

The Efficiency Evaluation of Energy Enterprise Group Finance Companies Based on DEA

Lina Jia^{a*}, *Ren Jin Sun*^a, *Gang Lin*^b, *LiLe Yang*^c

^aUniversity of Petroleum, Beijing, China

^bChina Construction Bank, Beijing (Branch), China

^cXi'an Changqing Technology Engineering Co., Ltd., China

*Corresponding author: Lina Jia, Master, E-mail: cuplnjia@hotmail.com

Abstract:

By the end of 2015, about 196 financial companies have been established in China. The energy finance companies accounted for about 25% of the proportion. Energy finance groups has some special character such as the big size of funds, the wide range of business, so the level of efficiency of its affiliated finance company has become the focus of attention. In this paper , we choose DEA to measure the efficiency(technical efficiency, pure technical efficiency, scale efficiency and return to scale) and make projection analysis for fifty energy enterprise group finance companies in 2014. The following results were obtained: ①The overall efficiency of the energy finance companies is not high. ①Under the condition of maintaining the current level of output, Most of the energy enterprise finance companies should be appropriate to reduce the input redundancy, so as to improve efficiency and avoid unnecessary waste. ③Some companies should continuously improve the internal management level to achieve the level and the size of output . Through the projection analysis, this paper provides some enlightenment and practical guidance for the improvement of the efficiency level of the non DEA effective energy group enterprise group.

Key words: *DEA; finance company of energy enterprise group; efficiency; projection analysis*

1 Introduction

As non-bank financial institutions, financial company is the product of the combination of production and finance. The establishment and development of finance companies promote the reform and development of large enterprise groups in china. China established the first enterprise group finance company in 1987. At the end of 2015, the national financial company established a total of 196. Energy enterprise group financial company accounted for 25% of the proportion of financial companies¹. Energy finance groups has some special character such as the big size of funds, the wide range of business, so the level of efficiency of its affiliated finance company has become the focus of attention. In this paper, we choose DEA to measure the efficiency(technical efficiency, pure technical efficiency², scale efficiency and return to scale) and make projection analysis for fifty energy enterprise group finance

companies in 2014. Through the projection analysis, this paper provides some enlightenment and practical guidance for the improvement of the efficiency level of the non DEA effective energy group enterprise group³.

2. Definition of financial company

According to the “Measures for the administration of financial companies of enterprise groups”(2007), as non banking financial institutions ,the goal of Enterprise group finance company is to strengthen the group's capital concentration ,improve the efficiency of the use of funds and provide financial management services to the group members⁴.

3. Overview of data envelopment analysis

Data envelopment analysis was proposed by the famous operational research scientist Charnes, Cooper and Rhodes in 1978. The relative efficiency of the decision making units is calculated and compared with the same type, then make evaluation to the evaluation object⁶. Generally speaking, DEA is considered to be one of the most effective ways to evaluate the efficiency⁹. DEA do not have to consider the weight of the problem, objectivity is relatively strong. DEA determine whether the DMU is on the production of the forefront of the analysis. At the same time, we can use the DEA to carry on the projection analysis, correct the non DEA effective decision making unit, and finally realize the effective⁵.

The DEA model is divided into scale return invariant model and VRS model with variable returns to scale⁷. The VRS model can explain the technical efficiency, pure technical efficiency and scale efficiency. This paper we choose the VRS model.

4. Empirical analysis

4.1 Sample selection and calculation

This paper selects 50 energy enterprise group finance company and data collected from the 2015 statistical yearbook of the financial companies. According to the existing research and the actual situation of the energy enterprise group finance company, we select the following input and output indicators⁸⁻¹¹:

Input indicators: Total assets; Total liabilities; Number of employees.

Output indicators: Gross profit; Operating income; Capital adequacy ratio; Capital concentration; Return on net assets;

Orientation of DEA model: input oriented.

The input and output index data of the company are shown in Appendix 2. Using the software DEAP2.1, we deal with the input and output data of the financial companies of the 50 energy enterprise group, and get the following results shown in table1.

