Research on the Comprehensive Performance Evaluation of Energy Enterprises

Meng Diyun [1,2, a]

[1] Hunan vocational college of science , Changsha, 410004, China

[2] technology Changsha University of Science & Technology, Changsha, 410004, China

[a] Mengdiyun2013@163.com

Keywords: Energy enterprises; Company performance; Fuzzy optimization model; Comprehensive evaluation; Rational investment; Macro-control

Abstract. In recent years our country has introduced various preferential policies. This made Chinese new energy industry developed vigorously. A variety of new energy enterprises not only focus on domestic energy market and continue to form alliances with foreign company to become a multinational group. The company's performance is an important part those investors pay attention to. Through the study of listed energy Corporation's performance this paper analyzed the scientific basis of rational investment. By using the fuzzy optimization model, it analyzed the performance evaluation of listed energy enterprise and avoided investors blindly following suit into investment traps. From the results can be seen, our country has a prospecting future and potential in the development of new energy enterprises' listing company.

Introduction

With the rapid development of our economy, especially since the reform and opening policy, China has entered into the World Trade Organization. More and more enterprises have implemented the development strategy. In early August of last year, China's development and reform commission announced the newly approved five overseas energy investment projects, and the project types included petroleum, natural gas, liquefied coal-bed methane. The ratification of multiple projects means that the investments of overseas resources projects in our country enter into the intensive period. How to have the accurate and efficient evaluation of overseas projects' credit risk and make the corresponding loan program is a very urgent task of the domestic bank. Development of diversified energy promotes the development of new energy, and its investment risk is relatively lower than other resources [1].

Our country vigorously promoted the structure optimization and adjustment of energy industry, and actively supported the development of the energy industry. Since 2000, China's energy companies continued to expand their business areas, actively cooperated with foreign energy industry. By using a variety of mechanisms, the companies participate in economic globalization, regulation of coal, crude oil and refined oil continuously price system. Company performance of energy enterprises are changing, which bring challenge to the investor. In order to reveal the performance of new energy enterprises, by establishing new energy enterprises fuzzy optimization model, this paper makes research on comprehensive evaluation of the energy industry enterprise performance. We know that we have great prospect and potential in new energy listing Corporation development.

The establishment of fuzzy optimization model

a. Energy enterprise performance based on the grey model

It is an applied mathematical discipline with uncertain phenomenon that studies information part clearly, part unclear. Expression form of grey system forecast model is differential equation. It reveals the continuous process of energy enterprise performance. By using the grey model GM (1, 1) provided by DPS software, this paper analyzed the energy performance of enterprises [2].

© 2013. The authors - Published by Atlantis Press

① Making one accumulated generation to data series (1), which can get formula (2)

$$X^{(0)}=\left\{x^{(0)}(1),x^{(0)}(2),\cdots,x^{(0)}(N)\right\} \quad (1) \qquad X^{(1)}=\left\{x^{(1)}(1),x^{(1)}(2),\cdots,x^{(1)}(N)\right\} \quad (2)$$

In formula (2), $X^{(1)}(t)=\sum_{k=1}^{t}x^{(0)}(k)$.

②Tectonic accumulated matrix B and constant vector YN, it is

$$B=\begin{bmatrix} -\frac{1}{2}(x^{(1)}(1)+x^{(1)}(2)) & \cdots & 1 \\ \vdots & \ddots & \vdots \\ -\frac{1}{2}(x^{(1)}(N-1)+x^{(1)}(N)) & \cdots & 1 \end{bmatrix} \quad (3) \qquad Y_N=\left[x^{(0)}(2),x^{(0)}(3),\cdots,x^{(0)}(N)\right]^T \quad (4)$$

