valid samples as the research data. The variables were shown in **Table S1**.

We used SPSS for data analysis and choose the alpha level of 5% by default in data analysis, and descriptive statistical analysis, one-sample t-test, independent sample t-test, one-way ANOVA, and paired samples were performed on the data respectively. t-test. Among them, the one-way analysis of variance was carried out for post-hoc analysis of two variables, and the significance level was 5%.

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APPENDIX

Variable	Variable Description
ESG	Huazheng ESG rating data
E	E (Environmental) rating data
S	S (Social) rating data
G	G (Governance) rating data
MV	Total market value（100million）
P/E	Price-to-Earnings Ratio = share price/earnings per share
EPS	Earnings per share
IPS	Operating income per share
CFOPS	Net cash flow from operating activities per share

Table S1: Description of Variables Used in Analysis.

Variables	Variance	Sum. Sq	df	Mean. Sq	F	Sig. (p valve)
ESG	X	252.854	5	50.571	31.535***	<0.001
	Residual	6634.162	4137	1.604		
	Total	6887.015	4142			
E	X	1242.581	5	248.516	95.639***	<0.001
	Residual	10749.937	4137	2.598		
	Total	11992.517	4142			
S	X	1046.158	5	209.232	122.591***	<0.001
	Residual	7060.835	4137	1.707		
	Total	8106.993	4142			
G	X	85.278	5	17.056	4.925***	<0.001
	Residual	14325.549	4137	3.463		
	Total	14410.827	4142			

Table S2: One-way ANOVA Test. We found that not only ESG rating indicators, but also E ratings, S ratings, and G rating indicators also have significant differences among companies in different industries. *** indicates significance at the 1% level.
ESG: Huazheng ESG rating data; E: E (Environmental) rating data; S: S (Social) rating data; G: G (Governance) rating data. Sum. Sq: Sum of the square; df: degrees of freedom; Mean. Sq: Mean square; F: F value; Sig: Significance.