

Analysis of the Financing Efficiency of China's Listed New Energy Companies under the Goal of Peak Carbon Emissions and Carbon Neutrality

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Abstract: Among the new energy enterprises strongly supported by China, there are many emerging products involved, so they will require a large amount of research and operation funds, which involves the financing problem of enterprises. Among the numerous research objects, financing efficiency has become one of the important factors. If enterprises want to become leaders in the industry, they must have high financing efficiency. Researchers have analysed the efficiency of corporate financing from different dimensions and levels, and have achieved a series of impressive research results. This article provides an example of 182 new energy listed companies, analysing and exploring their financing efficiency from the following micro data: financial expenses, proportion of non-tradable shares, total corporate funds, equity concentration, and shareholding ratio of the largest shareholder. The article uses the DEA-Logit model to study the impact of various factors on financing efficiency and draw conclusions. The research results indicate that, except for the positive impact of an increase in total assets on a company's financing efficiency, other factors such as shareholder equity ratio, equity concentration, non-tradable share ratio, and financial expenses have a negative impact on financing efficiency. Finally, based on the results of data analysis and combined with the actual situation, we propose micro and macro suggestions for the financing situation of new energy listed companies.

1. Introduction

1.1 Literature Review

The research conclusion of Zeng[1] indicates that the choice of financing methods can affect the financing cost and efficiency level of enterprises. Du[2] believe that the return on equity of enterprises has the most significant impact on their financing efficiency, and the macroeconomic regulation effect will also have a certain impact on their financing efficiency. Marco[3] conducted a study on the financing efficiency of all listed companies in China from 2009 to 2012 using a combination of DEA

and Logit models. The results showed that the overall level of financing efficiency of listed companies in China is not high. Among the factors that affect financing efficiency, total assets, shareholder shareholding ratio, and financing efficiency are positively correlated; The proportion of non-tradable shares, property rights ratio, financial expenses, and financing efficiency are negatively correlated. Li[4] pointed out in his research on the financing efficiency of small and medium-sized enterprises on the New Third Board in Liaoning Province that the financing efficiency of enterprises is positively correlated with total assets and the proportion of the largest shareholder's shareholding.

Berensmann [5] believe that most new energy companies are not large in scale and have greater financing risks than leading new energy companies, which resulting in low financing efficiency for the entire industry. Muhammad [6] believes that the duration of debt financing is a factor that affects financing efficiency, and the duration of debt financing is negatively correlated with the financing efficiency of the enterprise.

2. Model Selection

2.1. DEA Model Variable Selection

This article selects the following explanatory variables to analyse the influencing factors of financing efficiency of new energy listed companies.

Input indicators:

Total Asset of the enterprise, Enterprise shareholder equity ratio (SE), Concentration of Enterprise Equity (LE), Non tradable shares ratio of enterprises (ILS), Corporate financial expenses (FC)

Output indicators:

Enterprise operating income, Net profit of the enterprise (NP), Enterprise earnings per share (EPS), Enterprise Tobin Q value (TQ)

The requirement of the DEA model is that the input-output indicators are all non-negative. In the collected data, there are negative data such as corporate financial expenses, so it is necessary to normalize the data. I chose min max normalization for normalization:

$$y_{ij} = 0.1 + \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} \times 0.9 \quad (1)$$

2.2. Logit model variable selection

This article uses the financing efficiency measured by the DEA model as the dependent variable (Y^* , as the variable Y is used in the DEA model, it is denoted as Y^*), where the numerical result of achieving effective financing efficiency is 1. If the value is 0, it indicates that the financing efficiency has not reached the effective value. Financing efficiency between 0-1 is also known as the non-effective state. The establishment of the Logit model is based on the above method and is established as follows:

$$Y^* = \text{Logit} \left(\frac{p}{1-p} \right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \mu \quad (2)$$

The five explanatory variables in Table 1 were selected from the input indicators in the DEA model, as the output indicators are difficult to control. We need to focus on the input indicators, assuming that the content is:

Assumption 1: There is a positive relationship between total assets and financing efficiency of a company. Assumption 2: There is a negative correlation between shareholder equity ratio and financing efficiency. Assumption 3: There is a negative relationship between equity concentration and financing efficiency. Assumption 4: There is a negative correlation between the proportion of

non-circulating shares and financing efficiency. Assumption 5: There is a negative correlation between financial expenses and financing efficiency.

