Research on Performance Evaluation of Real Estate Enterprises Based on DEA

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Abstract: Real estate enterprises are the main bearers of the real estate industry. This paper studies the performance evaluation of real estate enterprises, establishes the performance evaluation model of real estate enterprises, and puts forward measures to improve the performance level, so as to improve the survival and development ability of real estate enterprises. Based on the analysis of the significance of real estate business performance research, this paper makes an analysis of the relevant factors affecting the business performance of real estate enterprises in China. At the same time, this paper uses DEA model to study the performance level of real estate enterprises, and puts forward measures to improve the performance level of listed real estate enterprises, in order to promote the healthy and stable development of the real estate industry.

1. Introduction
The real estate industry has the characteristics of large amount of capital, long investment cycle, capital-intensive and slow turnover speed. It is very important for the development and operation of real estate enterprises to study the business performance of real estate enterprises. Without the cooperation of financial institutions, the real estate market is difficult to operate normally, and the process of manufacturing and consuming real estate needs a lot of money. Therefore, scientific research on the performance evaluation of real estate enterprises is conducive to the real estate enterprises to recognize the advantages and disadvantages of their own development, use their own advantages to tap more benefits, optimize the allocation of resources, and avoid unfavourable factors, system risks or individual risks. DEA analysis method has become a very important means and method, especially in the process of management science, decision analysis and technical evaluation, DEA method is an effective analysis method. At the same time, the study of real estate business performance evaluation is conducive to the effective implementation of government policies and creates more favourable conditions to promote the economic development of the real estate market.

2. The situation of real estate enterprise operating performance evaluation
2.1 Theory of real estate enterprise operating performance
Operator's performance and enterprise's operating benefit during the operation period can be regarded as enterprise's operating performance. The level of enterprise operating efficiency is mainly manifested in the profitability and follow-up development ability of enterprises. In the process of managing enterprises, managers’ achievements and contributions to the growth, development and operation of enterprises reflect the performance of managers. The performance level of real estate enterprises is also based on the business performance of real estate enterprises. The performance level can be reflected by the follow-up development ability of real estate enterprises and so on. Therefore,
on the basis of the study of real estate business performance, we can first understand the relevant theoretical research of business performance, from which we can get the basic principles and theoretical basis of business performance of real estate enterprises.

2.2 Theoretical basis of business performance research
The theory of enterprise performance comes from the excessive concern of human beings for economic interests, which is the initial cause of enterprise performance evaluation. The formation and development of modern management theory makes the evaluation method of performance work more objective. The four theories shown in Figure 1 below have become the theoretical basis of enterprise performance evaluation.

![Figure1. Theory of enterprise performance evaluation](image)

3. Analysis of the factors affecting the performance evaluation of real estate enterprises

3.1 Performance characteristics of real estate enterprises
The investment forms of real estate development are divided into direct investment and indirect investment, in which indirect investment does not directly participate in the relevant management work, there are investment managers to manage investment and most of the investment returns and investment returns generated by direct investment come from the development income of real estate. The income generated by direct investment accounts for the majority of real estate income, while the development income accounts for the majority of direct investment income, so the income of real estate enterprises comes from real estate development income. Most of the real estate business model analysis found that most of the real estate business is a comprehensive business model, a large part of the income from housing sales, while the proportion of other self-supporting income is small, which also shows that China's real estate market still needs to develop, real estate business model is single.

3.2 Factors influencing the operating performance of real estate enterprises
Assets, liabilities and profits can reflect the overall operation of a company, which is also an important financial factor affecting the business performance of the enterprise. The debt and other solvency of an enterprise can reflect the development and operation of an enterprise, and is also one of the financial factors affecting the operation performance of a real estate enterprise. Profit is an important purpose of real estate business activities, but not the ultimate goal of business activities. And how the profitability reflects the performance of real estate enterprises is an important indicator of the quality of the income level and operating capacity of enterprises.

4. Performance indicator system of real estate enterprises

4.1 Principles for the construction of evaluation index system
Through the collation of the literature on real estate business performance, it is concluded that the current performance evaluation of real estate enterprises focuses on financial evaluation indicators, as shown in Figure 2 below.
4.2 Establishment of performance evaluation index for real estate enterprises

The turnover rate of total assets is an important index to measure the operation effect of total assets and the efficiency of capital utilization. The bigger the total asset turnover rate of real estate is, the faster the total asset turnover rate of real estate enterprises is. It reflects the good sales and sales situation of real estate enterprises. The turnover of funds can reflect the operation status of the company. The total asset turnover rate is an important choice to consider the performance evaluation index of real estate enterprises. The growth rate of total assets reflects the development of the scale of assets, so as to evaluate the performance of real estate enterprises. In addition, real estate net profit, macro-control policies, as well as the number of personnel, sales area, sales area and social honour and other social factors will also affect the performance evaluation of real estate enterprises.

4.3 Establishment of evaluation model of real estate business performance

DEA (Data Envelopment Analysis) is a new direction in the research of mathematical economics, operations research and management science. It is a multi-input and multi-output analysis method based on relative efficiency. The two-stage DEA model is established to evaluate and analyze the operation performance of real estate enterprises. $X_j (j = 1, 2, ..., n)$ represents the input index of the operation performance of real estate enterprises, $Y_j (j = 1, 2, ..., n)$ represents the output index of the operation performance of real estate enterprises, and $V$ and $u$ are the weights of the input and output of the operation performance of real estate enterprises respectively. The efficiency evaluation index for each DMU is defined as:

$$h_j = \frac{\sum_{r=1}^{p} u_r Y_{rj}}{\sum_{i=1}^{m} v_i X_{ij}}, \quad j=1, 2, ..., n$$  \hspace{1cm} (1)

Pure technical efficiency reflects whether the resources invested by each decision-making unit in each year can be effectively used to maximize output or minimize input, that is, the use efficiency of input factors. The product of pure technical efficiency analysis value and scale efficiency analysis value is equal to the comprehensive efficiency analysis value.

4.4 Application procedures of performance evaluation model for real estate enterprises

Firstly, the evaluation index of real estate enterprises' operation performance is determined. Secondly, the real estate listed companies are chosen as the decision-making unit of efficiency evaluation. Then, according to the availability and measurement of decision-making unit data, it establishes the input index, output index and intermediate index system of real estate business performance. This paper uses two-stage DEA model based on CCR model to study the performance evaluation of real estate enterprises. Through screening and sorting out the collected data, the model is constructed and analyzed with two-stage DEA model.
According to the results of DEA analysis, real estate enterprises should pay attention to social responsibility, especially for the top real estate industry, it is necessary to set a certain example, in addition to improving the turnover rate of current assets and accelerating the turnover rate of total assets in the real estate industry.

5. Conclusions
In summary, the real estate industry has become the basic industry and leading industry in China. At present, most companies and enterprises will evaluate the performance of employees to reflect the overall business situation of enterprises. Under the current immature real estate management mode, real estate enterprises aim to improve the performance of enterprises, make efforts for the development of the overall economy of our country, and jointly create a stable development of the real estate market. This paper uses the model to study the performance level of listed real estate enterprises, through the model calculation to understand the relative performance level of real estate enterprises, and separately from the perspective of input and output to study the ineffective enterprises of enterprises.

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