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## **THE EFFICIENCY ANALYSIS OF SINGAPORE REAL ESTATE INVESTMENT TRUSTS**

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### **Abstract**

Since the REIT industry is relatively new in Singapore, the objective of this research is to examine the operation efficiency among firms in the industry through the method of Data Envelopment Analysis (DEA). In addition, the method of Tobit regression is applied to investigate the impact factors on efficiency. The results are as follows. First, none of 14 firms analyzed performs relatively efficiently based on the average efficiency scores over the sample periods of 2007 to first quarter of 2015. Nevertheless, it is found that First REIT and Suntec REIT are the most efficient and least efficient REITs respectively. Second, ROA is positively correlated to efficiency scores while the negative relationship is found with the debt ratio. Third, regarding property-type, retail REITs perform better than commercial ones on average. However, the most efficient group is "others" which consists of one hospitality/residential REITs, one healthcare REITs, and three industrial REITs. Fourth, geographical diversification may not affect REIT's efficiency. Meanwhile, REITs holding more properties overseas perform better than their counterparts on average. Last, in regards to size, small-size REITs significantly perform better in efficiency than those in other categories. Especially, medium-size and large-size REITs do not have significant differences on average in efficiency.

**Keywords:** REIT, Singapore, DEA, Tobit Regression

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### **1. Introduction**

#### **1.1. Background**

Singapore is known to be one of the four original Asian Tigers, a global financial hub, as well as Asia's 1st and the world's 4th most influential city by Forbes. She is recognized to be one of the freest, least corrupted, most competitive, and most business-friendly country in the world. She

ranks high in the Human Development Index in terms of education, healthcare, life expectancy, quality of life, personal safety and housing. According to World Bank, she has the 3rd highest annual GDP per capita at purchasing power parity of US\$82,736.4 in 2014. Certainly, her successes did not come easy.

After her independence from Malaysia in 1965, Singapore was faced with high levels of unemployment and poverty. She has only a small domestic market and lacks natural resources. She could only rely on her population as resources, half of them illiterate at the time. Hence, the government established Economic Development Board to attract foreign direct investment to build her economy. She also established the Central Provident Fund that forces its citizen to save a proportion of their salary into an account that can be later used for housing, medical purposes, and retirement. Coupled with state-led industrialization strategy, Singapore produced an average real GDP growth of 8.7% since her independence until the 1997 Asian Financial Crisis hit.

Due to Singapore's integration to the region's economy, her economy was affected. Singapore's exports and tourism regional demand decreased significantly due to the region's depreciation against the Singapore Dollar as well as the region's weakening demand, her banking sector were affected due to lending exposure to these Asian countries, investments in these region suffered a setback, and Singapore real estate sector took a beating. However, due to her strong economic fundamentals, sound policies, and the ability to take bold effective measures, her economy was quick to rebound with an astounding growth of 5.4% in 1999 and public sector employees' pay cuts were fully restored by the year 2000 (Jin, 2000).

One of the other things Singapore did was to introduce the Singapore Real Estate Investment Trust (REIT). REIT is a trust that pooled money from many investors to purchase and manage income property (Keke and Emoh, 2015). When the Asian Financial crisis hit, Singapore's private property prices was reduced to 40% within the year among other things (Jin, 2000). The introduction of REIT would bring more liquidity and new capital needed to reawaken her real estate sector that was severely affected by the Asian Financial Crisis. It is also established to widen the range of financial products available to investors, strengthening Singapore's position as a global financial hub further (Ooi et al. 2006). There are many benefits of REITs: they serve as a vehicle for international funds who are looking to diversify into Asia's real estate assets (Newell et al. 2005), provide steady income in the form of dividends while having the potential of capital gain in the future (especially ideal for pensioner), provide a hedge against inflation, offer tax benefits as REITs enjoy corporate tax and exempted from paying Goods and Service Tax and capital gain tax, a more secure form of investment as they are subjected to more stringent regulation in areas of corporate governance, leverage, and financial reporting (Keke and Emoh, 2015), as well as having a lower transaction fees than real estate transaction whereby investors have to pay for GST, trading tax, broker fee and stamp duties.

