Performance and Efficiency Assessment of Listed Real Estate Companies: An Empirical Study of China

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Abstract

This study measures performance and efficiency of the Listed Real Estate Companies (LRECs). Three types of Data Envelopment Analysis (DEA) approaches are employed, which are CCR-DEA, BCC-DEA and Super-Efficiency-DEA models. The DEA is a powerful, non-parametric technique that allows the comparison among diverse decision-making units (DMUs) as well as provides assessment of performance and efficiency for comparable production units such as companies. Based on the DEA approaches, we conduct an empirical analysis on the 94 LRECs in China stock markets according to the *2009 Annual Financial Statements*. In general, this empirical research delivers four outcomes: firstly, an integrated assessment system and a ranking of the LRECs are established, which provides useful information for investors who are seeking for indirect exposure in the Chinese real estate market. Secondly, the average OE, PTE and SE of the LRECs are 0.78, 0.84 and 0.92 respectively. Thirdly, 69% of the inefficient LRECs are classified as increasing returns to scale and could further increase operating efficiency by scale expansion. Fourthly, the employees slack is prevalent at 18.96% for the inefficient LRECs.

Keywords: Listed Real Estate Company; input-output; efficiency; scale economics; DEA; China.

1. Introduction

Over the last two decades, China has achieved amazing economic growth, accompanied by rapid development of her real estate market. The demand for urban land and new dwellings has substantially increased due to the fast growth of urbanization (Hui and Yue, 2006). It is widely accepted that the real estate industry is an important booster for the recent China's economic development, especially after the Housing Policy Reform in 1998. Accompanying her economic development, the China stock market is becoming one of the biggest security markets in the world. The huge and sustaining economic growth creates lots of opportunities for worldwide investors to profit from China's booming economy. More importantly, it provides a safe hedge against tumultuous events from the international financial markets to some extent. Among all the China stocks, the property stocks have benefited profoundly during the last five years, due to the tremendous growth in housing prices and the urbanization process, as well as the rise in China's currency exchange rate.

As we can see in Figure 1, China property stock index (left scale) rocketed in early 2006, doubling and then tripling before peaking in Oct, 2007. Although China's property market presents indubitable growth potential, huge volatilities are imbedded in the property stock prices, just like the enormous decline after the 2007 U.S. Subprime Crisis (see Hui, *et al.*, 2010 for example). Now, though foreign investors are still paying increasing attention to the well-run China property market, they are keen to seek indirect property investment opportunities in the Chinese stock market. However, there still remains one fundamental question: *how to build up the portfolio?* This is because this emerging market, which contains nearly one hundred property securities, seems mysterious to most cross-border investors. In this regard, evaluating operation efficiency will be useful to better understand the way that a company operates, and has been widely adopted in many previous studies (see Anderson *et al*., 2002; Hu and Wang, 2006; Thakur *et al.*, 2006 for examples). Besides, it is plausible to assume that the performance of the real estate securities can be discriminated indirectly in terms of the operating efficiency of their underlying companies. In other words, a company with higher operational efficiency (i.e. produce some outputs using relatively lower inputs) will enjoy higher capital increment in the listed security market.

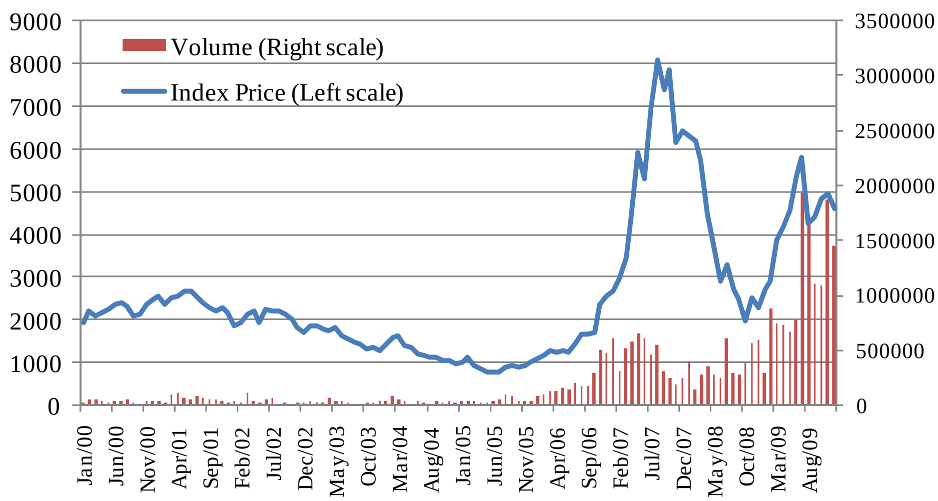

Figure 1 Historical China property security composite index: Jan, 2000 to Dec, 2009 (*Source*: Bloomberg).

The purposes of this paper are twofold (see Figure 2). The first purpose is to develop a DEA-based selection criterion of LRECs from a perspective of performance and operating efficiency, and explore the scale efficiency of the LRECs. The second purpose is to find out the best operating LRECs using the Super-efficient DEA model. The structure of this paper is laid out as follows: Section 1 provides the background for the study. Section 2 presents a brief review of previous studies on the evaluation of real estate securities. Section 3 presents the methodologies and models used in this study. Section 4 presents empirical results with the case of China. The last section concludes the paper.

