PERFORMANCE EVALUATION OF PROPERTY AND REAL ESTATE COMPANIES LISTED ON INDONESIA STOCK EXCHANGE USING DATA ENVELOPMENT ANALYSIS

Tessa V. Soetanto
Liem Pei Fun
Faculty of Economics, Petra Christian University
Siwalankerto 121-131, Surabaya 60236
Email : tessa@petra.ac.id

ABSTRACT

The property sector in Indonesia has experienced attractive growth and some companies in the sector enjoy a significant increase in their revenue and net income. However, other property and real estate companies cannot make use of the growth in the sector and even experienced losses. Companies efficiencies in managing their assets to generate profits will determine their performance. This paper aims to evaluate perfomance of property and real estate companies listed in Indonesia Stock Exchange using the Data Envelopment Analysis (DEA) method. There are 23 property and real estate companies listed on Indonesian Stock Exchange used as sample in this research with the period of study from 2009 to 2012. DEA method is employed and results show that some companies are relatively efficient compared to other companies in each year. However, only one company consistently had technical efficiency equal to 1 during the period of study. The main cause of inefficiency from the period of 2009-2011 is more on scale inefficiency while inefficiency happened in 2012 is pure technical inefficiency. Overall the property and real estate companies operate efficiently under constant returns to scale is showing an increase from 17.39% to 39.13%.

Keywords: company performance, technical efficiency, property and real estate, DEA

ABSTRAK

Sektor properti di Indonesia telah mengalami pertumbuhan yang atraktif dan beberapa perusahaan di sektor ini menikmati peningkatan pendapatan dan laba bersih yang signifikan. Akan tetapi, perusahaan properti dan real estat yang lain tidak dapat memanfaatkan pertumbuhan tersebut bahkan mengalami kerugian. Efisiensi perusahaan dalam menggunakan asetnya untuk menghasilkan laba akan menentukan kinerja perusahaan. Penelitian ini bertujuan untuk mengevaluasi kinerja perusahaan properti dan real estate yang terdaftar di Bursa Efek Indonesia dengan menggunakan metode Data Envelopment Analysis (DEA). Terdapat 23 perusahaan properti dan real estat yang terdaftar di Bursa Efek Indonesia yang digunakan sebagai sampel dalam penelitian ini dengan periode penelitian dari 2009 sampai 2012. Hasil penelitian menunjukkan bahwa beberapa perusahaan relatif efisien dibandingkan perusahaan lain dalam setiap tahunnya. Namun hanya ada satu perusahaan yang secara konsisten memiliki *technical efficiency* sama dengan 1 selama periode 2009-2012. Penyebab utama ketidakefisienan perusahaan selama periode 2009-2011 lebih kepada *scale inefficiency* sedangkan pada tahun 2012 lebih kepada *pure technical inefficiency.* Secara keseluruhan, persentase perusahaan properti dan real estat mengalami peningkatan efisiensi secara *constant return to scale* dari 17.39% - 39.13%.

Kata kunci: kinerja perusahaan, *technical efficiency*, properti dan real estat, DEA

INTRODUCTION

The property market in Indonesia has experienced attractive growth in the past few years. Compared to other sector indexes in the Indonesian stock market, the property stock index has benefit from higher growth during 2012. The Indonesia property sector index grew profoundly, exceeding the growth in the Indonesia stock market index which is known as Indeks Harga Saham Gabungan (IHSG). On 12 October 2012, IHSG reached 4,331 which shows increase of 489.4 points or increased 12.8% compared to 2011 while on the same date, property stock index increased 34.37% ("Saham Properti Incaran Investor", 2012).

Thus far, the escalation of the property sector in Indonesia is driven by positive performance in property markets. High demand of property caused by an increase in the number of middle class people combined with rising price in property offer potential opportunities for developers. During 2012, many companies from the property sector listed on the Indonesia Stock Exchange obtain high revenue and net income growth. For instance, PT Ciputra Property Tbk reported revenue of Rp826 billion in 2012 or an increase of around 88% compared to 2011 (PT Ciputra Property Tbk, 2012) while PT Pakuwon Jati Tbk attained revenue of Rp2.165 trillion in 2012 or an increase of approximately 46% compared to the previous year (PT Pakuwon Jati Tbk, 2012). Other developers, PT Alam Sutera Realty Tbk booked net income of Rp1.216 trillion during 2012 or an increase of 102% compared to 2011 (PT Alam Sutera Realty Tbk, 2012) while PT Lippo Karawaci Tbk reported net income of Rp2.483 trillion or an increase of 205% compared to the previous year (PT Lippo Karawaci Tbk, 2012).

