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Optimization Method of the Win-Win Path of New Energy and Financial Innovation

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Abstract. In the process of industrial progress, financial innovation has played a vital role. Although the new energy industry is one of the country's seven strategic emerging industries, it still needs to rely on current financial assistance to deal with the oversupply of overcapacity problem. In order to optimize resource allocation and solve the problem of overcapacity, it is crucial to select appropriate channels for financial innovation. This study organized the benefit analysis of financial innovation on the typical characteristics of the new energy industry in the Shanghai and Shenzhen stock markets. Through these analyses, this study can determine the reliability and importance of the win-win path for new energy and financial innovation and provide appropriate policy guidance accordingly.

Key words. New Energy, Financial Innovation, Win-win Path, Optimization Method.

1. Introduction

The 14th Five-Year Plan clearly states that it is necessary to continue reducing energy consumption and carbon dioxide emissions per unit of GNP to achieve the new goals of resource conservation and environmental protection. Promoting the progress of new energy economy has been regarded as the consistent view of the long-term development strategy of China's social economy, and this emerging economic form has given the optimization of industrial layout and economic reform and improvement to bring great convenience [1]. In the development process of China's new energy industry, during the 13th Five-Year Plan period, the government introduced frequent policies in the new energy industry, which also led to the coordination of industrial policies from the central and local governments. During the 13th Five-Year Plan period, Chinese governments at all levels have launched more than 30 new energy industry stimulus policies, laws, guidelines, and guidance catalogues, mainly promoting the development through the implementation of fiscal policies such as tax relief and investment subsidies [2], and industrial policies such as quota supply and forced grid connection. However, the most significant development problem, capital circulation, has not been effectively solved [3].

The organization carries out research on the impact of financial innovation support on industrial progress based on the connection principle of industry and finance, evaluates the efficiency of capital circulation, finds out the bottleneck of industrial development, and guides the optimization and aggregation of resources, capital, technology and demand. The study of China's new energy industry financial innovation support performance organization carried out evaluation, using the mathematical model and quantitative analysis, calculation and study the current financial innovation support for the development of wind and solar industry effect and influence, but also evaluate the financial innovation support in the importance of the development of new energy industry in our country [4]. After all, based on empirical research and combined with the specific situation of China, appropriate policies and solutions have been formulated to make China's new energy industry pay more attention to the role of finance to ultimately improve the path of financial innovation support, and provide a reference for solving the current problem of overcapacity [5].

2. Study Design

A. Selection of the DEA Model

The Input-output model selection. The selected input-output mode depends on which part has the most vital operating power in the numerous investment and generation systems. If the indicators of the multi-input systems are more stable and difficult to change than the multi-output systems, then the output-led DEA model should be selected for this study [6]. Conversely, if the indicators in the system are mainly presented in the form of variables with considerable variability, then the input-oriented DEA model should be selected for this study. The research method of this study is to evaluate its effectiveness and performance in the new energy industry

through financial innovation so that the study will choose the DEA model dominated by capital investment [7], [8].

The Selection of the Computational Model. The four commonly used DEA modes are C^2, BC^2, C^2WH, and C^2GS^2. The C^2GS^2 model is only suitable for analyzing and evaluating the effectiveness organization of pure technical efficiency to reveal the changing trend of scale returns [9]. When considering many input and output factors, the C^2WH model can show an excellent evaluation effect. The BC^2 is constructed by setting the constant of the production function to the scale under the premise of the C^2R model and scaling the parameters by adding a fixed parameter. Overall, BC^2 has taken into account large-scale effectiveness, pure technical effectiveness, as well as overall technical efficacy. Therefore, according to the characteristics and objectives of this study, the BC^2 model will be selected as the basis for the analysis.