According to Monetary Authority of Singapore, Singapore is currently the second largest REIT market after Japan. However, countries such as China and India are catching up to establish their own REIT market and will threaten Singapore's REIT market position if they manage to overcome their high tax and high interest rates problems. Hence, it is important for Singapore REITs to strengthen their position by managing and improving their technical efficiency level to retain their position as a major Asian REIT hub.

## 1.2. Objectives and Structure of the Research

Since the REIT industry is relatively new in Singapore, there are not many empirical studies that are done to assess their technical efficiency. Hence, the first objective of this research is to examine efficiency across the REIT industry in Singapore using Data Envelopment Analysis (DEA). The study will cover available quarterly data of REITs from first quarter of 2007 until first quarter of 2015.

There are many REIT characteristics that may explain the differences in a REIT's technical efficiency. There are many institutions such as National Association of Real Estate Investment Trust and Singapore Exchange that categorize its REITs into property-type. One of the possible reasons why researchers categorize REITs in such a way is because these

categories respond to their respective underlying property sector (Mueller and Laposa, 1996). These property sectors respond differently to certain market conditions at times. For example, falling recreational tourist arrival will affect hospitality and retail sector but unlikely to affect healthcare sector. Hence, falling tourism level will affect hospitality REITs and retail REITs. Because of this reason, our second objective is to include property-type as one of the REIT characteristics that may explain differences in technical efficiency.

There are some REITs that diverse geographically. Diversification is usually associated with higher cost in general expenses. On the other hand, REITs might choose to diversify to lower their risk and take advantage of rapid growth in other countries. Therefore, the third objective is to find out whether diversification actually improves technical efficiency.

Different properties locations are subjected to different markets and economic conditions, hence, there might be some differences in performance. In this study, the fourth objective of the researcher is to find out whether there is a significant difference in technical efficiency for concentrating on overseas properties versus Singapore properties.

There exists an optimal size for REIT where they operate at the lowest point of the average cost curve. Hence, the fifth objective of this study is to assess the technical efficiency level across size. From this study, the researcher can deduce whether there are opportunities of better performance through expansion.

The remainder of this research is organized as follows: Chapter Two will discuss the research methods used in this study. Chapter Three will present Research and Findings of this research while Chapter Four will provide conclusion to this study.

## 2. Research Method

### 2.1. Research Data and Sources

The data used in this study consists of quarterly observations from Real Estate Investment Trusts that are listed in Singapore Exchange between first quarter of 2007 to first quarter of 2015. Quarterly information of REITs is gathered from each REIT's respective quarter and annual reports that can be found on their official websites. The sample data excluded stapled REITs as there are very few stapled REITs in Singapore. To assess REITs efficiency improvements over the years with fairness as mentioned by Topuz and Isik (2009), only S-REITs that are active throughout the studied period (1Q2007 to 1Q2015) will be used. In total, there will be 14 S-REITs and hence, 462 REITs observations (calculation: 14 REITs \* 33 quarters from 2007 to 1st quarter of 2015).

As discussed previously, the efficiency of the Decision Making Units (REITs) increase when their number of inputs and outputs increase. Hence, to solve this problem, the researcher will adhere to the rule of thumbs used by Golany and Roll (1989), Bowlin (1998), and Dyson *et al.* (2001). The researcher will only use 2 input variables: (1) Property operating expenses, (2) Manager's Fees, as well as 2 output variables: (1) Total Revenue, (2) Total Assets to assess the efficiency of each REITs. Following the DEA estimation, the researchers will run regression of the efficiency scores against factors such as property-type, diversification, geographical concentration, and size.

The list of input and output variables for the period of 2007Q1-2015Q1 is shown in Table 1.