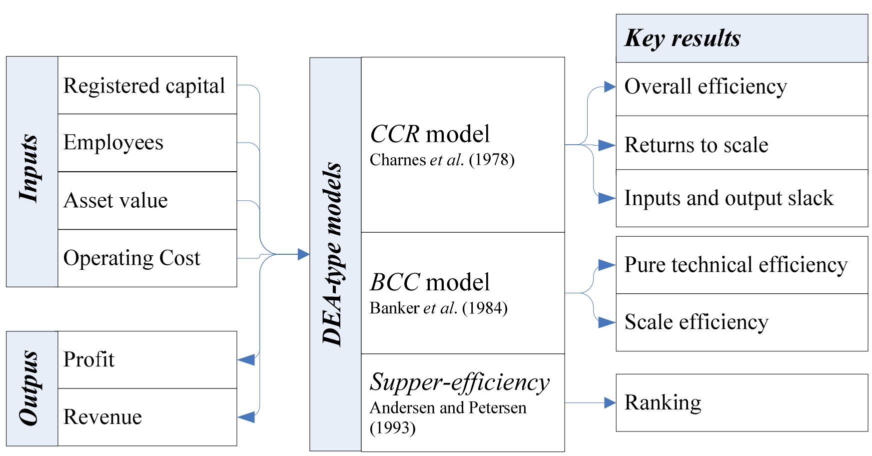

Figure 2. An overview of the research framework.

2. Literature Review

Operational efficiency is considered to be one of the key issues and important selection criterions for the listed securities. In the last few years, many academic literatures (e.g. Bers and Springer, 1997; Springer and Anderson, 2000) have empirically investigated the operational efficiency of Real Estate Investment Trusts (REITs). Bers and Springer (1997) use the trans-log cost function to estimate economies-of-scale for a sample of REITs during the period of 1992–1994. Their empirical results show that economies-of-scale exist for REITs for all years under investigation. Besides, they also find that the individual characteristics (i.e. type of management and degree of leverage) affect the magnitude of the scale economy. Later on, Anderson *et al.* (2002) use DEA approach to estimate economies-of-scale and inefficiency for REITs using a time series sample from 1992 to 1996. They find that those technically inefficient REITs are results of both poor input utilization and failure to operate at constant returns to scale, which means that most of the inefficient REITs could be further improved by company expansion. Besides, their results also imply that internal REIT management is positively related to all measures of efficiency (see also Anderson and Springer, 2003 for another example). Miller *et al.* (2007) estimate the operating efficiencies of REITs using the stochastic frontier models and panel data. This model can identify frontier cost improvements, returns to scale, and cost inefficiencies over time. In contrary to the previous studies, they find no evidence of scale economics and some evidence of scale diseconomies. However, the stochastic frontier techniques are not competent for studying multiple outputs that are jointly produced, because this approach is normally limited to focus on single output at a time.

Although the operational efficiency of REITs has been well discussed by real estate economists, there has been little systematic analysis of the listed real estate companies, especially in the emerging economy like China. Chau *et al.* (2003) analyze the returns of twelve listed property companies and one property portfolio in Hong Kong using the style analysis approach. The results suggest that indirect and direct real estate are becoming closer substitutes for each other; and the performance of a property company is mainly attributable to its investment style characterized by the implied portfolio rather than management skills. Hui *et al.* (2007) examine the economic performance of Hong Kong property companies in term of Economic Value-Added (EVA). They find that the companies which diversified into other sectors performed better than those focused solely on real estate sector. They further argue that both the Singapore's and Hong Kong's property companies do not perform well from an EVA perspective. Wang and Wang (2009) use the DEA approach to analyze the efficiency of twenty LRECs in China from 2000 to 2007. They find that the efficiency of real estate industry is greatly influenced by the control policies. However, their results cannot further identify those extreme efficient companies. Besides, their study only focuses on the well known LRECs but does not cover all the LRECs in China, which might make the results incomplete and somehow biased. This is because the reputation and scale of a company do not necessarily mean a higher level of operational efficiency. Chau *et al.* (2010) empirically investigate the linkage between direct and indirect real estate in terms of corporate governance structures, their results show that the China listed property companies had a weaker linkage between direct and indirect real estate than that of Hong Kong.

3. Methodology and Model Specification

Data envelopment analysis (DEA) is a popular non-parametric method in both operations research and economics studies for the estimation of the production frontiers and the relative efficiencies of a homogenous set of Decision-Making Units (DMUs: listed real estate companies). DEA is a multi-factor productivity analysis model, which is specifically designed to deal with multiple outputs and inputs without pre-assigned weights and without imposing any functional form on the relationships between variables. Within the DEA framework, the performance is evaluated with respect to an efficient frontier, which is constructed by examining linear combination of the DMUs under study and determining the minimum necessary input level to achieve a given output level (see Anderson *et al.*, 2002). In general, there are three advantages of DEA approach: First, it measures the efficiency by converting multiple inputs into multiple outputs. Second, it does not require any assumptions about the functional form of the production function or prescribed weights to be attached to each input and output. Third, it explores and identifies the underlying causes of the inadequate (for example, slack in input factors).