B. Selection of Input-output Indicators

According to the uniqueness of the new energy industry, the study uses the production and asset methods to determine the indicators of the model. As for the measurement standard of investment, this study selected the total share capital in circulation share ratio (ltg), the total debt ratio (zcfz), and the risk element in the process of financial innovation Beta to organize the evaluation. These data all reveal the direct financing of the stock market. The financial debt ratio reveals the proportion of direct financing; in the financial innovation process, the risk element reveals the large-scale economic situation and how securities market conditions affect stock prices. Based on its own practical experience and professional understanding, this study finally confirmed the return on equity (s1), Gross profit margin of sales (s2) And the year-on-year net profit growth rate of the parent company (s3) These three output indexes, these are important references to measure the company's profitability and development potential. Theoretically, the model describes the role and effect of financial innovation on new energy companies' profit and development ability.

C. Logit Model

In the academic field of metrology, the logical model is adopted on a large scale, which is a logical model constructed by factors and natural variables, which can help this study to deeply explore and elaborate the research results to obtain practical insights. The use scope of this model has been extended to many fields such as economy, management and science and technology, providing a solid theoretical basis for the government's various decisions. This study is based on the effectiveness of financial support obtained through data envelope analysis, and will explore in depth how various indicators and parameters affect the company's operational effectiveness. In addition, the study based on the real state and the importance of evaluation results gives up some researchers to further study regardless of the time series, but take the annual Logit model organization to carry out the annual analysis, and in accordance with the overall situation of our country state and industry policy, and match the empirical results of the study. Table 1 presents the parameter metrics of the Logit model in this article.

Table 1. Parametric Indicators of the L Ogit Model

TYPE OF VARIABLE	VARIABLE NAME	VARIABLE-DEFINITION
Dependent variable	Y*	Financial innovation supports efficiency
Explanatory variable	zcfz	asset-liability ratio
	LTG	The proportion of the outstanding shares to the total share capital
	Beta	Risk factor residual terms in the process of financial innovation
	E_i	support, normally distributed
The coefficient of variables to be estimated	β_i	I take 1,2, and 3

The goal of constructing the model is to explore the efficiency of financial innovation support and the causal links among the explanatory variables. Investment-driven by the DEA model, the dependent variable of the binary variable represents the overall technical efficiency. Among them, the decision unit responsible for providing financial innovation is set to 1, while the value of other decision units that are not achieved is set to 0. The asset-liability ratio zcfz is used as the explanatory variable. Ltg and beta are the risk factors measuring the proportion of outstanding shares in the total equity and in the support process of financial innovation. The Logit model was constructed as follows:

$$Y^* = \beta_1 \times zcfz + \beta_2 \times ltg + \beta_3 \times Beta + \varepsilon_i \quad (1)$$

D. Data Sources

In view of the new energy field being a budding emerging field, its development is still in the prosperity and growth stage, and there is a limited number of listed new energy enterprises, the listing cycle is short. Therefore, on the basis of ensuring the stability and accuracy of the empirical research, this research selected 20 excellent new energy enterprises in the field of new energy, wind power generation and solar photovoltaic from the A-share market in Shanghai and Shenzhen to carry out in-depth discussion and interpretation. All 40 listed new energy companies are focused on new energy and have a significant market share in various sub-sectors, especially in wind power, from the production of wind power equipment parts to the production of full equipment and wind power production. During the study, the annual financial reports for the three years from 2020 to 2022 were collected, and the information was divided into three parts in screenshots, comprehensively assessing the effectiveness of financial

innovation in each year in various international contexts.

E. Data Processing

In the DEA analysis model, we must ensure that the input and output data have no negative values, that is, the connection of all the decision parts has not changed. Therefore, for the sequence data with negative values, this study can adopt the following methods to achieve unified treatment:

$$Z_{ij} = 0.1 + (Z_{ij} - \min Z_{ij}) / (\max Z_{ij} - \min Z_{ij}) \times 0.9 (2)$$

Among them, Z_i is the value of the first item *j* index of the first *i* new energy enterprise.

3. The Study Found that

A. DEA Analysis of Financial Innovation Support Efficiency

The growth of the new energy industry is driven by the financial sector, that is to say, it can use the market liquidity to promote the improvement of the organization industry and organize the rational allocation of resources.

The analysis of the comprehensive effectiveness. Overall benefit (θ) represents the sum of a single scientific and large outcome. From 2019 to 2021, this study conducted an in-depth analysis of financial innovation organizations in the wind and solar power industries and further clarified the benefits of the two industries.

