



Financial Constraint' Impact on Firms' ESG Rating Based on Chinese Stock Market

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Abstract. Enterprises with strong financing constraints will be under the pressure of difficult obtaining funds and are more likely to fall into financial difficulties. This will also have a certain impact on the ESG rating of rating agencies. This paper explores the impact of corporate financing constraints on ESG ratings. Firstly, this paper constructs the financing constraint index through principal component analysis and then uses the regression model to explore the impact of financing constraints on ESG scores. The results of the article show that the degree of financing constraints of the company (the smaller the FC value) has a negative impact on the ESG rating of the company. The result is similar to the score for environmental protection, social responsibility, and corporate governance. This paper will contribute to the expansion of the literature on ESG ratings-related areas in corporate finance.

Keywords: ESG rating, Financial Constraint, finance.

1 Introduction.

Since the Industrial Revolution, productivity and production technology have developed rapidly. At the same time, environmental, climate, and resource crises have become increasingly prominent [1-2]. People have experienced a process from ignoring nature to valuing nature. The "Paris Agreement" signed in 2015 called for global attention to climate change, and the 18th National Congress of the Communist Party of China included the construction of "ecological civilization" into the five-in-one overall layout, all of which put forward new requirements for sustainable development [3-4]. Under this premise, ESG information disclosure, as a disclosure method covering environmental protection, social responsibility performance, corporate governance, and other non-financial information, is in line with the concept of sustainable corporate development and high-quality economic development and has been widely recognized by both academic and practical circles [5-6].

The embryonic form of ESG can be traced back to ethical investment in the 1950s and 1960s, and then gradually formed the concept of socially responsible investment and sustainable development investment. In recent years, investors and the public have been paying more and more attention to sustainable development issues, and financial disclosure alone cannot meet the information needs of stakeholders. Therefore, ESG

information disclosure, as a non-financial information disclosure method, can help investors understand the real development status of enterprises and reduce the necessary rate of return for their risk perception and requirements. Many rating agencies also rate the ESG of enterprises [7].

The "difficulty in financing" and "expensive financing" of enterprises are important factors restricting the high-quality development of enterprises. The key reason is the information asymmetry in the capital market. The "2020 National Enterprise Burden Survey and Evaluation Report" shows that about 43% of enterprises report that their overall burden is heavier. Under the impact of the downward pressure on the economy and the impact of "black swan" events such as the new crown epidemic, enterprises are not interested in broadening financing channels, and reducing the demand for financing costs is even stronger. With the implementation of the dual carbon goals and the launch of the national carbon emission trading market, the public's attention to environmental protection and social responsibility has been unprecedentedly high [8], which has also continuously promoted the construction and development of China's ESG information disclosure [9].

ESG score is also affected by corporate financing constraints. At the same time, companies also hope to obtain financing support through ESG disclosure levels [10]. According to the principle of disclosure, when the benefits of disclosing sustainable development information are greater than the cost of disclosure, companies will choose to disclose ESG information and be rated by some rating agencies, which is conducive to attracting them for financing. Therefore, exploring the relationship and mechanism between ESG ratings and financing constraints is of great significance for enterprises' green transformation and high-quality development.

In this paper, the article considers the relevant data of Chinese listed companies in 2022, the paper empirically tests the impact of corporate financing constraints on ESG ratings. The results of the article show that the degree of financing constraints of the company (the smaller the FC value) has a negative impact on the ESG rating of the company, and also has a negative impact on the ESG indicators such as environmental protection, social responsibility, and corporate governance.

2 Data

In this paper, the author collects the Chinese stock market's data to investigate the impact of financial constraints on a firm's ESG rating. The ESG rating index is based on Wind's score. The work obtains the Firms' ESG Score, Firms' Environmental Protection Score, Firms' Social Responsibility Score, and Firms' Corporate Governance Score based on the Wind database. Besides, the paper also collects a series of financial constraint variables like ROE, ROA, DEBT, and so on in firms' Interim Financial Statements for 2022 from each firm's website. Also, the article collects the numbers of firms' employees, firm size, firm total assets, and firm current cash. The detailed variables are shown in the following table.

Moreover, this article also excluded financial institutions such as banks, brokerages, and companies with missing data when conducting research, and finally obtained 4,425 samples.