3.1 The CCR model

The *Charnes-Cooper-Rhodes* (CCR) model is proposed by Charnes *et al.* (1978), built on the idea of Farrell (1957). The CCR model assumes constant returns to scale (CRS). In other words, it assumes that there is no significant relationship between the scale of operations and efficiency. For example, the large LRECs are just as efficient as the small ones in converting inputs to outputs. In this study, we adopt the input-oriented model, which means the inputs are minimized and the outputs are kept at their current levels. A relative efficiency score of a test DMU_j can be obtained by solving the following fractional program:

$$
\begin{aligned}
& Max \ \sum_{r=1}^{s} u_{rj} y_{rj} \ / \sum_{i=1}^{m} v_{ij} x_{ij} \\
& Suject\ to: \\
& \sum_{r=1}^{s} u_{rj} y_{rj} \ / \sum_{i=1}^{m} v_{ij} x_{ij} \le 1;\ y_{rj}, x_{ij} > 0;\ v_i, u_r \ge 0 \\
& j = 1,...,n;\ \ i = 1,...,s;\ \ r = 1,...,m
\end{aligned} \tag{1}
$$

Where m and s are the number of inputs and outputs factors respectively; $\mathbf{y}_j = (y_{1j},...,y_{sj})$ is a given s dimensional vector of s outputs of DMU_j ; and $\mathbf{x}_j = (x_{1j},...,x_{mj})$ is a given m dimensional vector of m inputs of DMU_j . $\mathbf{v}_j$ and $\mathbf{u}_j$ are the weights given to $\mathbf{x}_j$ and $\mathbf{y}_j$ respectively. Weights are not allowed to fall below non-zero small positive numbers in order to prevent the mathematical omission of an output or an input in the iterative calculation of efficiency. Both $\mathbf{v}_j$ and $\mathbf{u}_j$ in DEA are derived from the data instead of being fixed in advance and may vary from different DMUs (Cooper *et al.*, 2007, Chapter 1). Specifically, for each DMU_j , we can find the best vector weight $\mathbf{u}_j = (u_{1j},...,u_{sj})$ and $\mathbf{v}_j = (v_{1j},...,v_{mj})$ that maximize the ratio between the weighted output and weighted input. In fact, both input and output slacks may exist in model (1). Hence, the fractional program in (1) is subsequently converted to a linear programming format and a mathematical dual with slacks as shown in program (2):

$$\theta^{OE} = Min\ \theta - \varepsilon(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+)$$

$$Suject\ to:$$

$$\sum_{j=1}^{n} \lambda_j x_{ij} + S_i^- = \theta x_{i0};\quad (i = 1, 2, ..., m);$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} + S_r^+ = y_{r0};\quad (r = 1, 2, ..., s); \qquad (2)$$

$$\lambda_j \geq 0; S_i^- \geq 0; S_r^+ \geq 0.$$

Where θ^{OE} is the relative overall efficiency (OE); λ_j is the dual variable. S_i^- and S_r^+ represent input and output slacks, respectively; Generally, a DMU is efficient if and only if $\theta^{OE} = 1$ and $S_i^- = S_r^+ = 0$ for all i and r. The efficient targets of inputs and outputs are $\hat{x}_{io} = \theta^{OE} x_{io} - S_i^{-*}$ and $\hat{y}_{ro} = \theta^{OE} y_{ro} - S_r^{+*}$ respectively.

3.2 The BCC model

The BCC DEA model proposed by Banker *et al.* (1984) further relaxes the CRS assumption to variable returns to scale (VRS) by adding a restriction of $\Sigma_j^n \lambda_j = 1$. The CRS efficiency score in model (2) represents the overall technical efficiency, while the VRS efficiency score (see program (2)) denotes the pure technical efficiency (PTE). The BCC DEA model further decomposes the OTE into pure technical efficiency (PTE) and scale efficiency (SE), namely $SE = OE / PTE$.

$$\theta^{PTE} = Min\ \theta - \varepsilon(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+)$$

$$Suject\ to:$$

$$\sum_{j=1}^{n} \lambda_j x_{ij} + S_i^- = \theta x_{i0};\quad (i = 1, 2, ..., m);$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} + S_r^+ = y_{r0};\quad (r = 1, 2, ..., s); \qquad (3)$$