Table 1 – Efficiency value

DMU	Technical Efficiency	Pure Technical Efficiency	Scale Efficiency	Returns to scale
China Huaneng Finance Co.,Ltd.	0.8	0.801	0.999	Increasing
CGN Finance Co.,Ltd.	0.61	0.634	0.958	Decline
China Huadian Finance Co.,Ltd.	1	1	1	Constant
China Southern Power Grid Finance Co.,Ltd.	0.88	1	0.88	Decline
China Power Finance Co.,Ltd.	0.843	0.849	0.993	Increasing
Zhejiang Province Energy Finance Co., Ltd.	0.834	1	0.834	Decline
Shenenergy Finance Co.,Ltd.	0.941	1	0.941	Decline
State Nuclear Power Finance Co.,Ltd.	1	1	1	Constant
Anhui Province Energy Finance Co., Ltd.	1	1	1	Constant
Three Gorges Finance Co.,Ltd.	0.718	0.741	0.968	Decline
China Datang Finance Co.,Ltd.	1	1	1	Constant
China Power investment Financial Co.,Ltd.	1	1	1	Constant
BEIH Finance Co.,Ltd.	0.641	0.664	0.966	Increasing
Guangdong Yuedean Finance Co.,Ltd.	0.846	0.888	0.952	Increasing
Shenzhen Energy Finance Co.,Ltd.	0.726	0.727	0.999	Increasing
Hubei Energy Finance Co.,Ltd.	1	1	1	Constant
Sinopec Finance Co.,Ltd.	1	1	1	Constant
Sinochem Finance Co.,Ltd.	0.58	0.585	0.993	Decline
Chongqing Chemical and Pharmaceutical Holdings Group Finance Co., Ltd.	1	1	1	Constant
China National Aviation Fuel Finance Co., Ltd.	0.849	1	0.849	Decline
Shanghai Huayi Finance Co.,Ltd.	0.658	0.734	0.897	Increasing
Shaanxi Yanchang Petroleum Finance Co.,Ltd.	1	1	1	Constant
Tianjin BohaiGroup Finance Co.,Ltd.	1	1	1	Constant
CNOOC Finance Co.,Ltd.	0.685	0.929	0.737	Decline
China Chemical Finance Co.,Ltd.	0.807	0.83	0.973	Decline
Hubei Yihua Finance Co.,Ltd.	0.662	0.85	0.779	Increasing
China National Pharmaceutical Group Finance Co.,Ltd.	0.636	0.753	0.845	Increasing
Yuntianhua Group Finance Co.,Ltd.	0.959	1	0.959	Increasing
Juhua Group Finance Co.,Ltd.	0.849	0.85	0.999	Increasing
Shenhua Finance Co.,Ltd.	1	1	1	Constant
Huainan Mining Group Finance Co., Ltd.	0.873	0.873	1	Constant
Jizhong Energy Group Finance Co., Ltd.	0.667	0.674	0.989	Increasing
Yangquan Coal Industry Group Finance Co., Ltd.	0.732	0.771	0.949	Decline
Yankuang Group Finance Co., Ltd.	0.794	0.816	0.973	Decline
Kailuan Group Finance Co. Ltd.	0.719	1	0.719	Decline
Datong Coal Mine Group Finance Co., Ltd.	1	1	1	Constant
China PingMei ShenMa Finance Co., Ltd.	0.598	0.626	0.955	Increasing
China Coal Finance Co., Ltd.	1	1	1	Constant
Huaibei Mining Group Finance Co., Ltd.	0.542	0.571	0.948	Decline

DMU	Technical Efficiency	Pure Technical Efficiency	Scale Efficiency	Returns to scale
China Luan Group Finance Co., Ltd.	0.821	0.91	0.902	Decline
Henan Energy and Chemical Industry Finance Co., Ltd.	1	1	1	Constant
Shanxi Coking Coal Group Co., Ltd.	0.807	0.87	0.928	Decline
Jincheng Anthracite Mining Group Co., Ltd.	0.926	0.926	1	Constant
Fujian Energy Group Co., Ltd.	1	1	1	Constant
Shanxi Coal and Chemical Industry Group Finance Co., Ltd.	0.563	0.58	0.971	Decline
Guizhou Panjiang Group Finance Co., Ltd.	1	1	1	Constant
Shandong Energy Group Finance Co., Ltd.	1	1	1	Constant
Wanbei Coal- Energy Group Finance Co., Ltd.	1	1	1	Constant
Chongqing Energy Investment Group Finance Co., Ltd.	1	1	1	Constant
ENN Finance Co., Ltd.	0.495	0.516	0.959	Increasing
Average	0.841	0.879	0.956	--

According to the calculation results on the table, 18 finance companies of the technical efficiency is 1, accounting for 36%. 25 finance companies of the pure technical efficiency is 1, accounting for 25%. Pure technical efficiency of some finance companies is less than 1, but higher than the average value of 0.979, such as Guangdong Guangdong Finance Company Limited, Cnooc Finance Corporation Ltd, Shanxi Coal Group Finance Company Limited. Pure technical efficiency of 22 companies is lower than 1, and below the average. The internal management and operation and technical level of these finance companies is low . These company should continuously improve the management level.

From the scale efficiency, the scale efficiency of 21 energy enterprise group financial companies in China is 1. The average is 0.956. There are 15 companies below average.

4.2 Projection analysis

We choose DEAP2.1 to analyze the projection of the non DEA effective companies. Then we can get the data of input redundancy and output deficiency. S_1^- , S_2^- , S_3^- stands for the input redundancy. S_1^+ , S_2^+ , S_3^+ , S_4^+ , S_5^+ stands for the output deficiency. We choose 22 finance companies as the example to show the result. The results are showed as table 2.

