Evaluation on the Financing Efficiency of China’s Real Estate Listed Companies Based on DEA Model

Yan Qiu Cao\textsuperscript{1,2,3,a} and Yi Jie Bian\textsuperscript{1,3,b}

Abstract. The rapid development of the real estate industry plays an important role in stimulating economic growth and promoting economic development in China. However, the financing efficiency of China's real estate quoted corporation is generally low. In order to improve the financing efficiency of listed real estate companies, in this paper, the author estimates the financing efficiency of China's real estate quoted corporation based on DEA model, and proposes perfect measures from the state should provide appropriate financing environment and the real estate listed companies should optimize the financing and investment structure.

Keywords: Real estate; Financing efficiency; DEA model

Introduction

In recent years, the rapid development of the real estate industry has played a huge role in stimulating economic growth and promoting economic development and so on. Real estate industry as typical capital intensive industries, sufficient capital is an important guarantee for the normal operation of enterprises, once the situation of shortage of funds, enterprises will face a great crisis. However, the financing efficiency of China's real estate quoted corporation is generally low. For the real estate industry, the source of most funds is financing. Its capital investment has not achieved the maximum output,

\textsuperscript{1}School of Business, Hohai University, Nanjing 211100, China;\textsuperscript{2}Jincheng College, Nanjing University of Aeronautics and Astronautics, Nanjing 211156, China\textsuperscript{3}Jiangsu Provincial Collaborative Innovation Center of World Water Valley and Water ecological civilization, NanJing Jiangsu, 211100, China.
\textsuperscript{a}583836617@qq.com \textsuperscript{b}278711821@qq.com
which has seriously restricted the development of real estate enterprises. In this paper, based on the current situation of China's real estate listing Corporation financing, by selecting the corresponding evaluation index, to build the DEA model of financing efficiency evaluation, and by analyzing and evaluating the results of China's real estate listed companies financing efficiency analysis, find out the reasons for the low efficiency of enterprise financing, put forward corresponding suggestions and solutions, to improve the financing efficiency of Listed Companies in real estate.

Positive Analysis

Selection and Construction

Charnes, Cooper and Rhodes (1978) proposed the first DEA model—CCR model. CCR model under the assumption of constant returns to scale, the technical efficiency of each decision making unit can be obtained\(^1\). However, the efficiency results are single used CCR model. Charnes and Cooper (1984) proposed BCC model which without considering the possibility of producing cone. When you calculate technical efficiency, this model not only can remove the effect of scale efficiency, but only can figure out the result of pure technical efficiency, scale efficiency and scale returns. So in this paper, the authors use BCC model to calculate the efficiency value.

Hypothetical: If there are N decision making units, and the N decision making units are comparable. Every decision making unit has m type input and m type output.

The BCC model is:

\[
\begin{align*}
& \max (\mu^T Y_{0j} - \mu_0) , \\
& \omega^T X_j - \mu^T Y_j + \mu_0 \geq 0, \ j = 1, 2, \ldots, n , \\
& \omega^T X_0 = 1 , \\
& \omega \geq 0, \mu \geq 0, \mu_0 \in \mathbb{R}.
\end{align*}
\]

(1)

\(X_{ij}\) = DMU\(_j\) Inputs to i inputs, \(X_{ij} > 0\); \(Y_{rij}\) = DMU\(_j\) Inputs to r inputs, \(Y_{rij} > 0\). \(i = 1, 2 \ldots m; j = 1, 2, \ldots n; r = 1, 2, \ldots s; j = 1, 2 \ldots n\)

\(X_j = (x_{ij}, x_{1j}, \ldots, x_{mj})^T; Y_j = (y_{ij}, y_{1j}, \ldots, y_{mj})^T\)

\(v = (v_1, v_2, \ldots, v_m)^T, u = (u_1, u_2, \ldots, u_m)^T\).

Selection of Input and Output Indicators

Combined with the characteristics of listed real estate companies, this paper selects three input indicators and three output indicators\(^2\). Three input indicators respectively are total assets, main business costs and asset liability
ratio. Three output indicators respectively are return on equity, the main business revenue growth rate and total assets turnover. The asset liability ratio is equal to the total liabilities divided by the total assets of the enterprise. Return on equity equals to net profit divided by net assets. The index is usually the higher the better. Growth rate of main business income on behalf of listed companies. Total assets turnover is equal to the total net income of the main business divided by the total assets.

