

# An Empirical Study of Chinese Listed Real Estate Companies' Operating Efficiency

Li Tan<sup>1</sup>, Hua Deng<sup>2</sup>

<sup>1,2</sup>Hunan University of Humanities, Science and Technology, Department of Mathematics and Finance, Hunan, China

## **Abstract:**

The operation efficiency of listed Chinese real estate companies from 2006 to 2013 are evaluated by utilizing data envelopment analysis method. The results are compared under the criteria of the organization form, the length of listed time, and the company location. Constructive suggestions are given eventually.

**Keywords:** Listed Real Estate Company, Operational Efficiency, Data Envelopment Analysis, Suggestion.

## **1. Background and Significance**

Real estate plays a decisive role in the national economy and will affect the development of the social. Effective operation is considered as the assurance of the enterprises' development. Listed real estate companies are the main subject of the real estate industry. So, research on listed real estate company's operating efficiency has significance.

## **2. Literature Review**

Lei Shi used DEA method to analyze listed real estate companies' operating efficiency, found that many companies did not reach the desired level [1]. Yongle Liu studied the listed real estate companies' operating efficiency and got the typical company's scale income [2]. Jianqiang Wang demonstrated the feasibility and effectiveness of the CCR model to evaluate the efficiency of listed real estate companies [3]. Yue Wang thought that the input-output relationship of the real estate industry has its own uniqueness, when evaluating operating should pay more attention to the production process [4]. Bo Zhang evaluated 26 listed real estate companies' operating performance from two stages [5]. Yuxin Ning studied listed real estate companies' operating efficiency using the Richardson model [6]. Dongqing Zhao thought that the national macro-control promoted listed real estate companies' operating efficiency mainly by affecting their capital structures [7].

## **1. Empirical Measure of Operating Efficiency**

### **3.1 Model Introduction**

This paper selected DEA model to measure the operating efficiency. DEA is introduced as follows.

Suppose there are similar Decision Making Units (DMU), each decision unit has  $m$  input variables and  $n$  output variables. The  $i$ -th input inputs of the  $J$ -th DMU is called  $X_{ij}(X_{ij} > 0)$ ,  $j$ -th output of the  $J$ -th DMU is called  $Y_{rj}(Y_{rj} > 0)$ ,  $v_i$  represents a measure of the  $i$ -th input,  $i=1,2,\dots,m$ ,  $u_r$  represents a measure of the output of the  $r$ ,  $r=1,2,\dots,n$ . Corresponding to  $v=(v_1, \dots, v_m)^T$  and  $u=(u_1, \dots, u_n)^T$ , input  $X_{ij}$  and  $Y_{rj}$ , each unit has a corresponding efficiency rating index  $h_j, h_j = \frac{u^T y_j}{v^T x_j} = \frac{\sum_1^n u_r y_{rj}}{\sum_1^m v_i x_{ij}}$ ,  $j = 1, 2, \dots, t, x_j = (x_{1j}, \dots, x_{mj})^T, y_j = (y_{1j}, \dots, y_{mj})^T, j=1, 2, \dots, t$ .

With variable vector  $v$  and  $u$ , efficiency index as the goal, optimization model is constructed as follows:

$$(P) \begin{cases} \max \frac{u^T y_0}{v^T x_0} \\ \text{s. t. } \frac{u^T y_j}{v^T x_j} \leq 1, j = 1, 2, \dots, t \\ u \geq 0, v \geq 0, u \neq 0, v \neq 0 \\ x_0 = x_{j_0}, y_0 = y_{j_0}, 1 \leq j_0 \leq t. \end{cases} \quad (1)$$

Let  $S = \frac{1}{v^T x_0}, \omega = sv, \mu = su$ , get the following equivalent linear programming problem:

$$(P_{C^2R}) \begin{cases} \max h_0 = \mu^T y_0 \\ \text{s. t. } \omega^T x_j - \mu^T y_j \geq 0, j = 1, 2, \dots, t, \\ \omega^T x_0 = 1, \\ \omega \geq 0, \mu \geq 0. \end{cases} \quad (2)$$

Its dual plan is  $(D_{C^2R})$ , introduce slack variables as followed.

$$(D_{C^2R}) \begin{cases} \min \theta \\ \text{s. t. } \sum_{j=1}^t \lambda_j x_j \leq \theta x_0, \\ \sum_{j=1}^t \lambda_j y_j \geq y_0, \\ \lambda_j \geq 0, j = 1, 2, \dots, t. \end{cases} \quad (3)$$

$$(D_{C^2R}^1) \begin{cases} \min \theta \\ \text{s. t. } \sum_{j=1}^t \lambda_j x_j + S^- = \theta x_0, \\ \sum_{j=1}^t \lambda_j y_j - S^+ = y_0, \\ \lambda_j \geq 0, j = 1, 2, \dots, t, \\ S^-, S^+ \geq 0 \end{cases} \quad (4)$$

$\theta$  is the  $i$ -th DMU,  $s$  operating efficiency value,  $0 \leq \theta \leq 1$ . If  $\theta=1$ , the DMU is called DEA efficient, if  $\theta < 1$ , the DMU is non DEA effective,  $\theta$  is closer to 1 means the DMU is more effective.

