Research on Production Efficiency and Ownership Concentration---Taking Steel Industry and Logistics Industry as Examples

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Abstract: The iron and steel industry is a basic industry in my country's industry and holds an important position in the national economy. My country's steel industry has serious overcapacity. As the country virtually promotes the supply-side structural reform of steel production capacity and the merger and reorganization of the industry, the steel market has begun to pick up, and corporate profits have radically improved. Use effectiveness analysis, project analysis and sensitivity after analysis of the financial performance evaluation of companies in the listed steel industry (30) and logistics companies (several), it is found that China's steel industry needs to focus on growth capacity and proficiency, and there are redundant operating capacity inputs and ineffective growth capacity output. According to the analysis results, fou

Keyword: DEA model; Steel industry; Financial efficiency; Logistics industry

Introduction

1.1 Purpose and Significance of the Study

1.1. 1 Purpose of the study

By combing the related research on financial performance evaluation of domestic and foreign enterprises, this paper takes listed steel companies as the research object, and supplements

Construct the financial performance evaluation system based on DEA. The main purposes can be summarized as follows: (1) Aiming at the current financial situation of listed steel companies

The shortcomings of performance evaluation, complement the construction of financial performance evaluation system based on data envelopment analysis. (2) Passage structure

The evaluation system established makes a comprehensive analysis of listed iron and steel companies, finds out the problems existing in operation and management, and puts forward corresponding improvements

Discussion, to help enterprises improve their operating conditions.

1.1. 2 Significance of research

The financial performance evaluation system based on data envelopment analysis can comprehensively analyze the financial performance level of listed steel companies, and find out

The problems existing in the operation of listed iron and steel companies are conducive to improving the operation of listed iron and steel companies. Overcapacity in the steel industry

Under the background, scientific performance evaluation methods are conducive to deepening the reform of listed steel companies and promoting the transformation and upgrading of enterprises.

Through the horizontal and vertical evaluation of the financial performance of listed steel companies, it is beneficial for managers and investors to fully understand their operating conditions

Conditions. Investors often choose investment objects according to the operating performance of listed companies, providing reference for investors to make correct investment decisions and helping investors to invest rationally. Managers can make management decisions according to the evaluation results, adjust business strategies and management methods in time, and effectively improve the company's financial performance.

1.2 Research Trends at Home and Abroad

1.2. 1 Research Trends Abroad

On the Emergence and Development of Financial Performance Evaluation

Stern Stewart (1991) put forward the viewpoint of net profit after deducting capital costs such as equity and debt, that is, economic added value index [1]. This view is put forward in order to make the company plan its enterprise strategy with the maximization of shareholder value as its operating criterion. Robert S Kapuland and David P Norton (1992) proposed in "A New Method for Measuring Performance with Balanced Scorecard" that four dimensions including finance, customers, internal management, learning and growth are used to form a performance framework for evaluation [2]. This method not only retains the financial indicators spoken by data, but also includes non-financial indicators, and quantifies them into accurate targets. This method integrates the two in a balanced way, and evaluates the past performance as well as the future performance. Kaplan and Norton (2008) added the evaluation of enterprise strategy to the evaluation module of the original Balanced Scorecard [3], making a breakthrough contribution to the enrichment and improvement of the evaluation index system of enterprise strategic performance.

Research on Financial Performance Evaluation by Introducing Factor Analysis and Data Envelopment Analysis

Charnels and W.Cooper (1978) invented DEA (Data Envelopment Analysis), which is used for multi-input and multi-output analysis, and is an analysis method considering the optimal performance. Charles Spearman and Karl Pearson (1892) discovered factor analysis in the test analysis of intelligence tests. This method explains the information reflected by a large number of original factors by finding out common factors, so that the distortion of the analysis process is reduced, and the results are reasonable and objective. George E. Halkos and Dimitrios S. Salamouris (2004) used DEA to analyze the financial performance ratio over the years, and found that mergers and acquisitions can improve bank performance [5]. Yanrui Wu (2005) used DEA model to study the technical efficiency of iron and steel enterprises in different countries in the past 19 years, and put forward suggestions to improve the technical efficiency of iron and steel enterprises [6]. Sandra Moffett and Rodney McAdam (2009) used factor analysis to evaluate business management activities, and found that factor analysis made the evaluation results more scientific [7]. ENOMOTO KEIJI (2009) adjusted the assumptions in the C2R model and developed many models with different functions. The application of these models broadened the evaluation scope of the DEA method [8]. Doron Lavee and Shlomit Nardiya (2013) used DEA model to evaluate the efficiency of solid waste source separation system and put forward evaluation opinions [9].

