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TECHNICAL, SCALE AND MANAGERIAL EFFICIENCIES IN MALAYSIAN REITS: A NON-PARAMETRIC APPROACH

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Abstract

The paper examined technical, managerial and scale efficiencies scores of Malaysian Real Estate Investment Trust (M-REITs). A non-parametric approach of VRS-DEA examined the input and output variables to determine REIT efficiency. We examined their determinants using GLS regression in the second stage. On average, the M-REIT industry has faced technical inefficiency, that involves scale and managerial inefficiencies. This paper presents new estimates through discussion on return as REIT output. The empirical results indicate Islamic REITs exhibited higher efficiency scores than their counterparts. The results from GLS regression analysis suggest that efficient REITs are smaller in size with higher concentration in property sector and geographical area. Having examined these values, there is still some catching-up for the inefficient REITs in the sample to be more competitive to stay relevant in the global market.

Keywords: Technical, Scale; Efficiency; Malaysian REITs

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INTRODUCTION

Real estate investment trusts (REITs) are unit trust scheme which predominantly invest or propose to invest in income-generating real estate (Securities Commission Malaysia, 2019). The REIT market is now spread to 33 countries, with nearly US\$ 2 trillion market capitalisation (EPRA, 2019). The market capitalisation of Malaysian REITs was approximately US\$7.32 billion, contributing 1.8% to the Asia Pacific REIT market (EPRA, 2019). If confidence in the REIT industry is shaken, both local and global investors may leave the industry as well as the country, increasing the vulnerability of the real estate industry. To maximise profits, REIT investors must consider the operational efficiency of the REIT in which they invest. Furthermore, more efficient REITs can provide average stock gains of up to 3.88 percent greater than REITs that do not practise effective efficiency (Beracha et al., 2019). REITs with an effective strategy are often able to maintain higher-quality operating performance, lower risk, and higher cross-sectional stock returns (Beracha et al., 2018).

From managerial perspective, efficiency improvement could be the focus of REIT managers as inefficiency could likely lead to agency problems and the corporate resources wastage. Therefore, it is important for the managers to provide insights to ensure the dynamic performance to stay competitive in the global market. Building on past research on REIT operating efficiencies and recognising the growth in the industry over the past decade, we examine REIT efficiencies performance over the period of 2007 to 2015 in Malaysia.

LITERATURE REVIEW

Previous literature in the REIT industry focus on capital structure, diversification benefits and corporate strategies (see for example Anderson, Benefield, & Hurst, 2015; Bauer, Eichholtz, & Kok, 2010; Brockman, French, & Tamm, 2014; Newell & Marzuki, 2016). However, limited studies explore the issue related to technical and scale efficiencies (see Table 1) particularly in the Malaysian emerging market. Chuweni and Eves (2017) reviewed measurement for REIT efficiency, particularly for Malaysian Islamic REITs. Table 1 summarises the matrix for input and output variables in REIT efficiency.

Table 1: Matrix input and output variables

Source: Authors' compilation

Author(s)/ Year of publication	Chuweni et al., (2019)	Chuweni & Eves, (2019)	Yilmaz et al., (2019)	Chuweni et al., (2018)	Jreisat, (2018)	Isik & Topuz, (2017)	Ahmed & Mohamad, (2017)	, Topuz & Isik, (2009)	Anderson et al., (2002)	Frequency
Subject	Malaysian REITs	Malaysian REITs	Turkish REITs	Malaysian REITs	Australian REITs	US REITs	Singapore REITs	US REITs	US REITs	
Measures	TFPCH THPCH TECCH EFFCH PTECH SECH	TE PTE SE	TE, PTE SE	TFPCH THPCH TECCH EFFCH PTECH SECH	TFPCH THPCH TECCH EFFCH PTECH SECH	CE AE TE PTE SE	TFPCH THPCH TECCH EFFCH PTECH SECH	TFPCH THPCH TECCH EFFCH PTECH SECH	TE PTE SE	
Output (y)										
Total assets/ property assets	√	√		√	√	√	√	√	√	8
Loan properties						√		√		2
Other asset						√		√		2
Net Asset Value			√				√			2
Net profit			√							1
Market Cap			√							1
Total revenue							√			1
Enterprise value					√					1
Input (x)										
Interest expense/ cost of borrowing	√	√		√	√	√	√	√	√	8
Property operating expense	√	√		√	√	√	√	√	√	8
Admin expense	√	√	√	√	√				√	6
Mgmt. expense	√	√		√	√		√		√	6
Total loan			√							1
Equity			√							1
Total inventory			√							1

METHODOLOGY

Following previous work on REIT efficiency and productivity (see Table 1), the following input vector variables are used, namely interest expense, property operating expense, and administrative and management expense. However, as highlighted in Table 1, we propose return of investment as the management focus, measured by distribution and revenue as the output vector variables. Factors of sustainable returns could be used as better measure for possible focal area in achieving better market performance, rather than the conventional method of measuring using capital appreciation or asset value.