Although many publicly listed companies in the property and real estate sector encountered significant growth in revenue and net income, not all companies in that sector enjoyed the same experience. For example, during 2012, PT Bakrieland Development Tbk experienced a loss of Rp1.269 trillion (PT Bakrieland Tbk, 2012). It shows that growth in the property sectors are not automatically shared by all companies in that sector. How well companies managed their assets to maximize profit will determine their performance. Investors need to allocate the money in the companies that perform well to ensure they receive added value from their investments. Therefore, evaluating companies' performance is essential for investors.

Ratio analysis is a commonly used method to evaluate firm performance. However, many studies point out that traditional ratio analysis is insufficient to evaluate firm performance and suggest Data Envelope Analysis (DEA) as an augmented method for the analysis of firm performance (Feroz, Kim, & Raab (2003), Horta, Camanho, & Da Costa (2010), Gumus & Celikkol (2011)). Feroz, Kim, and Raab (2003) underline that although ratios are easy to compute, the major drawback with traditional ratio analysis is that their interpretation could be problematic in assessing overall firm performance, particularly when two or more ratios provide conflicting signals. They show that Data Envelopment Analysis (DEA) can improve traditional ratio analysis and conclude that DEA efficiency scores have incremental information content above the information generated by ratios. In line with that, research done by Gumus and Celikkol (2011) using non-financial firms listed on the Istanbul Stock Exchange for the period between 2005 and 2008 indicates that DEA and ratio analysis are complementary in terms of liquidity and profitability. Furthermore, Horta, Camanho, and Da Costa (2010, p. 581) state "one of the advantages of DEA method is to allow aggregating multiple

dimensions of company activity, evaluated by several key performance indicators (KPIs), into a single summary measure of performance". Therefore, this research employs DEA method to analyze firm performance.

To the best knowledge of authors, there is no research previously has ever measured the performance of property companies listed on the Indonesian Stock Exchange using DEA method. Hence, this research can potentially contribute to the literature and provide valuable information on the technical efficiency of property companies listed in Indonesia Stock Exchange in particular and property sector in Indonesia in general.

The remainder of this research paper is organized as follows. Section 2 provides brief literature review. Section 3 describes the research methods employed in this research. Section 4 presents the results and provides discussions of the results. The final section concludes.

LITERATURE REVIEW

Data Envelopment Analysis (DEA) is commonly used as a measure to examine the performance of the organizations in various of industry such as banks (Pasiouras, 2007; Saad and Moussawi, 2009; Suzuki and Sastrosuwito, 2011; Soetanto and Ricky, 2011), shipping industry (Lin et al., 2005), investment companies (Zohdi et.al, 2012; Zhao et al., 2011), and hospitality and tourism (Chen, 2009; Sigala, 2004).

Yu and Han (2012) used DEA to evaluate the technical efficiency of 26 publicly listed companies on the Taiwan Stock Exchange in 2010. DEA – Charnes, Cooper, Rhodes (CCR) model was used to find the technical of efficiency of each firm within the year. The input variables were the annual total fixed assets, operating cost, and the

number of employees while the output variables were annual total sales and on operating income. It was found that score of technical efficiency ranged from 0.61-1.00 and only 6 out of 26 semiconductor companies listed on Taiwan Stock Exchange were relative efficient.

Memon and Tahir (2012) measured and evaluated the relative efficiency of 49 manufacturing companies in Pakistan from 2008-2010 using DEA and categorized them based on the DEA efficiency and profitability index (ROA) to form the performance matrix. It employed both Charnes, Cooper, Rhodes (CCR) and Banker, Charnes, Cooper (BCC) models of DEA to find the overall technical efficiency (OTE), pure technical efficiency (PTE) and scale efficiency (SE) and found that eight companies were considered technically efficient while the source of inefficiency is pure technical efficiency rather than scale inefficiency. Through the performance matrix, there were 13 out of 49 companies in the super-start quadrant characterized by high efficiency and high profitability. Further, there were 20 companies in the problem-child quadrant characterized by low efficiency and low profitability.