**Table 1. List of input and output variables (2007Q1-2015Q1)**

<b>Input Variables</b>	<b>Output Variables</b>
Property Operating Expenses	Total Loans
Management Fees	Total Assets

## 2.2. Research Variables

### 2.2.1. Variable Selection

The selection of inputs and outputs variables will depend on the researcher's interest, view of firms and availability of data (Aly *et al.* 1990). There a lot of disagreements between researchers on what constitute the productions of REITs and how to measure their output. There are even arguments on whether REITs should be classified as stocks (e.g. Anderson *et al.* 2015; Ro and Ziobrowski, 2011; Campbell *et al.* 2003) or real estate institutions with many recent studies by Bers and Springer (1997), Bers and Springer (1998), and Anderson *et al.* (2002) supporting the latter. This research will view REITs as real estate institutions rather than stocks.

In regards to input, Anderson *et al.* (2002) use four inputs: interest expense, property operating expense, general and administrative expense, and management fees whereas Topuz *et al.* (2005) as well as Topuz and Isik (2009) employ interest expense and property operating expense. In this research, similar to Topuz and Isik (2009) and Topuz *et al.* (2005), only two inputs are used mainly due to the researcher's effort to adhere to the rules of thumbs in regards to the number of inputs and outputs used relative to number of DMUs reported. However, instead of interest expense, management fee will be used because the researcher is interested in finding out whether management fee actually improves efficiency. Many local articles in Singapore such as Straits Times discuss the importance of considering management fees when investing in REITs. Therefore, the inputs of this study will be 1) property operating expense and 2) management fees.

On the other hand, the common outputs used in research papers are market capitalization, total revenue, total assets, and/or dividends. According to Bers and Springer (1998), the use of total assets as output will yield a more conservative and more believable results as compared to other output measures. It has a high correlation with and a smaller variance than market capitalization. It also has more consistent results and if bias exists, it is conservative bias. Therefore, total assets will be preferable over market capitalization. In addition, Bers and Springer (1997) as well as Anderson *et al.* (2002) found that results are very similar in their efficiency studies when both assets and dividends are used as output and when only assets are used. Hence, this strengthened the researcher's choice for total assets as one of the outputs. Miller *et al.* (2006) as well as Miller and Springer (2007) also use total revenue in addition to total assets as their outputs in their study. Hence, in this study, the outputs will be 1) total assets, 2) total revenue.

### 2.2.2. REIT Characteristics

The researcher aims to examine whether REIT characteristics such as property-type, diversification, geographical concentration, and scale have an impact on REIT's efficiency. In this study, property-type is classified into three categories: retail, commercial, and other REITs. The property-type classification is based on the respective REIT's portfolio value concentration e.g. Suntec REIT is classified as commercial as its portfolio value in commercial exceeds retail.

In regards to geographical diversification, the researcher will measure diversification using two methods. The first method will employ the Herfindahl Index<sup>1</sup> method. The second method is to split the categories into specialized for REITs that focuses 75% of its total portfolio value on one country, and diversified otherwise (Anderson *et al.* 2015). On the other hand, for geographical concentration, the categories are split into Singapore-focused properties and overseas properties. The REIT's portfolio value concentration determines their geographical focus.

Lastly, for size, total asset is the parameter used for measurement. In this study, splitting the assets into three quartiles determines the REIT size into small, medium, and large. Capozza and Lee (1995) have also determined REIT size based on asset quartiles.

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<sup>1</sup>Sum of the squares of each country's share in a REIT's portfolio

### 2.2.3. Tobit Regression Model

This research will use two-stage procedure that comprise of DEA analysis followed by Tobit Regression Model to obtain consistent estimator. This model is introduced by James Tobin (1958) and allows the researchers to validate the DEA analysis and explain possible causes of differences in efficiencies. It traditionally assumes the dependent variable is left-censored at zero, hence, enabling researcher to estimate linear relationship between a non-negative dependent variable and independent variables. However, variation of the original Tobit model allows for a lower bound value other than zero and an upper bound value other than the latent value. Tobit regression model will help the researcher recognize the relationship between various controlling factors (i.e. size, property type, etc) and efficiency.

