Research on Financing Efficiency of Green Bond in New Energy Industry

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Abstract: Based on the data from 2017 to 2020 of 30 A-SHARE and Hong kong-share listed companies in China's new energy industry, this paper analyzes the financing efficiency of green bonds by using the Data envelopment analysis method. At present, the issuing scale of green bonds is the main factor that hinders the financing of new energy industry.At the same time, the new energy industry should issue green bonds according to the size and technology level of enterprises, which will lead to the investment redundancy and waste of resources.

Keywords: New energy industry; Green bonds; Financing efficiency; DEA model

1. Introduction

In March, the 14th five-year plan was officially adopted. The "Double-carbon target" is a hot topic at this year's two sessions, and the development of new energy industry is an important driving force for the realization of the "Double-carbon target". At present, China's new energy industry is in the growth period, capital demand, long cycle, financing difficulties need to be solved. Therefore, China's new energy industry should actively broaden financing channels to ease the financing pressure, such as: The issuance of green bonds.

Green bonds can reduce the cost of financing for companies. Reducing Information Asymmetry, improving safe liquidity and reducing perceived risk for issuers are the main channels through which green bonds reduce corporate costs. [1] Zerbib Compares Green Bonds with non-green bonds and finds that green bonds have more advantages in three aspects: issuing cost, tax cost and information disclosure cost. [2]

The theoretical significance of this paper is to get the financing efficiency of green bonds in new energy industry by DEA, and to put forward a more comprehensive evaluation method of green bonds for studying the financing efficiency. Its practical significance lies in promoting the new energy listed companies and investors'understanding of green bonds, which can not only help the listed companies to make financing decisions, but also activate investors'investment enthusiasm.

2. Research design

2.1 Sample selection and data sources

In the field of new energy in China, there are not many listed companies that issue green bonds, so this paper selects 30 listed companies of a and Hong Kong stocks that have issued green bonds for research and analysis. In the empirical process, according to the sample companies from 2017 to 2020 annual financial data, combined with the different macro-environment of each year for analysis, so as to get the new energy industry financing efficiency of green bonds.The data in this article is from the wind database.

2.2 Model selection

2.2.1 Selection of DEA models

The DEA model is suitable for the case of multi-input and multi-output. The idea of this paper is to measure the efficiency of green bonds in new energy industry financing.BCC model is suitable to study the efficiency of green bonds in financing new energy industry. Therefore, this paper chooses input-type BCC model as the basis.

2.2.2 Construction of indicator system

Based on the characteristics of the new energy industry, this paper follows the principles of independence and comparability in the selection of indexes.Finally, in terms of input indicators, ZQZE, PMLL, RZJG and RZFX are used as input indicators, and in terms of output indicators, basic earnings per share (EPS) , liquidity ratio (LDBL) , account receivable turnover (YSZK) , gross profit (GPM) and revenue growth (YYSR) were selected as output indicators.

3. Empirical Results and programme improvements

3.1 An empirical study on the efficiency of green bond financing based on DEA

Using Deap2.1 software to analyze the data of 4 green bonds input indexes and 5 financing efficiency output indexes of Chinese new energy listed companies, the average of overall technical efficiency, pure technical efficiency and scale efficiency of green bonds supporting financing of new energy industry during the four years from 2017 to 2020 is obtained as follows:

Table 1   2017-2020 average financing efficiency of sample companies

Year	Average value of overall efficiency	Average pure technical efficiency	Average efficiency of scale
2017	0.945	0.973	0.97
2018	1	1	1
2019	0.989	0.996	0.993
2020	0.879	0.978	0.896

From the overall efficiency of the average: 2017-2020 four years of green bond financing efficiency instability, in 2017-2018 in an upward trend, but from 2018, green bond financing efficiency has been in a downward trend, until 2020, has dropped to a four-year low. The reason for this may be the establishment of China's Green Bond Standard Committee in 2018, coupled with the introduction of local green bond financial support policies in Sichuan, Hainan and other provinces, making the green bond market environment increasingly perfect.[1]

3.2 2017-2020 input-output slack analysis of green bonds in new energy industry

The constant returns to scale means that the input and output of resources are optimal, when the sample is in the DEA efficient state, and the increasing returns to scale and decreasing returns to scale mean that the sample is in the DEA invalid state, this shows that there is a problem of input redundancy or insufficient output, and the resources have not been allocated effectively.

Based on the 2017-2020 green bond input data of China's new energy industry, the input-oriented BCC model is established, and the green bond input relaxation analysis table of the four-year invalid sample companies can be obtained.

China's New Energy Industry has four slack variables in the four years from 2017 to 2020: Beijing automobile in 2017, Yunnan water in 2017 and 2020, and Shenzhen Energy Group in 2019. In terms of financing income, there were two companies with redundant investments, which showed that the green bonds issued by Beijing automotive and Shenzhen energy group in 2017 and 2019 were too large, blindly financing can not improve the efficiency of enterprise financing. In terms of the financing cost, that is, the coupon rate of green bonds, Yunnan water has obvious investment redundancy in 2017 and 2020. Therefore, Yunnan water should reasonably set the coupon rate of its bonds when it issues green bonds in the future, appropriately reducing the coupon rate of the green bonds is beneficial to the raising of the financing level of Yunnan Water company. In terms of financing structure, only Yunnan water has investment redundancy in 2017. The quantitative indicator of financing structure in this paper is the total amount of green bonds issued/total liabilities, yunnan water does not have the problem of investment redundancy in 2017 green bond financing income (the total issue amount) , which shows that Yunnan water should pay attention to the company's debt problem, a company's debt is not the less the better, appropriately increase the debt, can promote enterprises to expand the scale of enterprises, improve their management level and technical level, which is conducive to the improvement of financing efficiency. Therefore, Yunnan water resources should reasonably plan the type and scale of its liabilities, to control the enterprise's asset-liability ratio in a reasonable range. As far as financing risk is concerned, the companies listed in the above table all had investment redundancy in the corresponding years, the most serious of which was the financing risk state of Yunnan water in 2017, yunnan water has insufficient capacity and experience in issuing green bonds to promote financing efficiency and needs to be further improved.[2]

4. Conclusions and countermeasures
4.1 Conclusion

From the point of view of comprehensive technical efficiency, China's new energy industry is in the growth stage, with limited anti-risk ability and strong sensitivity to the macro-environment. From the view of pure technical efficiency and scale efficiency, the scale efficiency is lower than pure technical efficiency in the four years from 2017 to 2020, which shows that the new energy industry, as a growing emerging industry, has a small scale of issuing green bonds, this is also the main factor that restricts the development of new energy industry at present. On the one hand, new energy industry is technology and knowledge-intensive industry, which requires high technology content and should invest a lot of funds to support its technology demand.

4.2 Countermeasures： Enterprises should reasonably plan the issue of green bonds

According to the analysis of financing efficiency and the improvement plan of input and output, the green bonds issued by new energy enterprises will improve the financing efficiency to some extent, but the more the green bonds issued, the better, for example, in 2017, Beijing Automobile and in 2019, Shenzhen Energy Group both have the phenomenon of investment redundancy. When Green Bonds are issued too much and the financing income is too high, the green bonds will have a certain degree of negative impact on the financing efficiency of enterprises, therefore, when new energy enterprises issue green bonds, they should, on their own scale and technical level, combine the macro-economic environment of the year, reasonably plan the scale of issuing green bonds can Not blindly pursue the excessive financing income absolute value blindly.

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