Zheng et al. (2011) measured performance and efficiency of the listed real estate companies in China using three types of DEA models which are CCR, BCC and Super-efficiency. Empirical analysis was conducted on 94 listed real estate companies in China stock exchanges in 2009. The input variables were registered capital, asset value, employee number and operation cost, while the output variables were revenue and profit. There were three efficiencies calculated namely the overall technical efficiency (OTE), pure technical efficiency (PTE) and scale efficiency (SE). The result showed that the average of OTE, PTE and SE of the listed real estate companies were 0.78,

0.84, and 0.92 respectively and about 69% of the inefficient companies were categorized as having increasing returns to scale.

Nanka-Bruce (2006) investigated the technical efficiency in the real estate sector of Spain for the period 1998-2003 and related the findings to the ownership structure of the firms using DEA. There were 530 firms being analyzed and the variables being used for inputs were fixed assets, material costs, employee costs and other costs while the output variable was operating turnover. The analysis was adopting input-oriented radial DEA under variable returns to scale (VRS) technology to measure technical efficiency. It was revealed that firms were only 69% efficient in their productive efficiency and experienced a downward trend in technical efficiency from 1998 to 2002 attributable to the increasing demand for new property. The most inefficient firms were state-owned compared with industrial companies as the ultimate owners.

To date, there has been relatively limited research conducted in evaluating the efficiency of property and real estate industry listed publicly in Indonesia. Most of the research being conducted to analyze the performance of the companies has been based on financial ratios and price of the stock as in Saskia (2013) dan Amalia (2012). Other research by Septyo (2013) was evaluating the performance of property and real estate companies listed on the Indonesia Stock Exchange from 2009-2011 using Public-Value Added Intellectual Coefficients (VAIC) while Nugroho (2012) used Economic Value Added to measure the financial performance in property industry from 2004-2010.

To the best knowledge of the authors, no research paper has ever measured the performance evaluation of property and real estate sector listed in Indonesian Stock Exchange using DEA.

RESEARCH METHOD

The nonparametric method of Data Envelopment Analysis (DEA), initially introduced by Charnes et al. (1978), to evaluate the efficiency of decision-making units (DMU) particularly in terms of efficiency. The DEA model forms a relative efficiency score by converting the multiple-input/multiple-output variables to a single measure of performance for each DMU (Horta et al., 2010). This happens by establishing an empirically based "best-practice" or efficient frontier as a result of classifying a set of efficient DMUs which lies on the frontier and inefficient DMUs which do not lie on the frontier (Wagner and Shimshak, 2007).

There are several of advantages of DEA compared to other methods such as Stochastic Frontier Analysis (SFA), Thick Frontier Approach, Distribution Free Approach (DFA) and etc. It does not have any assumption of frontier functional form, considers various inputs and outputs simultaneously, no prior specific behavioural assumptions of relationship needed and able to have different measurement units between inputs and outputs (Cooper et al, 2004, Charnes et al., 1978). Another advantages of DEA is no assumption related to the distribution of efficiencies and no prior information related to prices (Mohammadi & Ranaei, 2011).

There are two versions of the DEA model based on its features, namely constant return to scale (CRS) or CCR (Charnes et. al, 1978) and variable returns to scale (VRS) or BCC (Banker et.al, 1984). Charnes et al. (1978) used a mathematical programming model to identify the efficiency frontier based on the concept of Pareto optimality when multiple measures are applied. The ratio of outputs to inputs is used to measure the relative efficiency of the $DMU_j = DMU_0$ to be evaluated relative to the ratios of all of

the j = 1,2,…,n DMU. This basic DEA model implies the assumption of Constant Returns to Scale (CRS). Using Charnes-Cooper transformation and dual formulation under CRS, then:

θ^* = Minimum θ

$$\text{Subject to } \sum_{j=1}^{n} \lambda_j x_{ij} - \theta x_{i0} \leq 0 \qquad i = 1, \dots, m \tag{1}$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} - y_{j0} \geq 0 \qquad r = 1, \dots, s$$

$$\lambda j \geq 0 \quad \forall j$$

The optimal solution, θ^*, yields an efficiency score for a certain DMU. The process is repeated for each DMU_j. DMUs for which $\theta^* < 1$ are inefficient, while DMUs for which $\theta^*=1$ are boundary points or efficient. This model is sometimes referred to as the "Farrell model" (Cooper et al., 2004). In the CRS version, it is assumed that an increase in the amount of inputs would directly be proportional to an increase in the amount of outputs. During the process, however, there may be increasing or decreasing returns to scale, particularly for an inefficient DMU, which may occur from the different returns to scale of the operation (Boussofiane et al., 1991).

The efficiency measure derived from the model reflects the technical efficiency (TE). Technical efficiency (TE) refers to ability to produce the maximum outputs at a given level of inputs (output-oriented), or ability to use the minimum level of inputs at a given level of outputs (input-oriented). The envelopment surface resulting from the CCR model has the shape of a convex cone and the efficient DMUs would lie on top of the structure, while the inefficient ones would be below the cone.

Due to imperfect competition or constraints in finance, not all companies are able to operate at the optimal scale. In that condition, Banker et al. (1984) suggested the use of Variable Return to Scale (VRS), denoted as BCC hereafter, that allows the calculation of efficiency leads to decomposition of technical efficiency into scale (SE) and pure technical efficiency (PTE) components. The BCC model is (1) together with additional constraint that captures returns to scale characteristics

$$\sum_{j=1}^{n} \lambda_j$$

Then, the efficiency estimates obtained in the BCC model is net of the contribution of scale economies and therefore is referred to as 'pure' technical efficiency and also as the managerial efficiency. In the VRS version, the amount of outputs is considered to increase more or less than proportionally than the increase in the inputs.

A DEA model can be constructed either to minimize inputs or maximize outputs. An input orientation aims at reducing the input amounts as much as possible while keeping at least the present output levels, while an output orientation points toward maximizing output levels without increasing use of inputs (Cooper et al., 2004). The input and output measurements are always the same in the CCR model, but frequently differ in the BCC model. First, one model can be solved and be given either interpretation in CCR model while in BCC model, only the input interpretation be given and another solution must be made on the output to get the interpretation of it. Another difference between those two models is the efficiency score resulting from CCR Model is the same by scalar transformations of all data for a given DMU while not the same thing happens in BCC Model (Martic et al., 2009).

Both CCR and BCC models will result of efficiency scores between 0.0 and 1.0. It implies that DMUs are either on the efficiency frontier or below it. A company is efficient if it has an efficiency score of 1.0 or can be said that it lies on the efficient frontier, and otherwise if it has an efficiency score below 1.0.

Data and Variables

The data used in the analysis were collected from Annual Reports of company websites and the Indonesian Stock Exchange database. This research used property and real estate companies listed on the Indonesian Stock Exchange from the period of 2009-2012. Companies which experienced delisting during the period and those that lack data on selected variables for at least one year are eliminated, leading to 23 companies for further analysis.

A crucial phase in DEA measurement is classification of the input/output variables related to the units being measured (Boussofiane et al., 1991). DEA calculates efficiency directly from the input/output data, then the results will depend on the input/output adoption for analysis and the homogeneity of the DMUs to be assessed (Boussofiane et al., 1991). As stated by Sigala (2004), one primary drawback of DEA model is the difficulty in defining and classifying the measurement of inputs/outputs.

Based on previous research (Zheng et al., 2011; Nanka-Bruce, 2006; Yu and Han, 2012; Memon and Tahir, 2012) and considering the condition of the property and real estate companies in Indonesia, then the input variables are fixed assets, operating expense, inventories and land for development (consists of land that is currently being developed, land that is not yet being developed, asset real estate and investment property). Preceding articles use revenues and net income as output (Zheng et al., 2011;

Memon and Tahir, 2012; Yu and Han, 2012). However, since net income is subject to revenue, there is potential of endogeneity bias in DEA as pointed out by Orme and Smith (1996). Moreover, in the presence of relatively small number of DMUs, having more output than are necessary will lead to loss of discriminatory power of DEA which result in higher overall efficiency score (Hughes and Yaisawarng, 2004). Therefore, this research only use one output which is net income.

