

Does Green Bond Market Policy Improve Company Value? - Test of Policy Effect Based on Difference-in-Differences Model

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Abstract. To regulate the issuance of green bonds, the State Council, the Bank of China, and the National Development and Reform Commission successively released policies. Does this series of policies work? Using quasi-natural experiment, market policy is found to increase corporate value through improving managers' compensation. The paper concludes with suggestions and countermeasures for enhancing the value of green bond companies.

Keywords: Green bond; green bond market policy; corporate value; managers' compensation; difference-in-differences model.

1. Introduction

As living standards have improved since the Industrial Revolution, global warming has worsened. China is studying how to promote the orderly conversion of high-carbon emissions industries to low-carbon emissions under the transformation and support category. According to Qiu Muyuan and Yin Hong, peaking and neutralizing carbon require a massive economic and social revolution, and it will require enormous financial support for the green development strategy. In order to increase the issuance of green bonds, financial tools must be used. [1].

As a result of a series of green bond policies in 2017, the scale of green finance has amplified in China. However, there is no clear evidence that green bond policies will increase companies' values. Moreover, green bonds' risk management is not well researched. Hence, in this study, we analyze whether green bonds policies can enhance corporate risk management and examine feasible solutions.

2. Literature Review

Different economists have studied green bonds from different perspectives. Dupont et al. showed that green bonds are more valuable as investments [2]. According to Baulkaran, green bonds increase shareholder value significantly. Sustainable development is also promoted by green bonds [3]. Based on DID methodology, Flammer concluded that green bonds could enhance enterprise performance and generate long-term value [4]. According to Tang and Zhang, an enterprise's stock price would increase significantly after issuing green bonds [5].

In this paper, we explore how green bond policies affect listed companies that issue green bonds. According to the paper, green bond policy will boost Chinese listed companies' value. The previous study showed that green corporate bonds can improve corporate profitability and performance, and it employed indirect channel analysis frameworks such as green innovation degree, environmental protection, and sustainable supply chain management [6-8]. According to Alonso, green bonds would increase the internal discount rate (IRR) and provide direct financial incentives for companies that issue them [9]. In light of the above, green bonds can significantly enhance enterprise value. According to Wu Yuhui, green bonds issued by enterprises lower bond financing costs for other similar businesses [10].

In summary, the following three points are expected to contribute marginally to this paper. Firstly, the policy analysis of green bonds analyzed not only from an existing study indicating green bonds are positively correlated with company value, but also whether green bonds policies enhance company value. Second, whether green policy can increase corporate value through improving compensation. Finally, we provide green bond risk management advice.

3. Empirical Analysis

3.1 Evaluation Method

By building the difference-in-differences model, it is possible to judge whether a policy will result in the expected policy effect. Policy effects were evaluated by comparing the differences between the two groups before and after the policy was implemented.

3.2 Dataset and Model Setting

This paper selects relevant data from the Wind database from 2015 to 2020. Listed companies with missing data are eliminated to ensure certainty of the empirical results. The basic model of this paper as follows:

$$Tobin Q_{it} = \alpha_0 + \alpha_1 * green_{it} + \alpha_2 * \beta_{it} + \alpha_3 * did_{it} + \alpha_4 * Control_{it} + u_{it} + \varepsilon_{it} (1).$$

Where, i represents different listed companies, and t represents different time points. This paper takes the time when the company issues green bonds for the first time as the benchmark, and takes the year after issuing bonds as 1, like $treat_{it} = 1$; or $treat_{it} = 0$. In addition, this paper takes the time of green bond policy in 2017 as the benchmark, and takes 0 before 2017, like $post_{it} = 0$; or $post_{it} = 1$; $did_{it} = treat_{it} * post_{it}$. Variables are explained as shown in Table 1.