$$\Sigma_j^n \lambda_j = 1$$

$$\lambda_j \geq 0; S_i^- \geq 0; S_r^+ \geq 0.$$

3.3 The Super-efficient DEA model

A common weakness of the above DEA models is that a considerable number of DMUs is typically characterized as efficient, unless the sum of the number of inputs and outputs is small relative to the number of observations. Hence, Andersen and Petersen (1993) proposed the removal of the unit under evaluation from the reference set. In other words, when a DMU under evaluation is not included in the reference set of the envelopment models, the resulting DEA models are called super-efficiency DEA models. This procedure allows the determination of the unit's relative placement regardless of whether the unit is efficient or not. It can be used in identifying the extreme efficient DMUs. It should be noted that the modification of the super-efficiency will not impact the technical score of those inefficient units, which will still fall below the frontier, in the same manner as before (see Zhu, 2008, Chapter 10; Nahra *et al.*, 2009 for details and examples). Some studies show that the super efficient CRS model may be infeasible; however, Zhu (1996b) proves that the input-oriented CRS super efficient model is infeasible if and only if a certain pattern of zero data occurs in the inputs and outputs of DMU. In this study, all inputs and outputs are strictly positive, which will ensure that all the DMUs have feasible solutions. For the input-oriented CRS super-efficiency DEA model, the linear programming model is shown as follows:

$$
\begin{aligned}
&\text{Min}\,\theta^{\text{super}} \\
&\textit{subject to} \\
&\sum_{\substack{j=1 \\ j\neq 0}}^{m} \lambda_j x_{ij} \leq \theta^{\text{super}} x_{i0} \quad (i=1,2,...,m); \\
&\sum_{\substack{j=1 \\ j\neq 0}}^{s} \lambda_j y_{rk} \geq y_{r0} \qquad (r=1,2,...,s) \\
&\lambda_j \geq 0 \qquad\qquad\quad (j\neq 0)
\end{aligned}
\tag{3}
$$

Where the θ^{super} is the super efficiency score.

4. Empirical Studies

4.1 The data structure

The inputs and outputs selection procedure is one of the critical tasks for the follow-up efficiency analysis. Specifically, the data sources for this study consist of 94 LRECs in China's stock markets (both Shenzhen and Shanghai Stock Exchanges) according to the *2009 Annual Financial Statements*. There are four types of input factors adopted in this study: Registered Capital, Asset Value, Employee Number, and Operation Cost. On the other hand, there are two types of outputs factors: Revenue and Profit. The descriptive statistics of input and output factors of the selected LRECs are given in Table 1. A correlation matrix is shown in Table 2, which denotes that a high and positive correlation exists between these inputs and output factors. These results confirmed the so-called 'isotonicity' of the four inputs and the two outputs in this specific DEA model.

Table 1 Descriptive statistics for the data.

	Factors	Min	Max	Mean	Std. Dev.	Skewness	Kurtosis
Inputs	Registered capital (Million RMB)	107	10995	948	1315	5.39	37.40
	Employee number (person)	20	17616	1124	2320	4.91	29.35
	Asset value (Million RMB)	230	137609	10065	18536	4.76	27.32
	Operating Cost (Million RMB)	16	41122	2072	4716	6.71	52.36
Outputs	Profit (Million RMB)	2	6430	429	849	4.93	29.62
	Revenue (Million RMB)	15	48881	2536	5693	6.51	49.34

Table 2 Pearson correlation Matrix.

	Registered capital	Employee number	Asset value	Operating Cost	Profit	Revenue
Registered capital	1.0000					
Employees	0.8830**	1.0000				
Asset value	0.9332**	0.9030**	1.0000			
Operating Cost	0.9301**	0.9071**	0.9478**	1.0000		
Profit	0.1521	0.2246*	0.2511*	0.1942	1.0000	
Revenue	0.9364**	0.9113**	0.9554**	0.9980**	0.2084*	1.0000

Note: '' and '**" denote correlations are significant at the 0.05 and 0.01 levels (2-tailed) respectively.*

4.2 Ranking efficient units in DEA models

All the CCR-DEA, BCC-DEA and Super-Efficiency-DEA models are calculated using the DEA Frontier software developed by Zhu (2008); the detailed results are shown in Table A1 in the Appendix. According to the CCR-DEA model, only 12 out of 94 (namely 12.8%) LRECs are operating on the efficient frontier, and the total efficiency had a mean score of 0.78 (see Figure 3-A). Besides, the BCC-DEA model reveals that the PTE of the inefficient LRECs is 0.84 (see Figure 3-B), and it also suggests that there are 10 inefficient LRECs having optimal input utilization (i.e. PTE=1), while the SE is less than one. In other words, they still deviate from the efficient frontier due to the scale inefficiencies. On the other hand, the average score of SE is 0.93 (see Figure 3-C). These results imply that there are more possibilities for efficiency gain by better utilization of the input variables than taking advantage of scale efficiency, which further corroborates the findings of Bers and Springer (1997).

In order to discriminate the performance of these 12 operating efficient LRECs, the Super-Efficiency-DEA model was employed. As illustrated in the last column of Table 3, we have the top-ranked LRECs in terms of the Super-Efficiency Scores. More specifically, the top-ten LRECs are 000609.SZ, 600648.SH, 000042.SZ, 000502.SZ, 600663_SH, 600658_SH, 000517_SZ, 000797_SZ, 000838_SZ and 002208_SZ respectively. These ranking results could serve as useful selection criterion for the listed property investors.