Sample selection
This paper selects 30 real estate listed companies in Shanghai and Shenzhen real estate industry in China. Such as Gree Real Estate Co., Ltd., BaoAn Real Estate, JD Capital Co., Ltd. and so on. This paper selects the data from the 2015 annual report of those 30 listed real estate companies. Eliminate the abnormal data and part of the company's shares when selecting the sample enterprise, because these companies reflect the abnormal financial situation of the enterprise. It is means that excluded companies are financing inefficiency.

Empirical results
Using DEAP software, we can get the technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) of listed real estate companies in China as shown in Table 1. We can sum up the financing efficiency of 30 listed real estate companies as shown in Table 2.

| Sample Firms                        | TE  | PTE  | SE  | Returns to scale |
|-------------------------------------|-----|------|-----|-----------------|
| Gree Real Estate Co., Ltd.          | 1   | 1    | 1   | -               |
| XinDa Real Estate Co., Ltd.         | 0.870042 | 0.880728 | 0.987866 | drs             |
| Centralcon Investment Holding       | 0.947633 | 0.948061 | 0.999548 | -               |
| Yango Group Co., Ltd.               | 0.869206 | 1     | 0.869206 | drs             |
| BaoAn Real Estate                   | 1   | 1    | 1   | -               |
| Pearl River Industrial Development  | 1   | 1    | 1   | -               |
| Oceanwide Holdings Co., Ltd.        | 0.688381 | 0.722235 | 0.953125 | drs             |
| Cfoco Property(Group) Co., Ltd.     | 0.699370 | 0.703749 | 0.993778 | drs             |
| JD Capital Co., Ltd.                | 1   | 1    | 1   | -               |
| Yinyi Real Estate                   | 0.614543 | 0.618346 | 0.993849 | drs             |
| WanYe Enterprise                    | 1   | 1    | 1   | -               |
| Beijing North Star Company Limited  | 0.332427 | 0.531976 | 0.624890 | drs             |
| China Wuyi Co., Ltd.                | 0.525194 | 0.558317 | 0.940672 | drs             |
| Beijing Capital Development Co., Ltd.| 0.412548 | 0.543661 | 0.758832 | drs             |
As table 1 is showed, there are six companies which the relative effective value of the financing efficiency are one, accounted for 20% of the proportion. The other companies twenty-four companies’ financing efficiency are less than 1, accounted for 80% of the proportion. It is means the companies financing efficiency are effective only 1/5. The financing efficiency of the other twenty-four companies is not relatively effective, which input or output remains to be improved.

Among the 30 listed companies, there are twenty-one companies are non-scale effective and non-technical efficiency, the proportion accounted for 70%. From the perspective of efficiency distribution, we can see there are more than 2/3 of the company's technical efficiency is more than 0.5, this means the efficiency value of technical efficiency is high. While the pure technical efficiency value is relatively higher, because more than 93% companies more than 0.5. Just because the value of technical efficiency and pure technical efficiency
efficiency are all high, so the scale efficiency value is high. But there is still a certain gap to achieve full effectiveness. This shows the real estate companies in China's funds have no play the greatest value.

In addition, the companies which constant returns to scale is seven, increasing returns to scale is five and the diminishing returns to scale is eighteen. This shows that the real estate listed companies do not use the investment funds effectively.

**Countermeasure Analysis**

From the above conclusions, we can see the financing efficiency in China is generally low, and there is a certain gap between effective financing efficiency and China’s real estate companies. In order to improve the financing efficiency of listed real estate companies in China, we should take the measures as followed. Firstly, the state should provide appropriate financing environment and Strengthen information disclosure system\(^3\). Secondly, real estate listed companies should optimize the structure of corporate finance and investment structure. Thirdly, we should improve the efficiency of capital raising and allocation in real estate listed companies.

**Summary**

It can be seen from the above analysis that the financing efficiency of listed real estate companies in China are low and most enterprises are in the stage of increasing returns to scale. We must take measures to solve the problems. On one hand, the state should optimize the financing environment; on the other hand, the enterprises should optimize financing structure and investment structure.

**References**

[1] Charnes A, Cooper W., Rhodes E. Measuring the Efficiency of Decision Making Units [J]. European Journal of Operational Research, 1978, 32( 2) : 429-444.

[2] Shan Gao. Research on Financing Efficiency of Small and Medium Sized Enterprises Based on DEA [J]. Friends of Accounting, 2010,3:86-88.

[3] Jingwen Li, Yuchun Wang, Zhengdong Yang. Research on financing efficiency of Listed Companies in strategic Emerging Industries—a Case Study of Beijing [J]. Economic management and research, 2014,6:74-82.