A Study of Energy Sector Investment Strategies Based on DEA Model

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ABSTRACT : China has long advocated the "Scientific Outlook on Development" and attached great importance to the innovative development of the energy industry. As "energy" is a major hot topic today, we are based on the DEA model to analyze our investment strategy in the energy sector.After screening, observing, and analyzing the historical data of listed companies in China's energy sector, this group selected a large amount of historical data from the energy sector listed companies. Thirty energy companies were selected as the research subjects, and data from three input indicators and three output indicators from 2019 to 2021 were used as the research basis. The DEA model was combined with 30 energy sector listed companies, and investment efficiency was analyzed and summarized.

Keywords: Energy; DEA model; investment strategy.

I.   RESEARCH OVERVIEW

Energy scarcity is an eternal topic, and the Chinese government is guided by the Scientific Outlook on Development to develop China's modern energy industry with high speed, efficiency, and quality. It continues to adhere to the basic national policy of "saving resources and protecting the environment", strives to enhance the ability and level of sustainable development, builds an innovative country, and continues to make greater contributions to the development and prosperity of the world economy.

Against the backdrop of severe environmental pollution and energy scarcity, the vast majority of people in our country have realized the importance of energy and have received attention from various aspects. With the rapid development of the energy industry, the investment efficiency of energy listed companies has become an important means of determining investment goals, which plays a crucial role in the research of energy listed companies, a leading enterprise in China's energy industry. The research and analysis of energy listed companies in relevant theoretical literature in China is relatively rare, and research on energy investment is conducive to filling the theoretical gap of energy sector companies. Meanwhile, research and analysis are conducive to promoting the development and progress of energy listed companies, improving the competitiveness of energy sector companies, and optimizing investment behavior.

Based on this, this group adopts a research method that combines literature research, qualitative and quantitative analysis, as well as theoretical and empirical analysis. The DEA model is used to empirically analyze the investment efficiency of various energy listed companies and propose conclusions.

II.   LITERATURE REVIEW
1. Research on Investment Efficiency

Biddle&Myers (2009) used the methods of Myers (1977) and Jensen (1986) to divide the sample into an over-investment group and an under-investment group based on cash and debt standards, and analyzed the relationship between the quality of financial information and investment efficiency. The results still indicate that high-quality financial information is a significant factor in improving investment efficiency.

Bushmen (2011) From the perspective of cross-border research, it was found that corporate transparency can improve investment efficiency by reducing information symmetry.

2. DEA model analysis

Lei (2010) conducted a systematic analysis and research on the comprehensive energy consumption benefits of thirty provinces, regions, and prefecture level cities in China through the DEA method. The comprehensive energy consumption benefits of various regions in the country were divided into pure technical benefits and scale benefits, and it was found that the eastern region surpassed the central and western regions in terms of comprehensive energy consumption benefits and pure technical benefits, However, in terms of economies of scale, the central and western regions have taken a relatively leading position.

3. The impact of debt on investment efficiency

Lan (2005) divided enterprises into over investment group and non over investment group, and tested their debt ratio. The results showed that the debt level is not related to whether the enterprise has over investment.

Chen (2016) divided liabilities into operating liabilities and financial liabilities, and her research results showed that operating liabilities can inhibit excessive investment by enterprises, while financial liabilities cannot play the role of contingent governance of debts.

III.   RESEARCH CONTENT

1. Characteristics of Energy Investment

China has a long history and abundant energy resources, but its energy still faces difficulties and challenges:

(I)The phenomenon of imbalanced regional distribution of China's energy resources is evident. China's coal resources are mainly distributed in North China and Northwest China, while resources such as crude oil, natural gas, and hydro-power are distributed in other places. Therefore, the large consumption of resources in the eastern region necessitates large-scale major projects, which has led to the significant uneven distribution of energy in China and the basic pattern of energy transportation.

(II) The actual per capital energy ownership is relatively small. The population of China is as high as 1.4 billion, and globally, the per capital dependence on energy resources in China is also at a relatively low level, which limits the development of biomass energy. Therefore, energy acquisition faces difficulties, and investment poses certain risks.

Energy, as an indispensable part of the world, is closely related to human survival. Therefore, there are opportunities and broad prospects in the energy sector. The significant characteristic of investment in the energy industry, which is different from other investments, is that it not only generates economic effects but also social effects. The high attention of the government, the high attention of the public, the urgent demand of the market, the employment driven by related industries, and the continuous improvement of people's living standards are all catalysts for the development of the energy sector. Therefore, investment in the energy industry will also trigger additional intangible environmental benefits.