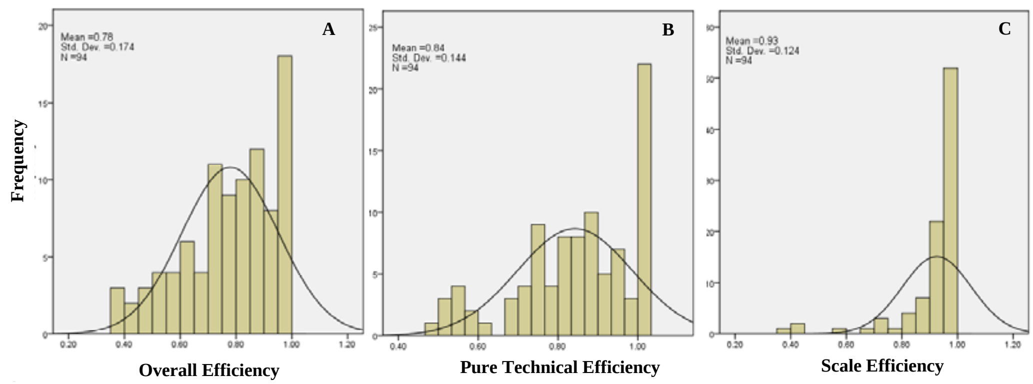

Figure 3. Frequencies of the OE, PTE and SE.

4.3 Returns to scale

In classical microeconomic theory, the returns to scale refer to changes in output subsequent to a proportional change in all inputs. More clearly, if output increases by that same proportional change then there are constant returns to scale (CRTS). If output increases by less than that proportional change, there are decreasing returns to scale (DRS). If output increases by more than that proportion, there are increasing returns to scale (IRS). Specifically, a company achieved scale efficient (namely constant return to scale) only if it operates at the bottom of the assumed U-shaped curve.

In this study, we examine the nature of the scale efficiencies by determining the number of firms operating under constant, increasing, and decreasing returns to scale. As shown in Figure 4 below, only 14% of LRECs under study were operating at CRTS, given the relatively low efficiency scores. On the other hand, the inefficient LRECs are dominated by those exhibiting increasing returns to scale (i.e. 69%), suggesting that these LRECs could increase operating efficiency through company's scale expansion, these results are coincident with the finding of Anderson *et al.* (2002), which shows that most REITs are operating at IRS. The results can be interpreted that the Chinese real estate companies are still under the rapidly developing state, especially after the Housing Policy Reform in 1998.

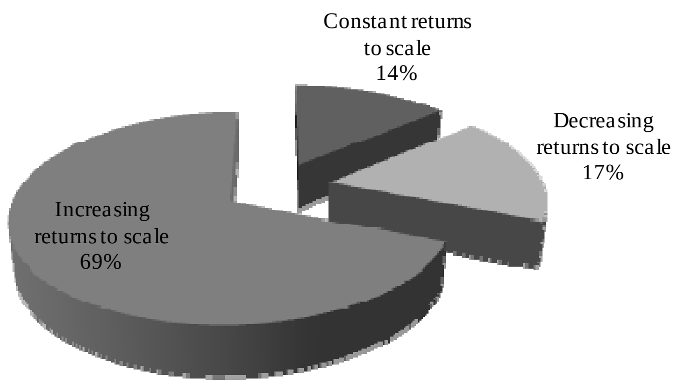

Figure 4 Scale efficiencies for all listed real estate companies.

4.4 Slack adjustments of the input variables

The CCR-DEA model can identify the most efficient LRECs which operate on the frontier and serve as the benchmarks for those inefficient LRECs. Figure 5 illustrates the average slack ratio of outputs for the inefficient LRECs. The employees slack is prevalent at 18.96%, followed by registered capital and asset value, which have 6.54% and 5.57% slack. It is worth mentioning that only one company has slack in the operating cost. These results could help real estate companies for staying competent in order to survive in such a competitive business environment. For example, the substantive of employees implies that most of the LRECs are inefficient with respect to employee input, which is a common phenomenon in the early stage of an industry.

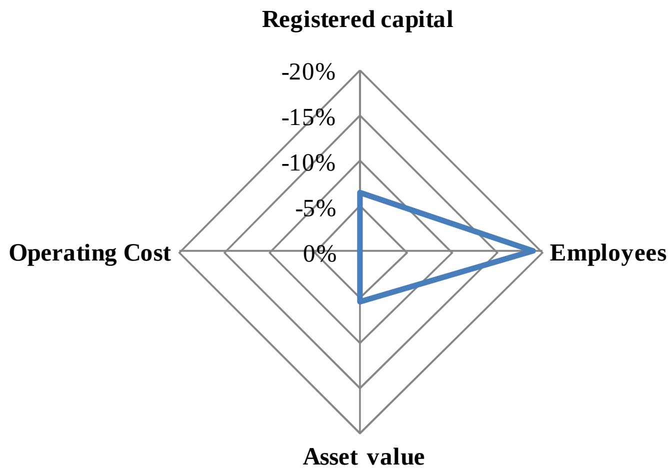

Figure 5 Slack proportions of the inefficient LRECs.