Table 1: Composition of Logit Model Variable Values

Variable Composition	Major Factor	Corresponding Symbols	Explanation
Explained Variable	Has financing efficiency reached an effective level	Y*	Numerical result interval [0,1]
Explanatory Variable	Total Assets of the Enterprise	X1	
	Equity Ratio	X2	Shareholders' equity/total assets
	Ownership Concentration	X3	CR1
	NONTRADE	X4	
	Financial Costs	X5	
stochastic disturbance	Residual	μ	Obey normal distribution

Data source: Self-made based on the research content

3. Empirical Study on Enterprises Financing Efficiency

3.1. DEA Model

3.1.1. Descriptive Statistics of DEA Model

Table 2: Sample Descriptive Statistics Table

	Variables	Average	Standard Deviation	Minimum Value	Maximum Value
Input Indicators	X1: Total Assets of the Enterprise	253.4873	348.3456	0.0472	1564.4834
	X2: Equity Ratio	0.1613	0.1913	0.0001	0.8674
	X3: Ownership Concentration	34.5826	15.6180	3.6200	99.0000
	X4: NONTRADE	1.3197	1.8662	0.0261	34.8779
	X5: Financial Costs	66.4838	153.5880	0.0001	1219.1975
Output Indicators	Y1: Income	72.2750	157.8793	0.0007	1285.6827
	Y2: Net Profit	40.6431	67.1564	0.0673	85.6486
	Y3: Earning Per Share	34.7456	54.9711	2.6756	104.7672
	Y4: Enterprise Tobin Q Value	1.0116	1.7052	-35.5971	28.1234

Data source: Self-made based on the research content

Table 2 selected a total of 182 sets of independent and dependent variable data, and selected four indicators: mean, standard deviation, minimum and maximum values from the data for descriptive statistics. From the perspective of the respective indicators of input and output, the polarization of enterprises is significant, and good enterprises obtain higher financing amounts and financing efficiency; Small businesses are at risk of bankruptcy.

3.1.2. Result Analysis of DEA Model

Through Excel calculation, it is very intuitive to see the performance of 182 listed companies θ Efficiency value and s_i^- , s_i^+ represents the value of the relaxation variable, TE represents the technical efficiency value of the listed company, PET represents the pure technical efficiency value, and SE represents the scale efficiency value. The calculated results are shown in Table 3.

Table 3: Financing Efficiency Analysis Results of 182 New Energy Listed Companies

Listed Companies	Scale Efficiency Value		Technical Efficiency Value		Pure Technical Efficiency Value	
	Companies	Proportion	Companies	Proportion	Companies	Proportion
Valid	3	1.65%	3	1.65%	12	6.59%
Invalid	179	98.35%	179	98.35%	170	93.41%

Data source: Self-made based on the research content

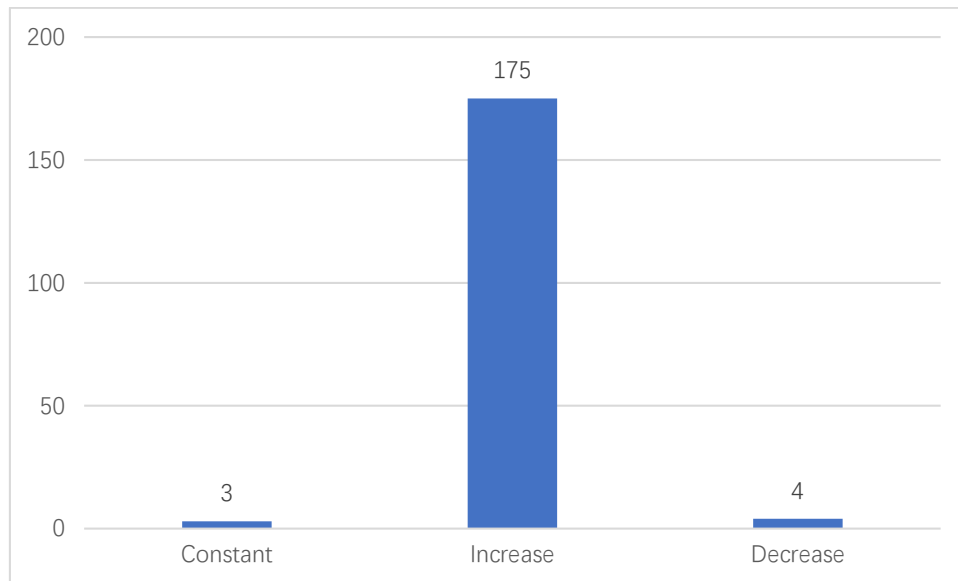
According to Table 3, out of the 182 selected new energy listed companies, only 3 are effective in terms of scale and efficiency. The measurement results show that there are three listed companies with effective technological efficiency. There are 12 listed companies that are purely technically effective. The three types of efficient companies account for 1.65%, 1.65%, and 6.59% of the total number of companies. Among the three companies that achieved effective technical efficiency, the values of the calculated slack variables were all 0, indicating that the scale returns of these three companies remained unchanged and their technical efficiency effectively met the standards. There are a total of 12 listed companies that have achieved pure technical efficiency, but 9 of them have not achieved technical efficiency. The financing efficiency value is less than 1, indicating that financing efficiency is not effective. This indicates that these listed companies all have excess investment or insufficient output, and further adjustments to corresponding rules and systems are needed. Table 4 shows the distribution of three efficiencies among 182 selected listed companies.