Table 2 – Projection analysis

DMU (Companies)	Technical Efficiency	S_1^- (Million)	S_2^- (Million)	S_3^- (Numbers)	S_1^+ (Million)	S_2^+ (Million)	S_3^+ (Million)	S_4^+ (%)	S_5^+ (%)
China Huaneng Finance Co.,Ltd.	0.8	0	146540.4	0	0	13441.25	22.954	17.778	1.164
CGN Finance Co.,Ltd.	0.607	0	224891.9	0	23857.882	0	25.831	12.924	0
China Southern Power Grid Finance Co.,Ltd.	0.88	0	0	0	0	0	0	0	0
China Power Finance Co.,Ltd.	0.843	0	72978.72	0	0	0	15.167	3.632	1.397
Zhejiang Province Energy Finance Co., Ltd.	0.834	0	0	0	0	0	0	0	0
Shenenergy Finance Co.,Ltd.	0.941	0	0	0	0	0	0	0	0
Three Gorges Finance Co.,Ltd.	0.718	0	80528.4	0	0	11113.73	3.257	0	0
BEIH Finance Co.,Ltd.	0.641	0	50815.93	0	6531.671	0	19.498	0	0
Guangdong Yuedean Finance Co.,Ltd.	0.846	0	121212.2	0	11753.938	0	18.644	29.154	0
Shenzhen Energy Finance Co.,Ltd.	0.726	0	59259.05	0	3037.414	0	10.587	6.807	0
Sinochem Finance Co.,Ltd.	0.58	0	121616.5	0	8647.121	0	27.082	8.856	0
China National Aviation Fuel Finance Co., Ltd.	0.849	0	0	0	0	0	0	0	0
Shanghai Huayi Finance Co.,Ltd.	0.658	0	45328.1	0	3307.957	0	20.282	0	0
CNOOC Finance Co.,Ltd.	0.685	1320240	1494190	0	31196.407	0	0	0	0.15
China Chemical Finance Co.,Ltd.	0.807	0	32640.86	0	2561.297	0	11.087	47.67	0
Hubei Yihua Finance Co.,Ltd.	0.662	0	26901.07	0	1415.817	1166.799	37.091	13.012	0
Yuntianhua Group Finance Co.,Ltd.	0.959	0	0	0	0	0	0	0	0
Juhua Group Finance Co.,Ltd.	0.849	0	8951.611	0	1716.561	2986.305	0.2	13.206	0
Huainan Mining Group Finance Co., Ltd.	0.873	1741	0	0	13230.851	0	9.782	0	2.027
Jizhong Energy Group Finance Co., Ltd.	0.667	0	16786.6	0	0	0	4.17	51.474	0
Yangquan Coal Industry Group Finance Co., Ltd.	0.732	0	52586.47	0	2394.652	0	17.67	13.298	0
ENN Finance Co., Ltd.	0.495	0	45172.56	0	562.124	0	16.115	6.146	0

On the table 2, S_{1-} is on behalf of the sum of assets, S_{2-} is on behalf of the sum of debts, and S_{3-} is on behalf of the input redundant values of employees' numbers, S_{1+} stands for the sum of income, S_{2+} stands for the revenues, S_{3+} stands for the capital adequacy ratio, S_{4+} stands for concentration degree of funds, S_{5+} stands for insufficient output value of ROE. The figure for input and output values 50 DEA effective and non-DEA efficient DMU financial companies were given a specific projection values. We can know that, DEA is effective, and overall efficiency DEA is a financial company, redundant input values and output values are less than 0; When the overall efficiency is less than 1, that is, those financial companies are DEA effective, and input and output values need to be adjusted based on projected values in order to achieve effective DEA. For example, China Huaneng Finance Co.,Ltd., the overall efficiency is 0.8, a non-DEA effective, therefore, its inputs and outputs need to be adjusted according to the projected value. According to the projection analysis, China Huaneng Finance Co.,Ltd. debt into redundancy, redundancy value 1,465,404,000 yuan; Meanwhile, the output value of the company's financial exists shortcomings, respectively revenue should increase to 134,412,500 yuan, the capital adequacy ratio should increase 22.954%, the concentration ratio of the funds should be 17.778%, ROE should increase the value of 1.164%.After making projected value adjustments, China Huaneng Finance Co.,Ltd.own total assets 29,622,940,000 yuan, total liabilities 24,348,564,000 yuan, 63 employees, the output values of total profit of 1.06085 billion yuan, sales income of 1,667,132,500 yuan, the capital adequacy ratio of 45.104%, 58.778% concentration ratio of funds, net assets yield 13.084%, China Huaneng Finance Co.,Ltd. is for the DEA effective.

5. Conclusion

In adopting DEA energy of 50 finance companies selected efficiency evaluation, it's discovered that the Group's overall financial companies integrated energy companies is not very efficient, and most energy finance companies, while maintaining the existing lower level of output conditions, should be appropriate to reduce the input redundancy and to improve efficiency and avoid unnecessary waste. In the process of improving the financial performance of the company and the overall efficiency, in addition to reduced inputs redundancy costs, we have to continue to strengthen the company's internal financial management, its training schedule according to the needs of employees, according to their performance and implement reasonable and effective incentives to continuously improve the company's internal financial management level, output level, increasing the size of the company to make the financial stability and development.

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