③ Solve the grey parameter $\vec{a}$ by the least square method

$$\vec{a}=\begin{bmatrix} a \\ u \end{bmatrix}=(B^TB)^{-1}B^TY_N \quad (5)$$

④bring the grey parameter to the time function

$$\vec{x}(t+1)=-a\left[x^{(0)}(1)-\frac{u}{a}\right]e^{-at} \quad (6)$$

⑤ Derivation reduce $\vec{X}^{(1)}$ to be

$$\vec{x}^{(1)}(t+1)=-a\left[x^{(0)}(1)-\frac{u}{a}\right]e^{-at} \quad (7)$$

⑥ calculate the difference between $x^{(0)}(t)$ and $\vec{x}^{(0)}(1)$, $\varepsilon^{(0)}(t)$

$$\varepsilon^{(0)}(t)=x^{(0)}(t)-\vec{x}^{(0)}(1) \quad (8)$$

Base on the principle of maximum membership degree, and use membership matrix to establish the standard evaluation scheme. Finally go through the rectification and practice, gradually revise and perfect it. But the actual project evaluation result is the basis of testing and adjusting the membership function.

b. The multilevel gray fuzzy optimization model

Take the two subsystems for example, evaluation index set M, M is the total number of evaluation index of the whole system [3]. According to the various properties of evaluation indexes, it can be divided into several subsystems, they are m. In the second system, the number i subsystem has several evaluation indicators meet the following formula:

$$\begin{cases} M=\bigcup_{i=1}^{m}m_i \\ m_i\bigcap m_j=1, i\neq j \end{cases} \quad (9) \quad {}_iu_{1j}=\left\{1+\frac{\sum_{k=1}^{m_i}\left[i\varpi_k\bullet(ir_{kj}-ig_k)\right]^2}{\sum_{k=1}^{m_i}\left[i\varpi_k\bullet(ir_{kj}-ib_k)\right]^2}\right\}^{-1},(i=1,2,\cdots,m;\ j=1,2,\cdots n) \quad (10)$$

ir_{kj} means the membership degree of number j object in number i subsystem to the number K indexes. ig_k is the membership degree of number j object in number i subsystem to the number K indexes. ${}_iu_{1j}$ is the membership degree of number j object in number i subsystem to the number K indexes. According to different attributes, the evaluation index can be divided into three types: bigger is better, smaller is better and intermediate and moderate, respectively expressed them as:

$$rij=\frac{xij-\min\limits_{1\le l\le n}xil}{\max\limits_{1\le l\le n}xil-\min\limits_{1\le l\le n}xil},\quad rij=1-\frac{xij-xi}{\max\limits_{1\le l\le n}xil-\min\limits_{1\le l\le n}xil},\quad rij=\frac{\max\limits_{1\le l\le n}xil-xi}{\max\limits_{1\le l\le n}xil-\min\limits_{1\le l\le n}xil} \quad (11)$$

Through the importance grading of above factors or indexes, we classify them and give a score, then determine the weight of each index which can affect energy enterprise performance. When

comparing two new energy development indexes, through expert scoring, all indexes above can meet the requirements , that can be applied to the analysis of this thesis.

Comprehensive energy enterprise performance evaluation index system

The comprehensive evaluation index of energy enterprises are energy enterprise's profit ability, its compensation ability and enterprise assets operation ability. While the profit ability of enterprises includes per share's earnings, shareholder equity growth rate and total assets' return rate. The compensation ability includes current ratio, quick ratio, cargo liabilities rate and total assets liabilities rate. Energy enterprise assets operation ability includes total asset turnover ratio, receivable turnover ratio and the inventory turnover rate [4].

According to the present situation, the index system of Chinese energy enterprise performance evaluation is not sound. Compared with developed countries, our national policy still needs further improvement. The reference data of these indexes is limited, can not fully explain the scientific rationality of each index. Reference index of energy enterprise's profit is per share's earnings, shareholder equity growth rate and the total assets' return rate. In fact, profit performance also means new energy price gains. In the above system, the compensation ability only includes current ratio, quick ratio, cargo liabilities rate and total assets liabilities rate, but it may also need to be divided into shares' debt ratio and so on. Assets operation ability of the energy business is mainly divided into the total asset turnover ratio, receivable accounts turnover and inventory turnover rate, but it may include energy planning and so on.