Interpretation data: (1) from 2020 to 2022, the overall efficiency of the wind energy industry was 0.817,0.753 and 0.811, respectively. However, the average overall efficiency was the lowest in 2021, with only two new energy companies having an overall efficiency of 1, a significant 50% reduction from the four in 2020. Between 2020 and 2022, the overall efficiency value of the solar photovoltaic industry was 0.798,0.750 and 0.730, respectively, which have been declining for the past three years. Especially in 2022, the overall efficiency value of only one new energy enterprise reached 1, accounting for only 20% of the five new energy enterprises in 2020, resulting in a reduced annual profit.

The analysis of the effectiveness of pure technology. Pure technical efficiency (δ) reflects the application effect of the investment element, aiming to achieve the increase or cost reduction of the output value. When the value of pure technical efficiency increases, this means that the investment of the project is fully utilized, that is to say, the efficiency of new energy enterprises will also improve. From 2020 to 2022, the study conducted an in-depth analysis of financial innovation organizations in the wind power and solar power industries and demonstrated the pure technical benefits of these industries.

Interpretation of the data: (1) according to the average level of pure technical efficiency, 2022 is recognized as the most efficient year in the wind power industry, of which 11 companies have a pure technical efficiency above the average level, and only 5 companies have a pure technical efficiency of 1. In 2020, the efficiency of the solar photovoltaic industry peaked, with 12 companies having an above-average single technology efficiency, and five having a single technology efficiency of 1. Between 2020 and 2022, the pure technical efficiency value of the wind energy industry is 0.883,0.860 and 0.893, respectively. However, the average pure technical efficiency in 2021 is the lowest, with only two new energy enterprises having a pure technical efficiency value of 1, which is significantly lower than the five new energy enterprises in 2022. During 2020 and 2022, the pure technical efficiency values of the solar photovoltaic industry were 0.866,0.853 and 0.844, respectively, which have been declining for the past three years. Especially in 2022, only two new energy enterprises will have a pure technical efficiency value of 1, which is significantly less than the five new energy enterprises in 2020.

B. Logit Model Analysis of the Effectiveness of Financial Innovation Support

The main function of the Logit model is to evaluate the utility model's reliability and the organization of the regression results by means of quantitative analysis. The construction of the Logit model is based on the fitting of various variables of financial innovation support efficiency, as follows:

$$Y^* = \beta_1 \times zcfz + \beta_2 \times ltg + \beta_3 \times Beta + \varepsilon_i \quad (3)$$

As shown in Table 2, the 2020 research data reveal the regression model of Logit for financial support benefits in the new energy industry, in which the two variables *ltg* and Beta deny the initial prediction at the 5% significance level, that is, *ltg* and Beta have a clear role in the benefits of financial support. The explanatory variable of *z* is within the 5% significance level and cannot deny its initial hypothesis. Therefore, this study can infer that *z* did not clearly impact the effect of financial services in that year. IPO and refinancing behavior has hurt the implementation of financial innovation, mainly because the direct financing quota in the capital market in 2020 has increased significantly compared with 2019, which makes new energy companies encounter the bottleneck of demand after blindly expanding through direct financing.

Table 2. Logit Regression Fitting Results of the Sample Financial Innovation Support Efficiency in the New Energy Industry in 2020

Equation		Y*=-0.4606zcfz x-4.2332ltg +0.9675Beta	
Std. Error	1.8633	2.09210.4241	
Z-Statistic	-0.2472	-2.02342.2816	
Prob	0.8048	0.04300.0226	
Goodness-of-FitTest H-L.Statistics	7.6464	Prob.Chi-Sq(8)Prob.Chi-Sq(10)	0.4687

Andrews Statistic	11.4135	0.3262

As shown in Table 3, the analysis results of the Logit regression model in the new energy industry in 2021 are presented. The two variables *ltg* and Beta deny the initial prediction at the 5% significance level, that is to say, lg and Beta have a clear role in the efficiency supported by financial innovation. The explanatory variable of zcfz cannot deny its initial hypothesis at 5% importance, so this study can infer that the current z does not clearly impact the effect of financial services. As capacity growth in completed projects exceeds energy demand, financing projects with low technology levels and vague market positioning cannot have a positive impact.