According to Hoff (2007) as well as Bogetoft and Otto (2010), Tobit Regression is commonly used as the second-stage evaluation to DEA scores. The Tobit model will enable researcher to find out the marginal impact of independent variables on the latent variable (i.e. efficiencies). In addition to that, it also allow researcher to see whether their relationship is positive, negative, or even neutral. As previously mentioned, it will help verify the findings of the earlier DEA model.

There are many literary works that combine the use of DEA and Tobit Regression (e.g. Barry *et al.* 2010; Berger and Humphrey, 1990; Wang *et al.* 2006; Pande and Patel, 2013). In the real estate industry, Anderson *et al.*(1998) use DEA and Tobit Regression to measure the efficiency levels of residential real estate brokerage firms.

## 3. Research Result

### 3.1. DEA Input and Output Variables

We treated REITs as an institution rather than stocks; hence, we assume the inputs are Property Operating Expenses and Management Fees, while the outputs are Total Revenue and Total Assets. The researcher used SPSS to organize the data panel of 462 observations and processed them accordingly.

The descriptive statistic of DEA input and output variables is shown in Table 2.

**Table 2. Descriptive statistic of DEA input and output variables**

Year	Input		Output	
	Property Operating Expense	Manager's Fee	Total Revenue	Total Assets
2007	10,419	2,660	36,411	2,199,313
2008	12,919	3,492	45,331	2,828,854
2009	13,002	3,682	49,137	2,869,377
2010	13,807	3,787	52,555	3,111,133
2011	15,651	4,608	57,496	3,596,823
2012	17,821	5,246	63,816	4,134,605
2013	17,882	5,568	63,441	4,307,645
2014	19,791	5,720	69,449	4,617,581
2015	21,003	5,945	72,594	4,868,350

**Note:** Variables expressed in thousand Singapore Dollar

Table 2 shows that Singapore REITs had increase in average property operating expense and management fee over the years. The average revenue also increases except for the year 2012 to 2013 where they experience a small decline. As for the average total assets, S-REIT also experienced an increase over the few years, reaching an average of \$4,868,350,000 in the first quarter of 2015. Table 3 shows the overall statistical results of DEA input and output variables.

The overall statistical result of DEA input and output variables is shown in Table 3.

**Table 3. Overall statistical result of DEA input and output variables**

Variable	Average	Standard Deviation	Maximum	Minimum
Property Operating Expenses	15,332	13,864	60,754	14
Manager's Fees	4,381	3,085	15,504	551
Total Revenue	55,206	40,141	173,794	6,003
Total Assets	3,501,320	2,496,828	10,242,098	269,244

**Note:** Variables expressed in thousand Singapore Dollar

The Pearson correlation of DEA inputs with efficiency scores that this paper proceeded is shown in Table 4.

**Table 4. Pearson correlation of DEA inputs with efficiency scores**

	Operating Expense (as a % of Total Revenue)	Manager's Fee (as a % of Total Revenue)
Pearson Correlation	-0.077	-0.404
Significant (two-tailed)	0.049**	0.000***

**Notes:** \*\*, \*\*\*. Correlation is significant at the 0.05 and 0.01 level, respectively (2-tailed).

From the results, it can be seen that both operating expense and manager's fee are negatively correlated with efficiency scores, which means that an increase in operating expense or management fee reduces the efficiency of REITs. As mentioned before, Singapore newspaper "Straits Times" stressed upon the importance of considering Management Fees when choosing which REITs to invest. Based on DEA results, investors are discouraged from investing in REITs that has a high management fees as it is shown to reduce efficiency.

### 3.2. DEA Efficiency Scores

Through the DEA program, the researcher was able to obtain the technical efficiency scores of Singapore Real Estate Investment Trust. The mean and standard deviation of REIT's efficiency scores are shown in Table 5.