According to Chen (2009), some guidelines have been proposed by previous research to limit the number of variables relative to the number of DMUs to achieve a rational level of discernments. Dyson et al. (2001), as cited by Chen (2009), stated that the number of DMUs should be at least two times of the number of inputs and outputs (i.e. $n \geq 2ms$). This research use 3 input variables (m=3) and 2 output variables (s=2) hence the number of DMUs should be more than 12 (2x3x2). The guideline is fulfilled since there are 23 property and real estate companies being analyzed in this research.

RESULTS AND ANALYSIS

Table 1 below shows descriptive statistics for inputs and outputs variable of 23 publicly listed property and real estate companies for 4 year-period (2009-2012). The values are given in million Rupiah.

Table 1 Descriptive Statistics for the Data

	Factors	Min	Max	Mean	Std. Dev.
	Year 2009				
Inputs	Operating Expense (Million IDR)	4096	705861	171239	189219
	Fixed Assets (Million IDR)	729	1559360	432230	534168
	Inventories & Land for Development (Million IDR)	35208	7299603	1963994	1871100

Output	Net Income (Million IDR)	2355	388053	101943	117447
	Year 2010				
Inputs	Operating Expense (Million IDR)	6705	802411	198053	219466
	Fixed Assets (Million IDR)	356	2012890	473280	590593
	Inventories & Land for Development (Million IDR)	84770	8558284	2192887	2094820
Output	Net Income (Million IDR)	8401	525346	145936	146810
	Year 2011				
Inputs	Operating Expense (Million IDR)	1019	968324	241102	265811
	Fixed Assets (Million IDR)	671	2395684	634063	739434
	Inventories & Land for Development (Million IDR)	93090	9159336	2687242	2383928
Output	Net Income (Million IDR)	5901	1012034	249861	268289
	Year 2012				
Inputs	Operating Expense (Million IDR)	9176	1343939	281370	336928
	Fixed Assets (Million IDR)	694	2222377	570806	648231
	Inventories & Land for Development (Million IDR)	103038	11886493	3590021	3337621
Output	Net Income (Million IDR)	4488	2482548	455816	595930

Table 1 displays that for input variables, the highest operating expenses and inventories & land for development happened in 2012 while the highest fixed assets is in 2011. During 2009 to 2012, the highest operating expenses amount is Rp1,343,939 million or Rp1.34 trillion spent by PT Lippo Karawaci Tbk in 2012 while the highest inventories and land for development value is Rp11.886 trillion, owned by PT Lippo Karawaci Tbk. PT Ciputra Development Tbk has highest fixed asset during the period of investigation. For output variable, mean of the net income is increasing from 2009 to 2012. Highest reported net income is Rp2,482,548 million or Rp2.48 trillion is earned by PT Lippo Karawaci Tbk in 2012.

After input and output variables data were collected, they were processed using DEA Frontier software developed by Joe Zhu. The first stage is running the data based on the CCR model with the orientation of minimizing inputs to get technical efficiency

(TE). The technical efficiency of 23 publicly listed property and real estate companies per year during 2009-2012 are shown in Table 2 below.

Table 2. Technical Efficiency of 23 Publicly Listed Property & Real Estate Companies