Table 3. Logit Regression Fitting Results of the Sample Financial Innovation Support Efficiency in the New Energy Industry in 2021

ESTIMATE EQUATION		Y*=-0.2102z -5.1444ltg+2.9950Beta	
Std. Error	2.5882-0.0812	1.9698-2.6117	1.2759
Z-Statistic	0.9353	0.0090	2.0162
Prob.			0.0438
Goodness of Fit Test H-L Statistic		8.3597Prob.Chi-Sq(8)0.3991	
Andrews Statistic		17.5917Proh.Chi-Sq(10)0.0623	

In 2022, the analysis results of Logit regression model in the new energy industry, zc and lug denied the initial prediction at the 5% significance level, that is to say, zcfz and lug have a clear role in the efficiency of financial services. Beta's explanatory variable cannot reject its initial hypothesis at 5% importance, so Beta's performance in the year did not clearly impact the effect of financial support. The goodness-of-fit test of the null hypothesis model is fully satisfied, apparently at the 5% significance level, the model successfully passed the H-L Statistic as well as Andrews Statistic test, which confirms that the goodness-of-fit of the model is excellent.

Therefore, this study concluded that while other conditions remain unchanged, the balance sheet ratio in 2022 and the realization of financial innovation support are positively correlated, and indirect financing is effective for improving the overall benefit. IPO and refinancing activities have negatively impacted the implementation of financial innovation, mainly because China's follow-up supervision of direct financing is not sound, many new production capacities have been surplus before the operation, and projects with low technical content of initial financing cannot produce positive results.

4. Conclusion

After a detailed empirical investigation, the study found that various types of financial innovation strategies and technologies have different roles in the new energy industry. After a detailed comparison and interpretation of the research results, this research has obtained the appropriate research results:

Companies in China's new energy industry are currently experiencing a critical stage of development, and their risk resistance ability is relatively weak, and they are sensitive to the overall environment. When the overall situation is good, the company's financial assistance benefits will grow rapidly. On the contrary, when the overall situation is not good stage, any kind of financial assistance method does not clearly impact the enhanced effectiveness of financial assistance. Given the complexity of the global economic situation, there are huge unknowns, so the capital distribution mechanisms of emerging energy industries often fail or fail to work.

The single technical benefits of China's new energy companies are usually inferior to the large-scale benefits, indicating that the low technical level is the key factor leading to the reduction of the overall benefits. China's new energy industry started relatively late, mainly relying on overseas advanced technology, and its technical level is quite low. Therefore, the company needs to increase the financial support in technology development and product innovation, pay attention to the training of senior scientific and technological experts, promote the forefront of science and technology, and improve the technical level of the industry, in order to better improve the technical benefits of the industry.

The development of new energy industry in China's new energy industry has not been effectively promoted by direct financing, and the efficiency of financial innovation support for three consecutive years has shown a negative trend. The National Development and Reform Commission has listed the new energy industry as the main support object of the seven strategic emerging industries, which has greatly increased the speed and scale of related new energy enterprises in the process of IPO and refinancing in the secondary market. However, the influx of a large number of projects of the same type increases the competitive pressure on the whole industry, and the income of many investment projects does not meet expectations, and even some of them have faced the problem of loss. Therefore, in the phase of financial market turmoil, this study should try to avoid relying too much on direct financing.

In China's new energy industry, the influence of indirect raising is increasingly prominent. The shift from a weak influence over the past two years to a significant influence in 2022 shows that indirect financing with a low-risk appetite plays a significant role in a complex and volatile macro environment. Through strict pre-evaluation and detailed in-process supervision, indirect financing methods can ensure the feasibility and profitability of production and expansion projects, to prevent blind investment. Therefore, in the stage of financial market turmoil, this research needs to make the best use of the characteristics

and advantages of indirect financing to achieve the best allocation of the industry.

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