5. Conclusion remarks

In this study, we employ three frontier-based DEA approaches to evaluate the operational efficiency of LRECs in China stock markets. The DEA approach is a powerful, non-parametric technique that allows the comparison among diverse DMUs. With the case of China, the empirical results deliver three valuable findings: notably (a) we develop a selection criterion of LRECs in terms of the operating efficiency. A ranking of the LRECs in China is established consequently, in particular the Super-DEA model is introduced to distinguish those LRECs that fall on the traditional DEA frontier. This ranking list can provide important information for both institutional and individual investors who are seeking for indirect investment in Chinese real estate market. (b) The average OE, PTE and SE are 0.78, 0.84 and 0.92 respectively. (c) 69% of the inefficient LRECs are dominated by increasing returns to scale, which implies that these companies could further increase their operating efficiency through scale expansion. It also confirms that the real estate industries of China is still under the early stage and have potential to be further developed. (d) The research identifies and quantifies those input variables influencing the efficiency of LRECs, which could help LRECs to improve their input efficiency and survival in the current competitive environment.

Acknowledgement

(To be inserted)

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Appendix

Table A1. Results of CCR-DEA, BCC-DEA and Super-Efficiency-DEA models

DMU	Name	OE	RTS	PTE	SE	S-E	Ranking	Registered capital	Employees	Asset value	Operating Cost
1	600048.SH	0.9978	Decreasing	1.0000	0.9978	0.9978	13	0.00%	0.00%	-8.76%	0.00%
2	600052.SH	0.9931	Decreasing	1.0000	0.9931	0.9931	15	0.00%	0.00%	0.00%	0.00%
3	600053.SH	0.6123	Increasing	0.7005	0.8741	0.6123	76	-5.31%	0.00%	-15.21%	0.00%
4	600064.SH	0.8766	Increasing	0.8769	0.9996	0.8766	32	0.00%	0.00%	-43.55%	0.00%
5	600082.SH	0.6906	Increasing	0.7306	0.9452	0.6906	70	-12.50%	0.00%	-6.91%	0.00%
6	600162.SH	0.8736	Increasing	0.8805	0.9922	0.8736	34	0.00%	-58.22%	0.00%	0.00%
7	600167.SH	0.6085	Increasing	0.8512	0.7149	0.6085	77	0.00%	-37.80%	0.00%	0.00%
8	600175.SH	0.8765	Decreasing	1.0000	0.8765	0.8765	33	-10.98%	-10.62%	0.00%	0.00%
9	600185.SH	0.4385	Increasing	0.5167	0.8487	0.4385	90	0.00%	-1.55%	0.00%	0.00%
10	600215.SH	0.5988	Increasing	0.6991	0.8566	0.5988	79	0.00%	-43.98%	0.00%	0.00%
11	600223.SH	0.8406	Increasing	0.8440	0.9961	0.8406	39	0.00%	-24.51%	0.00%	0.00%
12	600225.SH	0.8050	Increasing	0.8111	0.9924	0.8050	48	0.00%	0.00%	0.00%	0.00%
13	600239.SH	0.8923	Increasing	0.8929	0.9994	0.8923	28	0.00%	0.00%	-1.84%	0.00%
14	600240.SH	0.7328	Increasing	0.7488	0.9786	0.7328	62	0.00%	0.00%	-11.86%	0.00%
15	600246.SH	0.8555	Decreasing	0.9015	0.9491	0.8555	37	-14.07%	0.00%	-24.24%	0.00%
16	600256.SH	0.8198	Increasing	0.8208	0.9987	0.8198	42	0.00%	-62.39%	0.00%	0.00%
17	600322.SH	0.6169	Increasing	0.6249	0.9873	0.6169	75	-11.29%	0.00%	-25.11%	0.00%
18	600325.SH	0.9976	Decreasing	0.9980	0.9997	0.9976	14	0.00%	0.00%	-18.69%	0.00%
19	600376.SH	0.8652	Decreasing	0.8662	0.9988	0.8652	36	0.00%	0.00%	-31.37%	0.00%
20	600383.SH	0.8052	Decreasing	0.8881	0.9067	0.8052	47	0.00%	-16.37%	0.00%	0.00%
21	600393.SH	0.8949	Increasing	0.9100	0.9834	0.8949	27	0.00%	-58.70%	0.00%	0.00%