### 3.2 Indicators

This paper selected total assets, main business costs, employee compensation payment as input indicators, the net profit and the main business income as output indicators.

### 3.3 Samples and Data

This paper selected 55 listed real estate companies as samples, including Vanke, Poly Real Estate, etc. Input and output data are derived from the annual financial statements of listed companies which are publicly disclosed. In the original data basis, this paper did data grouping and normalization first.

### 3.4 Empirical Results

Using above normalized annual data and input-oriented DEA model, operating efficiency values of samples were measured. Taking the factors of space into account, only two samples' empirical results are reported in Table 1, we need to complete the data by e-mail reader can contact the author. Readers who need all results can contact the author by e-mail.

Table 1: Part of Operational efficiency values

Sample	Vanke	Poly Real Estate
2006	0.916	0.878
2007	0.969	0.936
2008	0.932	1
2009	0.931	1
2010	0.881	1
2011	0.97	1
2012	0.948	1
2013	0.967	1

## 4. Category Comparative Analysis

The results are compared under the criteria of the organization form, the length of listed time, and the company location. Organizational form is divided into two categories: state-owned and private. Listed age of 15 is the boundary of early and late. Location of the company is divided into two types: tier cities and non-tier cities. Operating efficiency comparison is shown in Figure 1, Figure 2, Figure 3 sequentially.

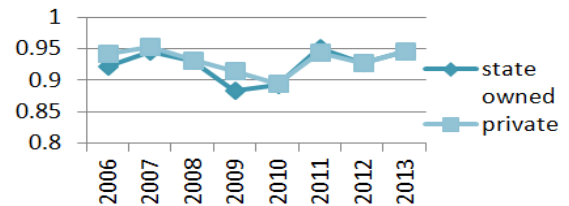


Figure 1: Comparison under organization form

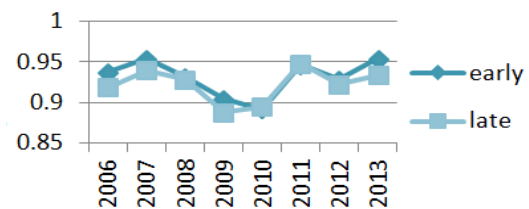


Figure 2: Comparison under the length of listed time

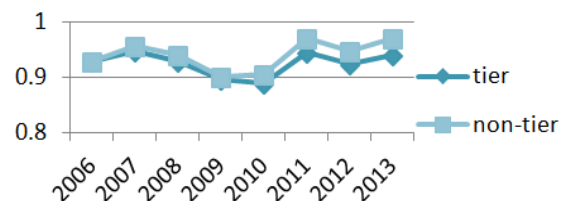


Figure3: Comparison under the company location

We can see that private companies are more efficient than state-owned companies, early listed companies are more efficient, company located in non-tier cities have a better efficient performance than companies located in first-tier cities. The reasons may include the followings. Firstly, most private companies have streamlined organization, but state-owned companies' organizations are more jumbled and have higher management fees, so private enterprises are more efficient. Secondly, a company listed earlier is more experienced so it has a higher efficiency. Thirdly, compared with non-tier cities, companies located in tier cities have more competitive pressures, such as higher public relation costs, which impact their operating efficiency.

## 5. Suggestions

Based on the previous analysis, we propose the following suggestions. Firstly, the state-owned enterprises should try to streamline the organizational structure, reducing administrative costs in order to improve their operational efficiency. Secondly, experience should be exchanged between companies. Taking the competitive factors into account, experience could be transferred by a third party, such as colleges and universities then do some research and summarize experiences. Thirdly, the government should strengthen supervision and management of land bidding, improve fairness and justice of the real estate industry, reduce their cost of public relations, promote companies' operating efficiency, thereby enhancing the operational efficiency of the entire industry.

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## Author Profile



**Li Tan** received the B.S. and M.S. degrees in Finance from Hunan University in 2011 and 2014, respectively. She is an assistant in department of mathematics and finance of hunan university of humanities, science and technology. Shi is interested in economic theory and practice.