1.2. 2 Domestic research trends

Yang Liuting (2014) used factor analysis to evaluate the performance level of the mining industry, believing that this performance evaluation method can provide reference for enterprises in other mining industries [10]. Zhang Yifang (2014) used DEA model and Malmquist total factor productivity index to conduct static and dynamic evaluation research on the financial performance of China's agricultural listed companies, and finally conducted fitting analysis on technology, scale and comprehensive efficiency [11]. Li Jianying and Mu Yang (2015) used B2C model in data envelopment analysis to evaluate the performance of high-tech capabilities of more than 50

manufacturing companies listed in A shares in 2012, and put forward corresponding measures to improve the competitiveness of manufacturing companies in the market [12]. Li Dai (2015) used factor analysis to extract common factors from financial indicators, used common factor scores to evaluate the efficiency of DEA input and output, and ranked vertical performance and horizontal performance of the oil industry [13]. Fan Feng (2015) used factor analysis to screen the financial data of 16 commercial banks in China in the past four years, and used DEA model to analyze the efficiency of commercial banks [14]. Wang Cuisen (2015) established a M&A performance evaluation system based on data envelopment analysis and analytic hierarchy process to study the changes in financial performance before and after the M&A exhibition in Thunis [15]. Jin Hongchun (2015) constructed a DEA-based financial performance evaluation system for environmental protection listed companies, made an empirical analysis of the performance of environmental protection listed companies from comprehensive efficiency, technical efficiency and scale efficiency, and put forward suggestions to improve the financial performance of environmental protection listed companies [16]. Xue Yunxia (2015) combined the data envelopment analysis model with the sum entropy method to construct the performance evaluation system of logistics companies, and took 8 logistics companies as entity cases to conduct empirical research [17].

Related Concepts and Theoretical Basis

Related concepts

Financial performance

Financial performance is the embodiment of whether the implementation of enterprise strategy contributes to the operating performance in a certain business cycle. The operating income of an enterprise is embodied in the management ability of assets, the profitability of the company, the repayment ability of liabilities and the potential development ability of the enterprise in the future. Financial performance is the core content of enterprise performance evaluation. Only when an enterprise has a perfect financial system and a good and stable financial benefit can it maintain its sustainable operation and positive development in the market.

The financial benefit situation needs to be paid close attention to in the academic theoretical research of disciplines and the evaluation of the company's operating performance. In the market, the evaluation system with the evaluation of financial benefits as the core can promote every enterprise to actively participate in market competition. By analyzing the results of financial performance and formulating scientific management strategies, enterprises can reduce production costs and operating costs to the greatest extent, effectively increase market sales share and market share, so as to achieve the purpose of improving the level of return on investment, avoid potential risks of enterprises in time, and maintain their own market competitiveness.

Financial performance evaluation

Financial performance evaluation refers to the use of indicators in enterprise financial data, According to certain standards, a comprehensive index evaluation system is constructed by qualitative or quantitative methods to evaluate and analyze the company's debt risk, asset quality, operating growth level and profitability, so as to give investors, creditors and operators information on the operating results of the enterprise. Financial performance evaluation can play a positive guiding role in evaluation, reveal the problems existing in enterprise management, and deal with them in time is expected to help enterprises improve their operating conditions.