Table 4: Distribution Table of Three Efficiency Types for 182 New Energy Listed Companies

	1	1-0.9	0.9-0.8	0.8-0.7	0.7-0.6	0.6-0.5	0.5-0
SE	3	45	65	69	0	0	0
TE	3	5	19	109	43	3	0
PTE	12	95	46	18	8	2	1

Data source: Self-made based on the research content

According to the analysis results in Figure 1, it is found that there are 179 listed companies in an inefficient state of technological efficiency, among which 175 companies have seen an increasing change in scale returns. The remaining 4 listed companies have a trend of decreasing scale returns, indicating that the proportion of capital investment in listed companies is small, and their reproduction capacity needs to be further improved.



Data source: Self-made based on the research content.

Figure 1: Distribution of RTS among 182 New Energy Listed Companies

3.2. Logit Model

3.2.1. Regression Analysis of Logit Model

Table 5: Logit Regression Results of Financing Efficiency for 182 New Energy Listed Companies

Explanatory Variable	Coefficient	Standard Deviation	Z-statistic	Adjoint probability
Total Assets of the Enterprise	0.053526	0.009713	5.510678	0.0000
Equity Ratio	-8.292746	1.803047	-4.599295	0.0000
Ownership Concentration	-0.045336	0.019106	-2.372846	0.0177
NONTRADE	-2.419735	1.841533	-1.313979	0.1889
Financial Costs	-4.351309	1.684609	-2.587394	0.0097
Explained Variable	$Y^*=5.456127X_1-10.135463X_2-2.487236X_3-2.414792X_4-5.456413X_5$			

Data source: Self-made based on the research content.

According to Table 5, the Z-test values of the explanatory variables of total assets, shareholder equity ratio, equity concentration, and financial expenses have passed the significance test, indicating that these factors will have a significant impact on the financing efficiency of listed companies. If the Z-test value of the proportion of non-circulating shares exceeds 10%, it indicates that the significance test result does not meet the requirements. It can be concluded that the proportion of non-circulating shares has not had a significant impact on the financing efficiency of listed companies. According to the goodness of fit test results of the model, the H-L Statistics numerical result is 9.7330, and the P-value result is 0.2843, exceeding 0.05, indicating that the model fitting results can meet the requirements. From the analysis results, it can be seen that all five hypotheses mentioned above are valid.

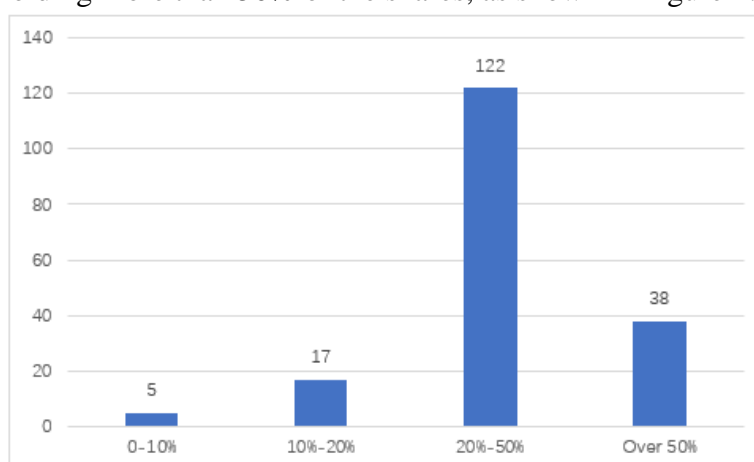
4. Strategies

4.1. Emphasize the Optimization of Equity Structure

According to the fitting results of the Logit model, it is found that the concentration of equity and the proportion of non-circulating shares will affect the financing efficiency of new energy listed companies, and there is a negative impact relationship. Therefore, three suggestions are proposed.