Table 1. Notation for variables

	Variable	Explanation for each variable
ESG factor	ESG	Firms' ESG Score based on Wind
	ENV	Firms' Environmental Protection Score based on Wind
	SOC	Firms' Social Responsibility Score based on Wind
	GOV	Firms' Corporate Governance Score based on Wind
Financial con- straint	ROE	Return on net assets
	ROA	Return on total assets
	NROS	Net profit margin on sales
	POR	Net profit/Total operating income
	TTM	Rolling P/E
	Quiratio	Quick ratio
	Casratio	Cash ratio
	NDEBT	Net asset liability ratio
	CASHOL	Net cash flow from operating activities/total liabilities
	DEBT	Asset-liability ratio
	Curratio	Current ratio
	CURROA	Current Assets/Total Assets
	EPS	Earnings per share
EBITDAPS	Earnings Before Interes per share	
Others	Size	Firm's size
	People	numbers of employees
	Asset	Firm's total asset
	Cash	Firm's current cash

Source is by author

3 Method

In this work, we first would establish the Financial constraint (FC) variables based on principal component analysis (PCA). Then, we would investigate the impact of FC on firms' ESG ratings.

3.2 Regression model

In this article, we consider the financial constraint as the dependent variable, and ESG scores as the independent variable. We also set the firm's cash, asset, size, and the number of employees as the control variable. Thus, we obtain the following regression model to investigate the impact of financial constraints on the firm's ESG score based on the Chinese stock market.

$$ESG = \beta_0 + \beta_1 \times FC + \beta_2 \times Cash + \beta_3 \times Asset + \beta_4 \times Size + \beta_5 \times People \quad (3)$$

Besides, in order to consider the FC's impact on the detailed indexes of ESG scores, this article also investigates the different effects of financial constraints on Firms' Environmental Protection scores, Firms Social Responsibility Scores, and Firms' Corporate Governance Scores. The regression model would be shown in the following.

$$ENV = \beta_0 + \beta_1 \times FC + \beta_2 \times Cash + \beta_3 \times Asset + \beta_4 \times Size + \beta_5 \times People \quad (4)$$

$$SOC = \beta_0 + \beta_1 \times FC + \beta_2 \times Cash + \beta_3 \times Asset + \beta_4 \times Size + \beta_5 \times People \quad (5)$$

$$GOV = \beta_0 + \beta_1 \times FC + \beta_2 \times Cash + \beta_3 \times Asset + \beta_4 \times Size + \beta_5 \times People \quad (6)$$

4 Result analysis

4.1 Results of PCA

The paper uses the PCA to calculate the Financial Constraint. The article discovers that for the major component, the first factor's eigenvalue to the fourth factor's eigenvalue is higher than 1, and the other is lower than 1, based on the table of the characteristic value, contribution rate, and accumulation contribution rate. As a result, we collect the FC with 4 components. The gravel yields the same outcome as well (Fig 1). The article predicts the different factors based on Stata software. And for each factor, the weight is 0.2733, 0.2219, 0.1556, and 0.137 for various sub-factors, respectively. The FC might then be obtained as shown below.

$$FC = \frac{0.2733 \times factor_1 + 0.2219 \times factor_2 + 0.1556 \times factor_3 + 0.137 \times factor_4}{0.7877} \quad (7)$$

Table 2. the characteristic value, contribution rate and accumulation contribution rate of the main component

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.82612	0.72018	0.2733	0.2733
Factor2	3.10594	0.92813	0.2219	0.4951
Factor3	2.17781	0.26032	0.1556	0.6507
Factor4	1.91749	0.96494	0.137	0.7877
Factor5	0.95256	0.28628	0.068	0.8557
Factor6	0.66628	0.03422	0.0476	0.9033

Factor7	0.63206	0.19236	0.0451	0.9484
Factor8	0.43971	0.29513	0.0314	0.9799
Factor9	0.14457	0.07746	0.0103	0.9902
Factor10	0.06711	0.02204	0.0048	0.995
Factor11	0.04507	0.02825	0.0032	0.9982
Factor12	0.01682	0.00837	0.0012	0.9994
Factor13	0.00845	0.00845	0.0006	1
Factor14	0		0	1

LR test: independent vs. saturated: $\chi^2(91) = 1.3e+05$ Prob> $\chi^2 = 0.0000$
Source is by author