**Table 5. Efficiency scores of S-REITs**

REIT's Name	Mean	Standard Deviation
Ascendas REIT	0.7719	0.1347
Ascott Residence Trust	0.8611	0.0656
Cambridge Industrial Trust	0.8371	0.1865
Capita Commercial Trust	0.9077	0.0611
CapitaMall Trust	0.7222	0.0247
CapitaRetail China Trust	0.7793	0.0166
First REIT	0.9353	0.0407
Fortune REIT	0.7182	0.0466
Frasers Centrepoint Trust	0.6629	0.0198
Frasers Commercial Trust	0.5965	0.0405
K-REIT Asia	0.5859	0.0673
Mapletree Logistics Trust	0.6764	0.0169
Starhill Global REIT	0.7095	0.0534
Suntec REIT	0.5332	0.0482

From this result, it can be seen that First REIT has the highest average efficiency scores over the year 2007 to 2015 (Q1) period. Capita Commercial Trust followed closely behind with an average mean score of 0.93527. On the other hand, Suntec REIT has the lowest efficiency score of 0.53324. The standard deviation of the efficiency scores shows the consistency of efficiency. Although Cambridge Industrial Trust has a relatively high efficiency score of 0.83712, it also has the highest standard deviation of 0.186497.

This research also examines the correlation of Return on Assets and Debt Ratio with efficiency score. The correlation of ROA and debt ratio with efficiency scores is shown in Table 6.

**Table 6. Pearson correlation of ROA and debt ratio with efficiency scores**

	ROA (based on Operating Profit)	Debt Ratio (Total Liabilities/Total Assets)
Pearson Correlation	0.371	-0.155
Significant (two-tailed)	0.000***	0.001**

**Notes:** \*\*, \*\*\*. Correlation is significant at the 0.05 and 0.01 level, respectively (2-tailed).

The result shows that Return on Assets is positively correlated with efficiency while debt ratio is negatively correlated at the 0.01 significant levels. Hence, this question the government’s recent policies to increase leverage from 35% to 45% of total assets because increasing leverage does not translate into increasing efficiency. The Debt Ratio results also confirm study done by Anderson *et al.* (2002)

### 3.3. Efficiency Score Based on Property-Type

The second objective of this research is to examine the differences in efficiency of REITs based on their property-type specialization. The DEA efficiency scores comparison between property-type is shown in Table 7.

**Table 7. DEA efficiency scores comparison between property-type**

	Mean	Standard Deviation	F	Sig.
Retail	0.7184	0.0511		
Commercial	0.6558	0.1577	65.949	0.000***
Others	0.8164	0.1386		

**Notes:**\*\*\*. Mean Difference between groups is significant at the 0.01 level (2-tailed).

The mean differences of efficiency scores between property-type are shown in Table 8.

**Table 8. Mean differences of efficiency scores between property-type**

(I)	(J)	Mean Differences (I – J)	Sig.
Retail	Commercial	0.0626	0.000***
	Others	-0.0980	0.000***
Commercial	Retail	-0.0626	0.000***
	Others	-0.1605	0.000***
Others	Retail	0.0980	0.000***
	Commercial	0.1605	0.000***

**Notes:**\*\*\*. Mean Difference is significant at the 0.01 level (2-tailed).

It shows that the category “others” has the highest efficiency of 0.81636, followed by retail with a score of 0.71840. The category “others” includes REITs from hospitality (1),

industrial (3), and healthcare (1). They are grouped as “others” because the researcher feels it is inappropriate to allow only a few REITs (e.g. for hospitality, only Ascott Residence Trust is in the sector) to represent the whole sector. For example, the efficiency achieved by Ascott Residence Trust may not be due to their property-type, but rather efficiency of the REIT itself.

According to Mueller and Laposa (1996), retail has a higher quarterly return with lower standard deviation than office on average for the period 1990-1995. In this paper, the researcher categorized office as commercial. The result is consistent with Mueller and Laposa (1996) as the result of this study shows that retail has a higher mean (higher efficiency score) and lower standard deviation (lower risk) than commercial.