DMU	Name	OE	RTS	PTE	SE	S-E	Ranking	Registered capital	Employees	Asset value	Operating Cost
22	600463.SH	0.7983	Increasing	0.8534	0.9354	0.7983	49	0.00%	-14.85%	0.00%	0.00%
23	600533.SH	0.7421	Increasing	0.7455	0.9955	0.7421	58	0.00%	-23.48%	0.00%	0.00%
24	600576.SH	0.7798	Increasing	0.8499	0.9175	0.7798	54	-8.16%	-70.40%	0.00%	0.00%
25	600606.SH	0.6633	Increasing	0.7429	0.8928	0.6633	72	0.00%	-48.36%	0.00%	0.00%
26	600614.SH	0.7407	Increasing	0.7408	0.9998	0.7407	60	-13.87%	-63.40%	0.00%	0.00%
27	600615.SH	0.6246	Increasing	0.8894	0.7023	0.6246	74	-8.47%	-20.85%	0.00%	0.00%
28	600638.SH	0.4635	Increasing	0.5478	0.8461	0.4635	88	0.00%	0.00%	-2.62%	0.00%
29	600641.SH	0.7618	Decreasing	0.7631	0.9983	0.7618	56	0.00%	0.00%	-16.54%	0.00%
30	600648.SH	1.0000	Constant	1.0000	1.0000	3.3379	2	0.00%	0.00%	0.00%	0.00%
31	600657.SH	0.8509	Increasing	0.8514	0.9994	0.8509	38	0.00%	-49.07%	0.00%	0.00%
32	600658.SH	1.0000	Constant	1.0000	1.0000	1.2536	6	0.00%	0.00%	0.00%	0.00%
33	600663.SH	1.0000	Constant	1.0000	1.0000	1.3156	5	0.00%	0.00%	0.00%	0.00%
34	600665.SH	0.7768	Increasing	0.7849	0.9897	0.7768	55	0.00%	-42.36%	0.00%	0.00%
35	600675.SH	0.8716	Decreasing	0.9672	0.9011	0.8716	35	0.00%	0.00%	0.00%	0.00%
36	600684.SH	0.8372	Increasing	0.9135	0.9165	0.8372	40	0.00%	0.00%	0.00%	0.00%
37	600687.SH	0.9010	Increasing	1.0000	0.9010	0.9010	26	0.00%	0.00%	-28.08%	0.00%
38	600696.SH	0.3959	Increasing	0.9355	0.4231	0.3959	92	-29.32%	0.00%	0.00%	0.00%
39	600716.SH	0.9260	Increasing	0.9333	0.9922	0.9260	22	-22.80%	0.00%	-5.00%	0.00%
40	600732.SH	0.5608	Increasing	0.7742	0.7243	0.5608	81	-17.63%	0.00%	-12.16%	0.00%
41	600736.SH	0.8209	Increasing	0.8209	1.0000	0.8209	41	0.00%	0.00%	0.00%	0.00%
42	600743.SH	0.7409	Increasing	0.7509	0.9867	0.7409	59	-17.14%	0.00%	-19.66%	0.00%
43	600745.SH	0.7538	Increasing	0.8166	0.9230	0.7538	57	0.00%	0.00%	0.00%	0.00%
44	600748.SH	0.9598	Increasing	0.9647	0.9950	0.9598	18	-39.02%	0.00%	-50.65%	0.00%
45	600766.SH	0.3535	Increasing	0.8345	0.4236	0.3535	94	-3.00%	-21.90%	0.00%	0.00%
46	600767.SH	0.6025	Increasing	0.8851	0.6807	0.6025	78	-31.19%	-11.27%	0.00%	0.00%

DMU	Name	OE	RTS	PTE	SE	S-E	Ranking	Registered capital	Employees	Asset value	Operating Cost
47	600791.SH	0.4333	Increasing	0.5513	0.7859	0.4333	91	-21.26%	0.00%	-9.58%	0.00%
48	600823.SH	0.4521	Increasing	0.4868	0.9287	0.4521	89	0.00%	-2.91%	-9.56%	0.00%
49	601588.SH	0.6416	Decreasing	0.6985	0.9184	0.6416	73	0.00%	-41.47%	0.00%	0.00%
50	000002.SZ	0.9182	Decreasing	1.0000	0.9182	0.9182	23	0.00%	0.00%	0.00%	0.00%
51	000006.SZ	0.8899	Increasing	0.8900	0.9999	0.8899	29	0.00%	0.00%	0.00%	0.00%
52	000011.SZ	0.6706	Increasing	0.6879	0.9748	0.6706	71	0.00%	-60.14%	0.00%	0.00%
53	000014.SZ	0.9174	Increasing	0.9616	0.9540	0.9174	24	0.00%	0.00%	0.00%	0.00%
54	000024.SZ	0.9782	Decreasing	1.0000	0.9782	0.9782	17	0.00%	-34.84%	-24.72%	0.00%
55	000029.SZ	0.7030	Decreasing	0.7438	0.9452	0.7030	68	-10.20%	-57.04%	0.00%	0.00%
56	000031.SZ	0.5398	Increasing	0.5423	0.9955	0.5398	83	0.00%	-23.83%	0.00%	0.00%
57	000042.SZ	1.0000	Constant	1.0000	1.0000	2.8996	3	0.00%	0.00%	0.00%	0.00%
58	000046.SZ	0.5284	Increasing	0.5325	0.9924	0.5284	86	0.00%	-29.02%	0.00%	0.00%
59	000150.SZ	0.7801	Increasing	0.9498	0.8214	0.7801	53	-19.76%	-25.17%	0.00%	0.00%
60	000402.SZ	0.7862	Decreasing	0.8831	0.8902	0.7862	51	0.00%	0.00%	-17.89%	0.00%
61	000502.SZ	1.0000	Constant	1.0000	1.0000	2.5312	4	0.00%	0.00%	0.00%	0.00%
62	000506.SZ	0.7060	Increasing	0.7247	0.9742	0.7060	67	-2.06%	-34.43%	0.00%	0.00%
63	000511.SZ	0.8069	Decreasing	0.8074	0.9994	0.8069	46	-45.88%	0.00%	-19.75%	0.00%
64	000514.SZ	0.7242	Increasing	0.7421	0.9760	0.7242	63	-29.59%	0.00%	-23.66%	0.00%
65	000517.SZ	1.0000	Constant	1.0000	1.0000	1.2275	7	0.00%	0.00%	0.00%	0.00%
66	000534.SZ	0.8162	Increasing	0.8618	0.9471	0.8162	43	0.00%	-57.99%	0.00%	0.00%
67	000540.SZ	0.7384	Increasing	0.7440	0.9925	0.7384	61	0.00%	-38.80%	0.00%	0.00%
68	000546.SZ	0.9800	Increasing	1.0000	0.9800	0.9800	16	-21.57%	-20.00%	0.00%	0.00%
69	000558.SZ	0.9093	Increasing	0.9302	0.9776	0.9093	25	0.00%	0.00%	0.00%	0.00%
70	000573.SZ	0.4859	Increasing	0.5365	0.9057	0.4859	87	-6.19%	-31.60%	0.00%	0.00%
71	000608.SZ	0.5606	Increasing	0.5921	0.9468	0.5606	82	0.00%	0.00%	0.00%	0.00%