2. Future development trend of energy

Energy is closely related to the overall development of the human economy and society, and plays a crucial role in China's strategic formulation and industrial planning. The mutual promotion of scientific and technological progress and energy transformation is profoundly affecting the prospects of China's energy development. Meanwhile, we will encounter the following issues.

About half of Europe's fuel energy is imported from the Middle East and Russia, and as it develops, its demand will increase to three-quarters, making it highly dependent on energy. Due to the dual constraints of economic development and environmental change, the issue of energy scarcity has become common. If left unchecked, the environment will become even worse.

With the rapid development of new energy, China's energy has evolved from centralized supply methods such as coal, oil, and electricity in the past to both centralized and "decentralized". The widespread application of various digital technology devices in the energy industry has gradually broken through the barriers between various energy products, and has become an important trend in the future.

3. DEA Fundamentals

DEA can be simply understood as evaluating the effectiveness of comparable units using linear programming based on multiple input and output indicators. By comparing the technical efficiency and scale efficiency of energy listed companies, we can determine whether investment efficiency is effective for the strategy.

IV.   DATA ANALYSIS

1. Sample data and indicator selection

This group takes listed companies in the energy sector from 2019 to 2021 as a sample through observation, analysis, and screening of data. For all sample companies with negative values, missing data, and ST categories in company data, deletion processing will be carried out. To ensure the accuracy of the results, the selection of sample size should be between twice and three times the total number of input-output indicators. Therefore, this article selects 30 energy listed companies and uses weighted return on equity, main business income, earnings per share, employee compensation payable, short-term income, and long-term income as analysis indicators.

2. Empirical Testing and Analysis

This group conducted efficiency analysis, residual variable analysis, and relaxation variable analysis on the 30 energy listed companies from 2019 to 2021, based on which to determine the production efficiency and utilization of input factors of each company, and determine when to achieve optimal efficiency and DEA effectiveness.

Table 1 Summary of Basic Information of Securities Trading

Number of trading stocks	7		Number of profitable stocks	5		Number of losing stocks	2
Serial number	stock code	stock name	profit and loss amount	holding days	buying and selling prices	buying and selling	holding
1	600550	transformer electrical	1500	15	6.36	6.37	10000
2	300180	Huafeng Superfiber	110000	6	4.14	4.76	150000
3	601222	Linyang Energy	1530	6	8.98	9.49	3000
4	600869	Far East Shares	372000	8	7.36	7.9	100000
5	601088	China Shenhua	104300	14	29.87	31.31	70000
6	600884	Shanshan Share	-395831	36	29	23.25	126500
7	000722	Hunan Development	-326162	35	14.65	13.28	220000
Total return on account							-4.64%

V.   CONCLUSION

This group analyzed the investment situation of these 30 energy listed companies, combined with relevant literature and DEA models, and reached the following conclusions:

In 2019, Jiahua Energy, Guoneng Rixin, Tianmao Group, Jerry Group, China Shenhua, Three Gorges Energy, Hunan Development, and Huaneng Hydro-power were all DEA effective, and the technical efficiency was the best at this time.In 2020, Jiahua Energy, Tianmao Group, Jerry Group, China Shenhua, Three Gorges Energy, Solar Cable, and Huaneng Hydro-power were all DEA effective, and the technical efficiency was the best at this time.In 2021, Guoneng Rixin, Tianmao Group, China Shenhua, Daquan Energy, Solar Cable, and Haili Wind Power are DEA effective, and the technical efficiency is the best at this time.

From this, it can be seen that Tianmao Shenhua and China Shenhua have achieved the best technical efficiency for three consecutive years. Our group will next combine Tianmao Shenhua, China Shenhua, and related stocks with better technical efficiency, and adjust the investment portfolio based on the market situation in a timely manner.

REFERENCES

[1]. Biddle, C.&Myers, S. Corporate Financing and Investment Decisions When Firms Have Information that In vectors do not Have [J] Journal of Financial Economics, 1984 (2) 187-221.

[2]. Bushmen, A. Large share holders and corporate control [J]. Journal of Political Economy, 1986,94 (3): 461-488.

[3]. Lei, X. Review of Energy Efficiency Evaluation Based on DEA Model [J]. Jiangxi University, 2010.

[4]. Lan, Y. Z. Capital Structure, Equity Structure, Growth Opportunities, and Corporate Performance [J]. Nankai Management Review, 2004 (7): 57-63

[5]. Chen, Y. The Impact of Financing Structure on Costs of Fan Wenli Company, Empirical Analysis of Chinese Commercial Enterprises [J]. Value Engineering, 2005 (10): 112-115.