### 3.4. Efficiency Score based on Geographical Diversification

The third objective of this research is to find out the effect of geographical diversification on REIT’s efficiency. The researcher engaged 2 methods based on Herfindahl index and diversification level, respectively.

The result of Pearson correlation of Herfindahl index with efficiency scores is shown in Table 9.

**Table 9. Pearson correlation of Herfindahl index with efficiency scores**

	Herfindahl Index
Pearson Correlation	0.013
Significant (two-tailed)	0.780

The result of efficiency scores comparison between specialized and diversified REITs is shown in Table 10.

**Table 10. Efficiency scores comparison between specialized versus diversified**

	Mean	Standard Deviation	t	Sig.
Specialized	0.739	0.1443	0.830	0.407
Diversified	0.727	0.1230		

Using the Herfindahl Index method, it can be deduced that there is no correlation between efficiency and geographical diversification. Meanwhile, the research categorizes REITs into specialized if 75% of its portfolio value is concentrated on one country, and diversified for otherwise. The researcher further analyzed using the second method to see if it still holds true and finds that although specialized REITs has a higher efficiency of 0.73901, it does not differ significantly from diversified which has a mean of 0.72737.

In summary, both tests show that there is no impact of geographical diversification on efficiency level. This confirms findings of Topuz *et al.* (2005) as well as Ro and Ziobrowski (2011).

### 3.5. Efficiency Score based on Geographical Concentration

The fourth objective is to find out whether there are differences in efficiency if REITs is more focused on Singapore or overseas in terms of their portfolio.

The efficiency scores comparison between Singapore and versus Overseas is shown in Table 11.



**Table 11. Efficiency Scores Comparison between Singapore versus Overseas**

	Mean	Standard Deviation	t	Sig.
Overseas	0.824	0.0940	11.047	0.000***
Singapore	0.700	0.1374		

**Notes:** \*\*\*. Mean Difference is significant at the 0.01 level (2-tailed).

It shows that the efficiency level of REITs who focused their portfolio more in overseas have a higher efficiency level of 0.824 compared to their counterparts on average. Furthermore, they are also more consistent in their efficiency level and hence, less risky as shown by the lower standard deviation. The results are shown to be statistically significant.

This result reflects the situation of the Singapore's economy that has slower growth compared to other countries such as China and Indonesia in recent years. The economy's growth definitely has an impact on the growth of REIT. In addition, rising cost of land and property prices in Singapore has slowed down the number of acquisitions as it has become more expensive and riskier to do so, and since one of the DEA output measure in this research is based on total assets, this situation might explain the lower DEA efficiency scores.

### 3.6. Efficiency Score based on Size

The fifth objective is to find out whether REIT's size (measured in terms of total assets) has an impact on efficiency. Assets are split into three quartiles to categorize REIT into small, medium, or large.

The comparison of efficiency scores by sizes of REITs is shown in Table 12.

**Table 12. Efficiency scores comparison between different sizes of REITs**

	Mean	Standard Deviation	F	Sig.
Small	0.7912	0.1376	21.062	0.000***
Medium	0.6989	0.1055		
Large	0.7164	0.1505		

**Notes:** \*\*\*. Mean Difference between groups is significant at the 0.01 level (2-tailed).

It shows that the smaller REITs display higher efficiency on average with a score of 0.7912. This is followed by large-size REITs with an efficiency score of 0.7164 and medium-size REITs with an efficiency score of 0.6989. Regarding standard deviation, medium-size REITs has the lowest standard deviation, followed by small-size REIT. However, the average standard deviations of different sizes of REITs are not very distinct from each other.

The testing result for statistically significant differences on the mean of these categories is shown in Table 13.

**Table 13. Mean differences of efficiency score between different sizes of REITs**

(I)	(J)	Mean Differences (I - J)	Sig.
Small	Medium	0.0923	0.000***
	Large	0.0748	0.000***
Medium	Small	-0.0923	0.000***
	Large	-0.0175	0.511
Large	Small	-0.0748	0.000***
	Medium	0.0175	0.511

**Notes:**\*\*\*. Mean Difference is significant at the 0.01 level (2-tailed).

The result shows that the mean differences between small-size REITs and other REITs are statistically significant while the differences between medium-size and large-size REIT are not. Hence, from this result, it can be deduce that small-size REIT has the highest efficiency while medium-size and large-size REITs are on an equal footing.