Data Envelopment Analysis

Data Envelopment Analysis (Data Envelopment Analysis) is a functional operation tool that uses linear programming and convex analysis to calculate the relative efficiency between decision-making units of the same type and compare them with each other, and evaluate the evaluation objects according to the obtained operation results. This method is also called efficiency evaluation analysis method. As a mathematical statistical method, DEA has a wide range of applications and can be used in comprehensive efficiency evaluation and financial performance evaluation. Therefore, DEA shows more superior properties than other evaluation methods in the application of performance evaluation.

Related theory

Principal-agent theory

The industrial revolution has made the productivity of the whole industry in the world develop at a high speed, and the high-tech and production tools have made continuous progress, which has greatly improved the labor efficiency of workers and made unprecedented changes in the accumulation of production capital. Due to the limitation of various reasons, capital owners cannot monitor their capital in real time, so capital owners begin to hire professional managers with professional skills and ability to operate enterprises to manage the company's capital. When the employment relationship occurs, the ownership of enterprises and capital is still controlled by the capital owner, and professional professional managers are responsible for the management of the company and the operation of capital. The control right and management right of the company are separated, and the rights are in the hands of different people. Based on this situation, the principal-agent theory appears.

In the modern production and operation system, the professional manager, as the manager in charge of enterprise operation, does not need to bear the enterprise risks brought by operation. The owners of enterprise capital hold the ownership of the enterprise, and all the operational risks of the enterprise are borne by themselves. Both operators and capital owners are pursuing the maximization of their own interests, and capital owners do not trust operators. The separation of management rights and ownership may lead to the deviation of the development direction of enterprises. Therefore, capital owners want to establish and perfect the principal-agent management mechanism to restrain managers. When the capital owner trusts the managers, he imposes restrictions, regulates the management behavior of the managers, and gives them appropriate incentives. When the capital owner restricts and encourages reasonably, the manager will fulfill his greatest responsibility and the interests of the enterprise will be maximized.

Contingency management theoryThe main content of contingency management theory is that it is impossible for company managers to make business strategies once and for all, and business strategies need to be adjusted in time according to the changes of external environment and internal situation. There are diversity in the actual management of enterprises. The same management methods should be adjusted with different industries, different company sizes and changes in market conditions. The specific adjustment places need to be determined by many conditions. Contingency thought tells the story that the company's operators adjust their management strategies in time under the constant changes of internal and external environment, so as to maximize the benefits of the enterprise. Contingency management requires every enterprise to make scientific and reasonable adjustments to its management strategies in a rapidly changing environment.

The theory holds that when external market conditions, internal management environment, enterprise strategic objectives and other factors change, the performance evaluation system should be improved according to the results of performance evaluation, the evaluation indicators should be adjusted accordingly, and the evaluation methods should be replaced in time to adapt to the market environment according to local conditions. At the same time, the management information system should make timely feedback and adjustment to maximize the

company's resource allocation, production efficiency and operating efficiency. Contingency theory reflects that with the change of market environment, companies should objectively realize the great degree of influence of internal and external environment changes on companies. The original financial performance evaluation model of enterprises cannot be applied all the time, and the financial performance evaluation method needs to be continuously adjusted and improved.

Short board theory

Short board theory is also called "barrel principle". This theory was put forward by Peter Drucker, the father of modern management. The main content of the short board theory is that the maximum volume that the water barrel can accommodate depends on the height of the shortest board in the barrel. In order to ensure the maximum volume of the barrel, the height of the lowest board needs to be optimized to make up for the disadvantages. As a scientific management means to judge the operation and management of enterprises, the evaluation results can reflect the specific situation of enterprise operation and management and find out the problems in the production and operation of the company. According to the barrel theory, the management of the enterprise should pay attention to the shortcomings and deficiencies in the production and operation of the company, adjust the management methods in time to deal with the shortcomings, and then improve the business performance of the enterprise.

3. Construction of financial performance evaluation system of steel listed companies based on DEA

3.1 DMU Selection

Using DEA model to study enterprise performance evaluation, the first step is to clarify the research purpose, and the second step is to choose evaluation

The third step is to construct the input and output index system, and the fourth step is to select the data suitable for the enterprise

Envelope analysis model, the last step is to carry out validity, efficiency value, projection and sensitivity analysis, and find out through result analysis

Deficiencies, found the problems existing in the enterprise management.