Table 3. Main ingredient load matrix of FC

Variable	Factor1	Factor2	Factor3	Factor4	Uniqueness
ROE	0.5438	0.5606	-0.4487	-0.0641	0.1845
ROA	0.5878	0.6071	0.2567	-0.0579	0.2166
NROS	-0.1699	0.2933	0.0075	0.9393	0.0028
POR	-0.1698	0.2933	0.0075	0.9393	0.0028
TTM	0.2841	0.2774	-0.8461	-0.0345	0.1252
Curratio	0.7446	-0.6094	0.0465	0.1748	0.0414
Quiratio	0.7451	-0.6105	0.0515	0.1624	0.0431
Cashratio	0.7396	-0.5877	0.0698	0.127	0.0867
NDEBT	-0.3515	-0.2485	0.8671	0.0098	0.0629
CASHOL	0.4823	0.3514	0.3126	0.0463	0.544
DEBT	-0.5826	0.2846	0.1222	-0.1942	0.5269
CURROA	0.3084	-0.2164	-0.002	0.1014	0.8478
EPS	0.5735	0.6066	0.3959	-0.0914	0.138
EBITDAPS	0.5198	0.6353	0.4046	-0.1122	0.15

Source is by author

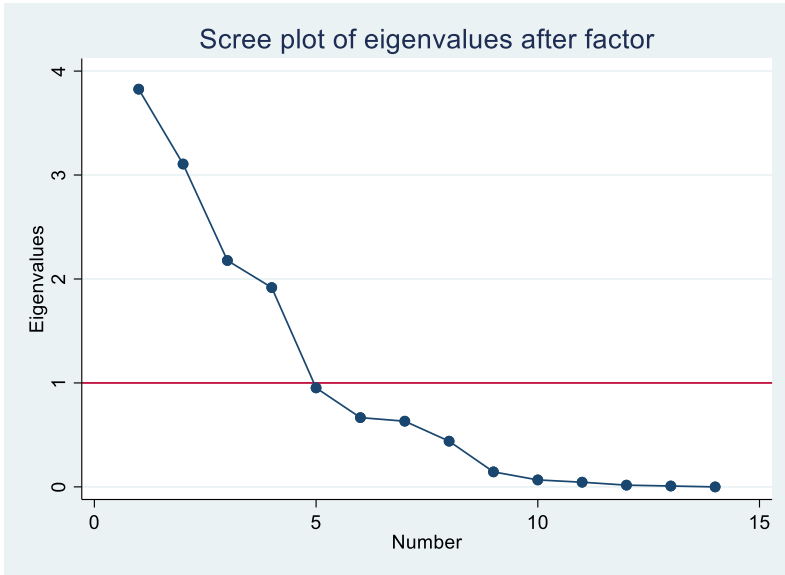


Fig. 1. Gravel of different main components

Source is by author

Through the Bartlett and KMO test, we may further assess the primary component's efficacy. The result is considered reliable when the KMO value is higher than 0.6 or the P-Value is lower than 0.05. The KMO of FC is 0.646, as seen in the table. This analysis result presents the accuracy of the PCA result.

Table 4. Test of Bartlett and KMO

	FC
Determinant of the correlation matrix	0.000
Bartlett test of sphericity	1.27×10^5
p-value	0
KMO	0.646
df	91

Source is by author

4.2 Data description

For Cash, Asset, Size, and People, this work considers logarithmizing for each variable. According to Table 2, the paper shows detailed information on different variables. ESG's range is from 3.87 to 9.31. The mean is 6.087. For FC, the std. dev is 0.51, ranging from -12.52 to 16.10. Table 5 also shows the other variable's condition.

Table 5. Summarize of the variables

Variable	Mean	Std. Dev.	Min	Max
ESG	6.086737	0.749931	3.87	9.31
ENV	1.945044	2.008677	0	10
SOC	3.92358	1.796902	0	10
GOV	6.712859	0.809559	0.75	10
FC	-1.57E-11	0.518662	-12.5242	16.10592
Cash	20.34528	1.473814	14.41646	26.56396
Asset	22.31251	1.363627	18.4354	28.65082
Size	2.699526	0.51725	0	3
People	7.544811	1.280282	2.833213	12.94491

Source is by author

Table 6. The correlation of different variables.