The empirical analysis

The paper choose Shanghai, Beijing the five new energy listed companies for example: Sinopec (600087), CNPC (600692), Xinjiang Jinfeng Technology (600751), Yingli Green Energy (600767) and Jiangxi LDK solar (600798) as the object of evaluation. According to the determined 5 subsystems and 16 indexes in performance evaluation index system of the energy enterprises, the paper studied the values corresponding to energy enterprises' index respectively. These index values approximately obey the normal distribution N (μ, σ 2).

When we make the fuzzy optimization evaluation, we should analyze the weight of each indicator. Based on the gray fuzzy optimization model we use

$$X = \sum_{i=1}^{n} (Oi \times Wi) + \sum_{i=1}^{n} (Ti \times Wi) \qquad (12)$$

Total assets return rate is equal to the net profit plus interest payments and divided by average total assets. Sales gross profit is equal to net sales income subtract sales cost and then are divided by sales net income. Per share's operating cash flow is equal to the net operating cash flow divided by the number of shares. Operating activities' income quality is operating cash flow subtract operating benefit and then divided by the operating cash flow. Flow rate is equal to the current assets divided by current liabilities. Assets liabilities rate is equal to total liabilities divided by total assets. Accounts receivable turnover rate is equal to the credit sales divided by average accounts receivable. Inventory turnover rate is equal to the main business cost divided by average inventory. Cash operating assets activity rate is equal to the business activities cash divided by average assets. So index weights in the first subsystem, are 0.431, 0.176, 0.133 and 0.280; index weights of the second subsystems are respectively 0.314, 0.314 and 0.372; the index weights of third subsystems are respectively 0.314, 0.314 and 0.372; the index weights of fourth subsystems are respectively 0.122, 0.558, 0.320; the index weights of fifth subsystems are respectively 0.401, 0.346 and 0.252. According to the weights of each subsystem, we get the weights 0.303, 0.162, 0.198, 0.198 and 0.139.

Along with the development of national economy and the strengthening of comprehensive national strength, in China the requirement of seeking the energy resources in the global environment is increasingly urgent. The banks and government pay attention to the problems that

how to have accurate and efficient evaluation of overseas project loan risk and make the corresponding loan programs. According to the past experience, decision-making work of traditional overseas project is mainly calculated the experimented by related persons of bank loans. But compared with traditional methods, risk decision of overseas energy investment project that based on grey clustering analysis method can overcome the shortcomings of traditional methods, at the same time it also can improve the accuracy and reliability of risk decision [5].

Conclusion

In order to develop and utilize energy resources better, China should promote energy companies to reform to develop new energy resources by means of science and technology. Therefore, in the future path of energy industry development, energy resource is a promising industry. Through the study of listed energy Corporation's performance this paper analyzed the scientific basis of rational investment. By using the fuzzy optimization model, it analyzed the performance evaluation of listed energy enterprise and avoided investors blindly following suit into investment traps. It is conducive to the realization of a better national macro-control policy and the implementation of better supervision supervising management mechanism.

References

[1] Zengfu Xi, Changjun Zhu, Yunxin Zhang, "Application of PCA Model in Prediction of Spring Flow Using SPSS", IJACT, Vol. 4, No. 8, pp. 240-247, 2012.

[2] Jian Zhang, John Giles, Scott Rozelle, "Does it pay to be a cadre? Estimating the returns to being a local official in rural China", Journal of Comparative Economics, Vol. 40, No.3, pp. 337-356, 2012.

[3] Xiangzheng Deng, Jikun Huang, Scott Rozelle, Emi Uchida, "Cultivated land conversion and potential agricultural productivity in China", Land Use Policy, Vol. 23, No.4, pp. 372-384, 2006.

[4] Wen-cheng Wang, Yu-mei Wang, Tao Ji, "Grains Automatic Counting Method Based on Computer Version", IJACT, Vol. 4, No. 13, pp. 345-351, 2012.

[5] Ziping Wu, Minquan Liu, John Davis, "Land consolidation and productivity in Chinese household crop production", China Economic Review, Vol. 16, No.1, pp. 28-49, 2006.