3.2 Determination of Original Indicators for Financial Performance Evaluation

The construction of evaluation index system is a complicated problem in the process of company financial performance evaluation. Index system department

Learning or not determines the accuracy and rationality of the evaluation results. Data Envelopment Analysis (DEA) is based on output and input elements

Carry out analysis and evaluation. Combined with the principle of index selection in the previous section, this section focuses on profitability, operating ability, solvency and growth

Ability to select the original financial indicators from four aspects.

The profit situation of the enterprise and the change of the company scale are based on the accumulation of debt capital in the early stage and the management and operation of the company in the later stage

Therefore, the indexes of solvency and operating ability are selected as the input original in the evaluation research system of TISCO shares

The initial index takes some indexes of profitability and growth ability as the original output indexes in TISCO's stock evaluation system. Right

In the original financial indicators, the main factors should be extracted to obtain the final input and output indicators.

Table 1 Evaluation Decision Unit

Number	Stock Code	Company Name	Number	Stock Code	Company Name	Number	Stock Code	Company Name
1	600569	Anyang Iron and Steel	12	002443	Jinzhou Pipeline	*23*	000717	Songshan of Shaogang
2	000898	Anshan Iron and Steel Co., Ltd	13	002318	Julia juncea	24	000959	Shougang shares
3	600581	Bayi Steel	14	600307	Jiugang Hongxing	25	603878	Wujin stainless steel
4	600010	Baotou Steel Co., Ltd	15	600231	Linggang Co., Ltd	26	600117	Xining Special Steel
5	600019	Baoshan Iron & Steel Co., Ltd	16	601003	Liugang shares	27	600782	Xingang Stock Company
6	000761	Benxi Steel Plate	17	600784	Luyin Investment	28	002756	Yongxing Special Steel
7	002478	Changbao shares	18	600808	Maanshan Iron and Steel Co., Ltd	29	000906	Zheshang Zhongtuo
8	000708	Daye Special Steel	19	600282	Nanjing Iron and Steel Co., Ltd	30	002423	Zhongyuan Special Steel
9	600507	Fangda Special Steel	20	002110	Sangang Minguang	31	000825	TISCO Stainless Steel
10	600126	Hangzhou Iron and Steel Co., Ltd	21	002075	Shagang Co., Ltd			
11	000709	Hegang Co., Ltd	22	600022	Shandong Iron and Steel			

Table 2 Original Indicators of Financial Performance Evaluation

Classification	Indicator Name	Calculation method	Select Reason
Debt service	Current ratio	Current assets/current liabilities	Measure the current assets of an enterprise before the maturity of short-term debts,
Ability	Quick-acting ratio	Quick assets/current liabilities	The ability to turn into cash to repay liabilities measures the short-term solvency of an enterprise and the realization of current assets
	Cash ratio	(Monetary fund + transactional fund financing	Capability measures the liquidity of a company's assets
	Asset-liability ratio	Production)/Current Liabilities Liabilities/Assets	Reflect the debt level and solvency of the enterprise
Operation	Accounts receivable turnover rate	Operating income/average accounts receivable balance	Ratio reflecting the turnover rate of the company's accounts receivable
Ability	Inventory turnover rate	Operating cost/average inventory balance	Reflect the turnover rate of inventory
	Total assets turnover rate	Operating income/average total assets	Reflect the management quality and utilization efficiency of all assets of the enterprise

	Turnover rate of current assets	Operating income/average total current assets	Reflect the efficiency of asset utilization of enterprises