DMU No.	DMU Name	Technical Efficiency			
		Year 2009	Year 2010	Year 2011	Year 2012
1	Alam Sutra Realty	1.00000	1.00000	1.00000	1.00000
2	Bekasi Asri Pemula	1.00000	1.00000	0.79529	0.61387
3	Bumi Serpong Damai	0.51946	0.54463	0.78449	0.77190
4	Ciputra Development	0.37591	0.57658	0.58347	0.68147
5	Ciputra Property	0.38848	1.00000	0.65921	0.46615
6	Ciputra Surya	0.35201	1.00000	0.59496	0.70940
7	Cowell Development	1.00000	0.97509	1.00000	1.00000
8	Danayasa Arthatama	0.85226	0.54369	0.37935	1.00000
9	Duta Anggada Realty	0.65491	0.76883	0.30309	0.92657
10	Gowa Makassar Tourism	0.65890	0.65420	1.00000	1.00000
11	Indonesia Prima Property	0.49609	1.00000	1.00000	0.94474
12	Intiland Development	0.42025	0.95843	0.48723	0.54987
13	Jakarta Inter Hotel	0.80389	0.60827	0.42524	0.46213
14	Jaya Real Property	1.00000	0.91717	1.00000	1.00000
15	Kawasan Jababeka	0.28737	0.51809	0.63351	0.64749
16	Lamicitra Nusantara	0.39968	0.47501	0.20067	0.19089
17	Lippo Cikarang	0.72974	0.68758	1.00000	1.00000
18	Lippo Karawaci	0.46460	0.52744	0.70364	1.00000
19	Modernland	0.45000	0.49516	0.40790	0.48010
20	Pakuwon Jati	0.75137	1.00000	0.90173	1.00000
21	Perdana Gapuraprima	0.42855	0.46624	0.61504	0.63498
22	Sentul City	0.33248	0.68826	0.47757	0.59962
23	Summarecon Agung	0.51564	0.64319	0.70468	1.00000

From Table 2 above, it can be seen that each year from 2009 until 2012, some companies have technical efficiency equal 1.0 which means that those companies are efficient in using their inputs (operating expenses, fixed assets, inventories & land for development) to produce outputs (revenues and net income) for that particular year.

However, companies having technical efficiency equal to 1.0 are not the same each year. In 2009, there are four companies that have technical efficiency equal 1.0 which are PT Alam Sutera Realty Tbk, PT Bekasi Asri Pemula Tbk, PT Cowell Development Tbk, and PT Jaya Real Property Tbk. In 2010, there are six companies which have technical efficiency equal 1.0. They are PT Alam Sutera Realty Tbk, PT Bekasi Asri Pemula Tbk, PT Ciputra Property Tbk, PT Ciputra Surya Tbk, PT Indonesia Prima Property Tbk, and PT Pakuwon Jati Tbk. In 2011, there are six companies having technical efficiency equal 1.0 which are PT Alam Sutera Realty Tbk, PT Cowell Development Tbk, PT Gowa Makassar Tourism Development Tbk, PT Indonesia Prima Property Tbk, PT Jaya Real Property Tbk, and PT Lippo Cikarang Tbk. In 2012, nine companies are having technical efficiency equal 1.0. Those companies are PT Alam Sutera Realty Tbk, PT Cowell Development Tbk, PT Danayasa Arthatama Tbk, PT Gowa Makassar Tourism Development Tbk, PT Jaya Real Property Tbk, PT Lippo Cikarang Tbk, PT Lippo Karawaci Tbk, PT Pakuwon Jati Tbk, and PT Summarecon Agung Tbk. From the table, it also can be seen that there is only one publicly listed company that consistently had technical efficiency equal to 1.0 during 2009 to 2012, which is PT Alam Sutera Realty Tbk.

Following the technical efficiency result of 23 publicly listed property and real estate companies, the average score of technical efficiency during the period of study is also calculated, as shown in Table 3. Afterward, the BCC model can be proceed with orientation of minimizing inputs to obtain pure technical efficiency (PTE). Then scale efficiency (SE) can be calculated as SE = TE/PTE. The result of PTE and SE can be seen in Table 4.

Table 3. DEA Result: Technical Efficiency (TE)

Year	Mean	Min	Max	St. Dev
2009	0.6035	0.2874	1	0.2416
2010	0.7412	0.4662	1	0.2114
2011	0.6792	0.2007	1	0.2518
2012	0.7687	0.1909	1	0.2416

Table 4. DEA Result: Pure Technical Efficiency (PTE) and Scale Efficiency (SE)

Year	Pure Technical Efficiency (PTE)				Scale Efficiency (SE)			
	Mean	Min	Max	St. Dev	Mean	Min	Max	St. Dev
2009	0.8038	0.3931	1	0.2194	0.7478	0.4323	1	0.1798
2010	0.9296	0.4826	1	0.1459	0.8002	0.4662	1	0.1847
2011	0.7925	0.3195	1	0.2301	0.6792	0.2007	1	0.2518
2012	0.8410	0.4714	1	0.1969	0.9178	0.2088	1	0.1829