DMU	Name	OE	RTS	PTE	SE	S-E	Ranking	Registered capital	Employees	Asset value	Operating Cost
72	000609.SZ	1.0000	Constant	1.0000	1.0000	7.6893	1	0.00%	0.00%	0.00%	0.00%
73	000616.SZ	0.9340	Increasing	0.9377	0.9961	0.9340	21	0.00%	0.00%	0.00%	0.00%
74	000628.SZ	0.8783	Increasing	0.9443	0.9301	0.8783	31	0.00%	-68.76%	0.00%	0.00%
75	000631.SZ	0.7073	Increasing	0.7083	0.9985	0.7073	66	0.00%	0.00%	0.00%	0.00%
76	000638.SZ	1.0000	Constant	1.0000	1.0000	1.0198	12	0.00%	0.00%	0.00%	0.00%
77	000667.SZ	0.5368	Increasing	0.5675	0.9460	0.5368	84	-18.40%	-22.66%	0.00%	0.00%
78	000711.SZ	0.3871	Increasing	1.0000	0.3871	0.3871	93	-9.75%	0.00%	0.00%	0.00%
79	000718.SZ	0.8102	Decreasing	0.8718	0.9293	0.8102	44	0.00%	-3.25%	0.00%	0.00%
80	000797.SZ	1.0000	Constant	1.0000	1.0000	1.2270	8	0.00%	0.00%	0.00%	0.00%
81	000803.SZ	0.8881	Increasing	1.0000	0.8881	0.8881	30	-43.76%	-81.73%	0.00%	0.00%
82	000836.SZ	0.8099	Increasing	0.8693	0.9318	0.8099	45	0.00%	-72.21%	0.00%	0.00%
83	000838.SZ	1.0000	Constant	1.0000	1.0000	1.1823	9	0.00%	0.00%	0.00%	0.00%
84	000897.SZ	0.5302	Increasing	0.5318	0.9971	0.5302	85	0.00%	0.00%	0.00%	0.00%
85	000918.SZ	1.0000	Constant	1.0000	1.0000	1.0446	11	0.00%	0.00%	0.00%	0.00%
86	000931.SZ	0.9481	Decreasing	1.0000	0.9481	0.9481	19	0.00%	-76.02%	0.00%	-0.01%
87	000965.SZ	0.7132	Increasing	0.7714	0.9246	0.7132	64	-5.42%	0.00%	-17.87%	0.00%
88	000979.SZ	0.5711	Increasing	0.9960	0.5735	0.5711	80	-48.36%	-47.84%	0.00%	0.00%
89	002016.SZ	0.7099	Increasing	0.8038	0.8833	0.7099	65	-9.40%	0.00%	0.00%	0.00%
90	002059.SZ	0.6934	Increasing	0.8307	0.8347	0.6934	69	0.00%	-45.00%	0.00%	0.00%
91	002133.SZ	0.7948	Increasing	0.8162	0.9737	0.7948	50	0.00%	0.00%	0.00%	0.00%
92	002146.SZ	0.9475	Increasing	0.9475	0.9999	0.9475	20	0.00%	0.00%	-1.86%	0.00%
93	002208.SZ	1.0000	Constant	1.0000	1.0000	1.1374	10	0.00%	0.00%	0.00%	0.00%
94	002244.SZ	0.7825	Increasing	0.7826	0.9999	0.7825	52	0.00%	0.00%	-9.47%	0.00%

Note: SH and SZ denote Shanghai Stock Exchange and Shenzhen Stock Exchange respectively.