Table 3 Original Indicators of Financial Performance Evaluation

Classification	Indicator Name	Calculation method	Select Reason
Growth	Main business income	(Revenue from main alfalfa business in the current period • Main business in the	Reflect the expansion of the scale of business income of enterprises. Further
Ability	Long rate	Business income)/Main business income of the previous period	Reflect the future development prospect of the enterprise
	Net asset acquisition rate	(net assets at the end of the period • net assets at the beginning of the period) net	It reflects the expansion speed of enterprise capital scale
	Growth rate of total assets	(Total Assets at Year-end-Total Assets at Year-beginning)/Total Assets at Year-	Reflect the K-increasing situation of the current asset scale of the enterprise
Profitability	Profit margin of main business	(Main Business Income-Main Business Cost-Main Business Taxes and	It reflects the profitability of the main business of the enterprise
	Net interest rate on total assets	Net profit/average total assets	It reflects the level of profit obtained by the company using all its assets
	Profit rate of cost and expense	Amount of operating profit/total cost	It reflects the operating results brought by operating expenses
	Operating profit margin	Operating profit/total operating income	It reflects the ability of enterprise managers to obtain profits through operation
	Cost rate of main business	Main business cost/main business income	Reflect the profit contribution ability of the main business income
	Net interest rate on sales	Net profit/sales revenue	Measure the ability of an enterprise to earn net profit after selling income in a certain period of time
	Return on assets	Earnings before interest and tax/total average assets	Evaluating the overall profitability of an enterprise using all assets is an important index to evaluate the operating efficiency of an enterprise's assets

After determining the original input indicators and output indicators, the common factors of input indicators should be extracted by factor analysis

And calculate the common factor score to construct the final index system of data envelopment analysis.

3.3 Selection of DEA Model

The CCR model is based on the premise that the return to scale does not change. It can aim at the overall effectiveness of scale-effective and technology-effective, and can be calculated

Calculate the relative technical efficiency value of the decision-making unit, However, because this model can only deal with decision-making units with constant economies of scale, However, not all sample decision-making units can keep the state of scale benefit unchanged. BCC model takes scale benefit into account. In addition to calculating the value of scale efficiency of decision-making units, it can also calculate the value of pure technical efficiency and comprehensive efficiency. In this way, the calculation results can provide more useful information for decision-making units. In this paper, BCC model is selected in the process of research and analysis. The model building process is as follows:

Assuming n decision-making units (j=1, 2, 3, …, n), these n DMUs are comparable, and each DMU has m inputs and s outputs. The efficiency of DUM can be expressed by the following linear programming:

$$\max \frac{u^T y_0}{v^T x_0}$$

$$\frac{u^T y_j}{v^T x_j} \le 1,\ j = 1,2,\cdots,n$$

$$u \ge 0, v \ge 0, u \ne 0, v \ne 0$$

$$u = (u_1, u_2, \cdots, u_s)^T, v = (v_1, v_2, \cdots, v_m)^T \quad t = \frac{1}{v^T x_0} > 0, \quad \omega = t \cdot v, \mu = t \cdot u$$

Where xj and yj are the production and output vectors of decision-making units respectively, and are the weight coefficients of m inputs and s outputs respectively. Charnes-Cooper transform for fractional programming is used. The model (CCR) of fractional situation is changed into the following linear programming model:

$$\max \mu^T y_0 = h^0$$

$$\omega^T x_j - \mu^T y_j \ge 0,\ j = 1,2,\cdots,n$$

$$\omega^T x_0 = 1$$

$$\omega \ge 0, \mu \ge 0$$

Serial Number	DMU	Comprehensive efficiency	Technical efficiency	Scale efficiency	Returns to scale	Ranking
1	Anyang Iron and Steel	0.890	1.000	0.890	Incremental	17
2	Anshan Iron and Steel Co., Ltd	0.894	0.997	0.896	Dizheng	16
3	Bayi Steel	0.594	1.000	0.594	Decrease	30
4	Baotou Steel Co., Ltd	1.000	1.000	1.000	Unchanged	1
5	Baoshan Iron & Steel Co., Ltd	0.975	0.998	0.978	Incremental	11
6	Benxi Steel Plate	0.866	0.999	0.867	Decrease	20
7	Changbao shares	0.874	0.996	0.878	Incremental	18
8	Daye Special Steel	0.906	0.995	0.910	Incremental	15
9	Fangda Special Steel	1.000	1.000	1.000	Unchanged	1
10	Hangzhou Iron and Steel Co., Ltd	1.000	1.000	1.000	Unchanged	I
11	Hegang Co., Ltd	0.995	1.000	0.995	Incremental	10
12	Jinzhou Pipeline	0.868	0.993	0.874	Incremental	19
13	Julia juncea	1.000	1.000	1.000	Unchanged	1
14	Jiugang Hongxing	0.851	1.000	0.851	Incremental	21
15	Linggang Co., Ltd	0.653	0.988	0.660	Decrease	29
16	Liugang shares	0.712	0.997	0.714	Incremental	27
17	Luyin Investment	0.797	0.997	0.799	Incremental	25
18	Maanshan Iron and Steel Co., Ltd	0.940	0.999	0. Strong 0	Incremental	13