### 3.7. Tobit Regression Analysis

To support and enhance the researcher's analysis further, Tobit regression is conducted. Tobit regression enabled the researcher to combine and assess all independent factors together to see their impact on efficiency level.

The result of Tobit regression model is shown in Table 14.

**Table 14. Tobit regression model result**

Variable	Unstandardized Coefficient		t	Sig.	Collinearity Statistics	
	B	Std. error			Tolerance	VIF
Constant	0.940	0.027	34.644	0.000***		
Property type – Others	0.097	0.012	8.203	0.000***	0.761	1.314
Manager's fee	-0.742	0.099	-7.491	0.000***	0.813	1.229
Geographical Concentration	-0.079	0.012	-6.606	0.000***	0.823	1.215
Debt Ratio	-0.201	0.073	-2.749	0.006**	0.791	1.264
Size – Medium	-0.037	0.011	-3.467	0.001**	0.981	1.020
Operating Expense	-0.114	0.052	-2.202	0.028**	0.699	1.430

**Notes:** \*\*, \*\*\*. Correlation is significant at the 0.05 and 0.01 level, respectively (2-tailed).

DEA efficiency scores are regressed against several factors that the researcher's has proven to affect efficiency level such as the property type-others, manager's fee, geographical concentration – Singapore, debt ratio, size-medium, and operating expense. The result shows the coefficients for these factors are 0.097, -0.742, -0.079, -0.201, -0.037, -0.114 respectively. The variables are all statistically significant. In addition, the VIF in table 14 shows that there is no collinearity problem between these variables.

### 4. Conclusion

This paper presented a DEA analysis that was supported by the Tobit regression analysis to examine the efficiency level of Singapore REITs over the period of 2007 to first quarter of 2015. First of all, the researcher found that First REIT is the most efficient REIT, followed by Capita Commercial Trust. Cambridge Industrial Trust and Ascendas REIT are the most inconsistent in performance over the years as shown by the standard deviation. ROA is also positively correlated to efficiency while the opposite applies to debt ratio. From here, the researcher concludes that REITs are not able to make use of their leverage to improve efficiency level, hence, it is recommended for REITs to minimize their debt as much as possible.

Secondly, regarding property-type, retail performed better than commercial on average. However, the most efficient group is "others" which consists of 1 hospitality/residential REITs, 1 healthcare REITs, and 3 industrial REITs. Apart from Mapletree Logistics Trust, other REITs in the "others" category performs better than the average REITs of other categories.

Thirdly, geographical diversification does not seem to affect REIT's efficiency. Fourthly, REITs that have more properties overseas performed better than their counterparts on average. Lastly, in regards to size, small size REITs significantly performs better in efficiency than those in other categories. Medium size and large size REITs does not have any significant differences on average in efficiency.

Tobit Regression Analysis also supported earlier findings by DEA where apart from ROA, variables such as manager's fee, market concentration – Singapore, debt ratio, size-medium, and operating expense has a negative impact on efficiency.

Future studies may want to look at Interest Expense as well as General and Administrative Expense as inputs because they are cost sources of REITs too. In addition, as there is a lack of sample in the hospitality, healthcare, and industrial sectors, further studies need to include more REITs in these categories to assess whether these sectors have better efficiency level than others. Having more REITs whose portfolio is concentrated in other countries e.g. China, Indonesia, etc will allow investors to compare between countries as well. In this research paper, only REITs that exist continuously between 2007 to 2005 (Q1) are used, hence, expanding the sample number of REITs can be done through shortening data collection years as only in recent years did many S-REITs enter the market. Finally, other approaches (e.g. SFA) can be used instead to assess efficiency of REITs in order to check for robustness of this paper's results.

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