Table 1. Summary of Variables

Variable		Symbol	Definition
Explained variable	The value of the company	Tobin Q	Share price/Book value of total assets
Explaining variable	Proportion of green bonds	green	Green bond issuance/Total claims payable
	Policy effect	did	
Mediator	Compensation of managers	Wage	The natural log of executive compensation
Control variables	Asset liability ratio	ALR	Total liabilities/Total assets
	Risk factor	β	
	The company size	SIZE	The natural log of the company's total assets
	The shareholding ratio of the largest shareholder	Shareholder	The shareholding ratio of the largest shareholder
	Return on equity	ROE	Net profit/Net asset
	Cost income ratio	CIR	Operating expenses/Operating income
	Growth of the company	Growth	The natural logarithm of a company's intangible assets

3.3 Empirical Analysis

According to the regression analysis in Table 2, green bonds have a positive correlation with corporate value. For verification, a difference-in-differences model (DID) is required to determine if the green bond policy increases the company's value.

Table 2. Correlation Analysis of Variables

	Tobin Q	β	Green	SIZE	ALR	Shareholder	ROE	CIR	Growth
Tobin Q	1								
β	0.322	1							
Green	0.278	0.155	1						
SIZE	-0.416	-0.350	-0.562	1					
ALR	-0.430	-0.203	-0.516	0.846	1				
Shareholder	0.0460	-0.0070 0	0.333	-0.511	-0.528	1			
ROE	0.149	-0.0720	-0.186	0.289	0.183	-0.246	1		
CIR	0.316	0.308	0.403	-0.764	-0.717	0.520	-0.41 8	1	
Growth	0.0620	-0.0390	-0.105* *	-0.0330	-0.199	0.0220	-0.15 7	0.3 05	1

According to Table 3, combining Model 1 and Model 2, with the support of the green bond market policy, the corporate who issues green bonds develops better than who do not.

Table 3. Policy Effect Analysis of Green Bonds

	Model 1	Model 2
Variables	Tobin Q	Tobin Q
Green	0.204***	0.0904**
	(5.677)	(2.355)
did	0.0728	0.107**
	(1.224)	(2.000)
The Control Variables	N	Y
Individual Fixed Effects	Y	Y
Time Fixed Effects	Y	Y
N	457	457
R-squared	0.236	0.410

Std in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

3.4 Mediation Effect Analysis

Firstly, this paper examines whether green bond regulations can increase the value of listed companies that issue green bonds. What is worthy of further study is, in addition to the proportion of green bonds, whether there is a mediating variable that can improve the value of listed companies under the condition of policy effect. Therefore, we further discusses wage of managers.

Table 4 illustrates that green bond policy has a positive impact on the compensation of managers, and improves the work enthusiasm of managers who work in the listed companies. In other words, after the promulgation of the relevant regulations on green bonds, the company can increase the compensation of managers in order to improve the enthusiasm of managers and control the risks of bond issuance more effectively.

Table 4. Impact of Policies on Managers' Compensation

Variables	Wage	Tobin Q
Wage		0.136***
		(5.501)
Green	-0.268***	0.0896**
	(-3.631)	(2.414)
did	0.201*	0.0979*
	(1.864)	(1.863)
The Control Variables	Y	Y

Individual Fixed Effects	Y	Y
Time Fixed Effects	Y	Y

Std in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

3.5 Robustness Test

From the results of placebo test, it can be found that the P value of only a few regressions is greater than the P value of the true regression coefficient, which indicates that the release of green bond policy has a relatively robust effect on the value of listed companies issuing green bonds, and indeed promotes the improvement of the value of listed companies issuing green bonds.

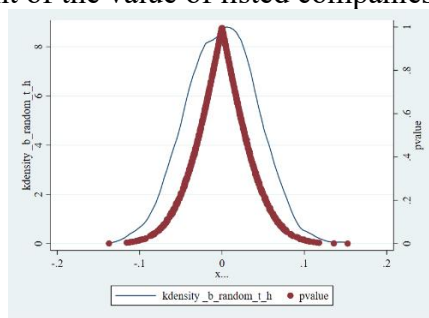


Fig. 1 Placebo Test for the Baseline Model

4. Conclusion

Using the data of listed companies from 2015 to 2020, and studies whether the green bond policy has a positive policy effect on listed companies issuing green bonds by using the difference-in-differences model. We can conclude from empirical results that, compared with before the promulgation of green bond policies, green bonds have a more significant positive effect on improving company value after the promulgation of policies. Further, to explore how risk management can be improved, this paper starts from the manager's compensation, which found that it correlates directly with the value of the company. That is to say, increasing the compensation of managers can improve their work enthusiasm, thus enhancing the value of the company and realizing more effective risk management.

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