$S^- \ S^+$ Relaxation variables and residual variables are introduced into the above planning. Relaxation variables represent the amount of input that needs to be reduced to achieve the optimal allocation, while residual variables represent the amount of output that needs to be increased to achieve the optimal allocation. Converted into dual form, the model can be simplified as:

$$\min \theta$$

$$\sum_{j=1}^{n} x_{ij}\lambda_j + S_r^+ = \theta x_0$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j - S_r^- = y_0$$

$$S^+, S^-, \ \lambda_j \geq 0, j = 1,2,\cdots,n$$

Using CCR Model to Determine Whether Technology Effectiveness and Scale Effectiveness Are Simultaneous;

$\theta = 1$且$S^+ = S^- = 0$ 1. If it is satisfied, the decision-making unit is DEA efficient, and the economic activities of the decision-making unit are both technology efficient and scale efficient;

$\theta = 1, \ S^+$和S^- 2. If at least one input or output is greater than 0, the decision-making unit is weak DEA efficient, and the economic activities of the decision-making unit are not both technology efficient and scale efficient;

$\theta < 1$ 3. If satisfied, the decision-making unit is not DEA effective, and the economic activity is neither technology effective nor scale effective.

After determining the index and selecting the model, this paper will process the original financial data, extract the common factor and calculate the score. DEAP2.1 software is used for data envelopment analysis. The software requires that the common factor score must be positive before subsequent measurement can be carried out. Therefore, the common factor score should be dimensionless in the subsequent process. The data will be adjusted between 0.1 and 1 in proportion. The processed data is the final input and output index system. Through BCC model operation, the efficiency value, relaxation variable, residual variable and referenced times of each decision-making unit are obtained. Based on the evaluation results, effectiveness analysis, efficiency value analysis, projection value analysis and sensitivity analysis are carried out, and the financial performance level of TISCO is evaluated through vertical dimension and horizontal dimension.

Table 4 Efficiency Evaluation Results of 31 Companies in Iron and Steel Industry in 2016

Serial Number	DMIJ	Comprehensive efficiency	Technical efficiency	Scale efficiency	Returns to scale	Ranking
19	Nanjing Iron and Steel Co., Ltd	0.817	0.997	0.820	Incremental	24
20	Sangang Mingguang	1.000	1.000	1.000	Unchanged	1
21	Shagang Co., Ltd	0.910	0.996	0.914	Incremental	14
22	Shandong Iron and Steel	0.699	0.980	0.713	Incremental	28
23	Songshan of Shaogang	1.000	1.000	1.000	Unchanged	1

24	Shougang shares	0.731	1.00 ()	0.761	Dizheng	26
25	Wujin stainless steel	1.000	1.000	1.000	Unchanged	1
26	Xining Special Steel	1.000	1.000	1.000	Unchanged	1
27	Xingang Stock Company	1.000	1.000	1.000	Unchanged	1
28	Yongxing Special Steel	0.837	0.985	0.850	Incremental	22
29	Zheshang Zhongtie	0.588	0.967	0.608	Incremental	31
30	Zhongyuan Special Steel	0.834	0.997	0.836	Incremental	23
31	TISCO Stainless Steel	0.957	L000	0.957	Decrease	12
Average	-	0.878	0.996	0.881	-	-