According to the CCR-DEA model, the average technical efficiency of property and real estate companies in Indonesia as shown in Table 3 is experiencing fluctuation starting from 60.35% to 74.12% from 2009 to 2010 and in 2011 is declining to 67.92% before it is improving to 76.87% in 2012. It indicates that the companies could further reduce their factor of production by 39.65% in 2009 to 23.13% in 2012 by maintaining the same output level. Table 3 also shows that the minimum technical efficiency keeps decreasing from year to year, except from 2009 to 2010. However in every period of analysis, there are some companies that can achieve technical efficiency as shown by the maximum score equal to 1.0.

Table 4 exhibits the decomposition of technical efficiency into pure technical efficiency and scale efficiency from the year 2009-2011. From Table 4, it can be seen that the average score of pure technical efficiency outweighs the average score of scale efficiency in determining property and real estate companies technical efficiency. The

results imply that during these years, the companies in property and real estate sector has been more efficient in controlling their operating costs rather than operating at an optimal scale of operations.

On the other hand, pure technical inefficiency seem to dominate during 2012 compared to scale inefficiency, suggesting that property and real estate sector has been relatively less managerially efficient in controlling their costs and operating at an optimal scale of operations. As in 2012, there is increasing demand of residential houses and apartments as people were more positive about the Indonesian economic circumstances and mortgage loans were more affordable, which was 10.62% in average based on data of Bank Indonesia (Property and Bank, 2012) compared to the previous years which was 14% (Finesso, 2009). Moreover, it is supported by the fact that the amount of mortgage loan in February 2012 was increasing 33% compared to February 2011 (Property and Bank, 2012).

Table 5. Summary of Overall Efficiency and Return to Scale

	2009		**2010**		**2011**		**2012**	
	Count	%	Count	%	Count	%	Count	%
Efficient (CRS)	4	17.39%	6	26.09%	6	26.09%	9	39.13%
Inefficient	19	82.61%	17	73.91%	17	73.91%	14	60.87%
CRS	4	17.39%	6	26.09%	6	26.09%	9	39.13%
IRS	1	4.35%	0	0.00%	3	13.04%	7	30.43%
DRS	18	78.26%	17	73.91%	14	60.87%	7	30.43%

This research also evaluate the nature of scale efficiencies based on the number of property and real estate companies operating under constant, increasing and decreasing returns to scale. From Table 5, the percentage of companies operating under constant returns to scale is increasing from 17.39% to 39.13% during the period of 2009-2012

while the companies that are not efficient are mostly having decreasing returns to scale. The percentage of companies who experience the decreasing returns to scale is 78.26% in 2009 and decline to 30.43% in 2012.

CONCLUSION

The positive and attractive performance of property companies has driven the Indonesian property sector's growth significantly as can be seen by the increasing revenues of some property and real estate companies listed in Indonesian Stock Exchange. However not all companies enjoyed the same condition and evaluating the performance of companies is necessary to know their sustainability. Besides it is helping investors to seek the right choice in doing investment.

This research utilizes DEA to evaluate the performance of property and real estate companies listed on the Indonesian Stock Exchange in the period of 2009-2012 as DEA is a highly-regarded method for evaluating performance which usually consists of multidimensional factors. DEA is converting multiple inputs and multiple outputs into a single measurement of performance which is technical efficiency and further can be decomposed into pure technical efficiency and scale efficiency. The DEA result shows that only PT Alam Sutera Realty Tbk was technically efficient during the period of study. The average score of technical efficiency from all property and real estate companies listed in Indonesian Stock Exchange varies from 60.35% to 74.12% (2009-2010), then went down to 67.92% (2011) and reached 76.87% in 2012. Meanwhile the cause of inefficiency from the period of 2009-2011 is scale. The inefficiency that happened in the last period of study is pure technical inefficiency, which means

companies are not controlling their costs efficiently and are operating at optimal scale of operation as the increasing demand of residential houses and apartments in 2012. Overall the percentage of companies operating under constant returns to scale is increasing from 17.39% to 39.13% during 2009-2012.

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