4.1.1. Reducing the Concentration of Corporate Equity

Among the 182 new energy listed companies studied in the article, there are 160 listed companies with the largest shareholder holding more than 20% of the shares, and 38 listed companies with the largest shareholder holding more than 50% of the shares, as shown in Figure 2:



Data Source: The author independently compiled the data based on the Wind database

Figure 2: Distribution of the largest shareholder SR in 182 new energy listed companies

A highly concentrated equity structure may affect the level of corporate governance, as the largest shareholder holds a large proportion of shares and may use their power to seek personal gain, causing damage to small equity interests and resulting in lower financing efficiency for listed companies.

4.1.2. Increasing the Number of Investors or Shareholding Ratio

According to the fitting results of the Logit model, the maximum shareholder shareholding rate of a listed company has a hindering effect on the company's financing efficiency. For companies with fewer shareholders, increasing the number of investors will also increase the number of board members, which is helpful for the future development prospects of the company and significantly improves financing efficiency; For companies with a large number of shareholders, increasing the proportion of shares held by the remaining shareholders, i.e. the larger the proportion of shares held by the 2nd to 10th largest shareholders, can allow shareholders to vote on major issues related to the company's development. This will have a certain restraining effect on the largest shareholder, thereby improving overall financing efficiency.

4.1.3. Introducing Excellent Talents and Investors

The relationship between strategic investors and strategic talents is causal, as having excellent strategic talents leads to the recruitment of strategic investors. Strategic talents are committed to the long-term stable development of the company and have sufficient influence on the company. Strategic

investors can optimize the ownership structure of company shares and achieve optimal distribution of shares. Both strategic talents and strategic investors can provide opinions or suggestions for corporate governance decisions, creating favourable conditions for the realization of long-term strategic interests. Therefore, listed companies need to attach importance to the introduction and rational use of strategic talents, recruit strategic investors based on this, optimize the company's internal policies, and effectively improve financing efficiency.

4.2. Developing the Bond Market

According to the fitting results of the Logit model, there is a negative correlation between shareholder equity ratio and financing efficiency. In addition, if the total asset size of listed companies is increased, it can effectively improve the financing efficiency and keep them in a constantly improving development trend. At present, listed companies in China have a high dependence on equity financing, based on this, solutions can be addressed from the following three aspects:

4.2.1. Correctly Understanding the Cost of Capital

Listed companies should have a correct understanding of the cost of capital, pay attention to the cost of equity capital, fully utilize the WACC calculation method to calculate the company's cost of capital, and further standardize the development of debt financing behaviour. They should consciously accept supervision from investors and relevant institutions to ensure that the principal and interest of bond financing can be repaid in a timely manner upon maturity.

4.2.2. Optimize the Credit and Rating System

With the continuous optimization of China's credit system, the credit rating system is also gradually improving. At the same time, companies need to expand financing channels, simplify the process of bond issuance, and gradually loosen the treatment of whether enterprises can issue bonds and the scale of issuance; Pay attention to standardized management of enterprise information disclosure and clarify the mechanism for assuming responsibility. We suggest that develop multiple types of corporate bonds to meet the differentiated and personalized needs of different investors. To provide policy support for the development of intermediary institutions in the bond market, we promote the rapid circulation of bond market products, timely turnover.

4.2.3. Give Full Play to the Government's Macro Regulatory Role

By optimizing financing risk prevention policies, important policy support is provided for the development of credit business, creating a favourable financing environment, and helping listed companies solve financing difficulties. For small and medium-sized enterprises, policy preferential support can be provided to create favourable conditions for their scale development and growth. We suggest that fully leverage the role of private capital, establish venture capital companies, and meet the differentiated financing needs of different investors.

5. Conclusions

In this study, 182 new energy listed companies were specifically selected as the research objects. The financing situation of these companies in recent years was investigated and analysed, models were constructed, and financing efficiency was measured. The results showed that the overall financing efficiency level of new energy listed companies in China is not high at the current stage. With the support of China national policies, there is still significant room for development in the

financing efficiency of new energy listed companies in our country, and reasonable measures need to be taken to address and solve it.

According to the measurement of 182 new energy listed companies, strategies and suggestions are proposed to optimize the equity structure of new energy listed companies and develop the bond market at both micro and macro levels. In optimizing the equity structure of new energy listed companies, there are three main points: reducing the concentration of equity in new energy listed companies, increasing the number of investors and the proportion of shares held by other shareholders, actively introducing excellent strategic talents, and recruiting strategic investors; In the development of the bond market, there are also three points: correctly understanding the concept of capital cost, improving China's credit system, and increasing government policy support.

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