	ESG	ENV	SOC	GOV	FC	Cash	Asset	Size	Peo- ple
ESG	1								
ENV	0.6064*	1							
SOC	0.8432*	0.3736*	1						
GOV	0.4486*	0.1645*		1					
FC	0.0936*	0.0266*	0.1605*	0.0639*	1				
Cash	0.1774*	0.2737*	0.0915*	0.1915*		1			
Asset	0.1224*	0.2854*	0.0709*	0.2081*	0.1281*	0.8675*	1		
Size	0.0465*	0.1365*	0.0185*	0.1272*	-	0.4051*	0.4690*	1	
Peo- ple	0.1581*	0.3053*	0.0556*	0.1788*	0.0361*	0.6813*	0.7684*	0.6360*	1
	*	*	0.0454*	*	-0.0186	*	*	*	

Source is by author

Based on Table 6, at the 10% significance level, each variable has some relationship with ESG. This paper can initially find that the degree of correlation between FC and ESG is positive. It shows that the larger the FC, the higher the ESG rating. In addition, FC also has a positive correlation with each sub-indicator of ESG, such as ENV, SOC, and GOV. The paper also found that cash held by firm, firm size, number of employees, and total assets also had a positive impact on ESG scores. In order to examine the results, the work would show the regression result in the following.

4.3 Regression

According to the results in the table below, this study finds that a company's FC has a positive impact on the ESG rating, that is, the weaker the company's financing constraints, the higher the ESG rating score.

By considering the above control variables, the article shows that when FC improves by 1 point, the ESG score would increase by 0.099. It also reflects that the more liquidity a company has, the higher the ESG rating agency's score on him. In addition, we gradually added different control variables into the model, and the results of the model were still very stable. FC still has a positively correlated impact on ESG.

By examining other variables, this paper finds that a firm's cash holdings and a number of employees will improve ESG scores. This suggests that companies can improve their ESG ratings by retaining cash and recruiting new employees. The company's assets and the company's size are not conducive to the ESG score of the company, and they all have a negative impact on the ESG rating.

Table 7. regression results of ESG

	(1) ESG	(2) ESG	(3) ESG
FC	.135*** (.022)	.091*** (.022)	.099*** (.022)
Cash		.133*** (.015)	.125*** (.015)
Asset		-.058*** (.017)	-.118*** (.019)
Size			-.121*** (.028)
People			.123*** (.015)
_cons	6.087*** (.011)	4.685*** (.182)	5.58*** (.216)
Observations	4425	4425	4425
R-squared	.009	.039	.053

Source is by author

In order to investigate the detailed impact of FC on Firms' Environmental Protection Score, Firms' Social Responsibility Score, and Firms' Corporate Governance Score, we consider the sub-regression and the results are shown in Table 8. The result also shows that FC has a positive impact on the sub-factor of ESG score, which means that FC would improve ENV, SOC, and GOV.

Table 8. regression results of ENV, SOC, and GOV.

	(1) ENV	(2) SOC	(3) GOV
FC	.063** (.012)	.25** (.072)	.092** (.029)
Cash	.111*** (.016)	.22*** (.029)	.01 (.026)
Asset	.073 (.057)	-.271 (.128)	.091*** (.005)
Size	-.35** (.075)	-.477* (.169)	.049 (.04)
People	.422***	.237*	.019

	(.02)	(.091)	(.024)
_cons	-4.188**	4.994*	4.206***
	(1.187)	(1.91)	(.342)
Observations	4425	4425	4425
R-squared	.107	.031	.048

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Source is by author

5 Conclusion

In order to verify the impact of financing constraints on companies' ESG ratings, this paper collects data on China's A-share market in 2022. This paper excludes banks and other financial institutions and companies and collects a total of 4,425 samples for research. The paper uses principal component analysis to consider ROA, ROE, asset-liability ratio, and other indicators that construct corporate financing constraints. This paper uses regression analysis to empirically test the impact of financing constraints on ESG ratings.

The results of the article show that the degree of financing constraints of the company (the smaller the FC value) has a negative impact on the ESG rating of the company, and also has a negative impact on the ESG indicators such as Firms' Environmental Protection Score, Firms' Social Responsibility Score, and Firms' Corporate Governance Score. This proves the stability of the model. The paper also finds that a company's cash and a number of employees can improve a company's ESG rating. A company's assets and size will lower its ESG rating.

There are still shortcomings in this paper. For example, the paper does not consider the state-owned and non-state-owned attributes of enterprises to explore the impact of financing constraints on the ESG ratings of different types of enterprises. In the future, this paper will consider the attributes of enterprises for further exploration.

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