Among the 31 companies selected in the steel industry in 2016, the financial performance level of TISCO ranked 12th, relatively

In terms of the performance of the enterprises in the sample, the performance is average, and the competitive advantage is not obvious. In 2016, there were 9 listed companies with financial performance

The efficiency value is 1, which is respectively Xingang, Xining Special Steel, Wujin Stainless Steel, Shaogang Songshan, Sangang Minguang, Jiuli Special Material,

Hangzhou Steel, Fangda Special Steel and Baotou Steel. Judging from the results in the table, the technical efficiency value of TISCO shares is 1, indicating the company

At the current level of scientific and technological production technology, the company has reached the highest level of resource allocation in all aspects, and the scale benefit is variable

The optimal level is reached under the condition of.

4、Result Analysis

Among the listed iron and steel enterprises studied, only Baoshan Iron & Steel, Bayi Iron and Steel and Xinxing Casting Pipe have relatively effective economies of scale. This shows that with the same asset input, These three firms can generate more output than other steelmakers with ineffective economies of scale, The reason is that the input-output ratio of these three iron and steel enterprises is relatively reasonable and the input-output efficiency is relatively high; Although the input to Baoshan Iron & Steel, Bayi Iron and Steel and Xinxing Cast Pipe are quite different, these three enterprises have brought their own production capacity advantages into full play in combination with their own characteristics; The production level and technical level of these three enterprises are relatively high. Baosteel is the "vanguard" of China's iron and steel industry. Its research and development capability and technical level are in the forefront of the industry. The production scale and comprehensive technical strength of emerging cast pipes are in the leading level in China and even in the world. Bayi Iron and Steel has a large amount of funds for technological transformation every year. However, the effectiveness of economies of scale of these three iron and steel enterprises is only relative, and there are still some problems that need further improvement.

(2) The DEA of Linggang and Shagang are invalid, but their economies of scale are increasing. Through data comparison, the capital investment of these two enterprises is less, resulting in low input-output efficiency.

(3) Eight enterprises, such as Benxi Steel Plate and TISCO Stainless Steel, not only have ineffective DEA, but also have decreasing economies of scale. The reasons are as follows: the organization is too large and the technical level of production personnel is low, which seriously restricts the production efficiency of enterprises;

The historical burden is too heavy, which consumes a lot of funds for expanding reproduction; Unreasonable collocation of production factors and low input-output efficiency lead to low production efficiency.

5、 Policy Recommendations

From the above analysis, it can be seen that most listed iron and steel enterprises in China are ineffective in economies of scale, and most of them are diminishing in economies of scale. In view of this phenomenon, this paper puts forward the following policy suggestions from the perspective of enterprises:

(1) Increase capital investment, improve technical level, attach importance to investment in fixed assets, update machinery and equipment in a timely manner, introduce advanced production technology, and effectively improve the level of production technology. In addition, strengthen the cooperation among enterprises, scientific research institutions and institutions of higher learning, and give full play to the core role of scientific research institutes and universities in independent innovation.

(2) Pay attention to human capital, improve the quality of employees, pay attention to the investment of human capital, actively introduce external talents, carry out various types of training, continuously improve the quality of employees, and build a "fighting, hardworking and high-quality" workforce.

(3) Reasonable streamlining of institutions, optimization of information transmission, reasonable streamlining of organizational structures, reduction of unnecessary posts, introduction of market competition and incentive mechanisms, and stimulation of employees' enthusiasm for work. Further optimize the information transmission mechanism, so that decision makers can grasp the front-line dynamics of enterprises in time and make correct decisions.

(4) Optimizing the ratio of factors and balancing input and output Iron and steel enterprises should adjust the ratio of production factors in time according to their own characteristics and market demand to maximize scale benefits, thus balancing input and output and improving the efficiency ratio of input and output.

(5) Strengthen exchanges and cooperation, enhance scale effect, further strengthen the effective integration of the entire iron and steel industry, and exchanges and cooperation between iron and steel enterprises, so that different iron and steel enterprises can complement each other's advantages and effectively enhance the scale economy effect of enterprises.

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