We utilised the data envelopment analysis (DEA) to examine technical, managerial and scale efficiencies of Malaysian REITs from 2007 to 2015. DEA allows the investigation of changes in efficiency results and measure whether the reasons for such changes could either be in the form of improvement in scales (scale efficiency) or in managerial practice (pure technical efficiency). The linear programming allows the measurement of each REIT relative to the frontier. We use the Variable Return to Scale-DEA input-oriented model which decomposes technical efficiency (TE) into pure technical efficiency (PTE) and scale efficiency (SE). The VRS-DEA model proposed by Banker, Charnes, & Cooper, (1984) relaxes the CRS assumption by Charnes, Cooper, & Rhodes (1978):

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

Subject to

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

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

$$\sum_j^n \lambda_j = 1;$$

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

Whereby λ_j are non-negative scalars such that $\sum_j^n \lambda_j = 1$, x_{i0} is the i th input, y_{r0} is the r th output, S_i^- and S_r^- represent input and output slacks, respectively. We investigate the sources of their degree of efficiency by focusing on the relation between efficiency estimates and key characteristics of REITs, suggesting useful information for managerial decisions. Following Isik and Hassan (2003) and Topuz et al., (2005), generalised least square (GLS) regression was employed in the second stage analysis. The estimated efficiency is regressed with a set of factors of

variables (key characteristics of REITs). GLS method could address the statistical issues, such as heteroscedasticity.

Table 2: Definitions of the variables

Variables	Definition of the variables
<i>Dependant variables:</i>	
TE	Technical efficiency
PTE	Pure technical efficiency
SE	Scale efficiency
<i>Independent variables:</i>	
Leverage	Total loan divided by total asset
Board size	The number of board directors
Board diversity	Dummy, equals one if more than one female directors in the board, 0 otherwise.
Capital risk	Total equity divided by total asset
Property and geographic index	Following (Anderson et al., 2002; Topuz et al., 2005), we calculate the Herfindahl-Hirschman Index to measure the property-type and geographic concentration effect on REIT efficiency, assuming N property types and M regions: $D_i^{prop} = \sum_{i=1}^N P_i^2, i= 1, \dots, N;$ $D_i^{geo} = \sum_{j=1}^M R_j^2, j= 1, \dots, M;$ Where P_i is the asset proportion invested in property i , R_j is the asset proportion in region j . The higher the index value indicate low diversification or high concentration (Anderson et al., 2002; Topuz et al., 2005).
REIT Size	Total asset value
Islamic REIT	Dummy, equals one if for Islamic REITs, 0 otherwise.

RESULTS AND DISCUSSION

Efficiency estimates of REIT industry

Figure 1 illustrates the mean scores of REIT efficiency between 2007 and 2015. There is a trend of the annual means for each type of REIT over time, from as low as 0.7071 in 2008 to the highest score of 0.9090 in 2007. As the result suggests, there is a downward (upward) trend in the technical efficiency (inefficiency) in REIT industry in the 2007-2009 and 2010 – 2015 periods, which is reflective of the impact of global financial crisis. Similar to our result, Islamic REITs exhibit persistent superior performance than conventional REIT for overall technical efficiency (Chuwani et al., 2017). We can see that the effect of global financial crisis is less evident for Islamic REIT, suggesting interesting question on how Islamic REITs behave better than their conventional counterpart.

The average means for TE, PTE, and SE of the REIT industry are 0.7982, 0.8811 and 0.9068 respectively: these scores imply that managerial inefficiency is the key component of inefficiency in REIT industry which is determined by resource management rather than operational management. The 79.82% indicates input waste of 20.18%, implying that REIT could reduce their input usage significantly if they operate on the efficient frontier.

The preceding discussion indicates the significant return to scale of Malaysian REIT for 2007 to 2015. The three possibilities include (1) constant return to scale or scale efficient, (2) increasing return to scale (economies of scale) and (3) decreasing return to scale (diseconomies of scale). The result in Figure 2 indicates that REIT experienced decreasing return to scale, with an average of 41.73% followed by 40.29% of constant return to scale. On the other hand, the percentage of REITs with increasing return to scale varies over the period: the percentages fell from 36.36% to 9.09% in 2009, rose to 15.38% and 40% in 2010-2011 and then fell again to 6.25% in 2012. One possible reason is that the vast majority of REITs were scale inefficient with either REITs experiencing diseconomies or economies of scale. Our results accord well with the findings from the US REITs (Topuz et al., 2005) since majority of them experienced decreasing return to scale (Topuz et al., 2005).

Determinants of REIT efficiency

Table 3 reports the results based on GLS regression to enhance the statistical efficiency of our estimate and heteroscedasticity was also taken into consideration. Our results show a positive relation and significant at 1 percent level for TE and PTE scores, suggesting that Malaysian Islamic REITs exhibit higher efficiency than their counterpart. This indicates that, despite their additional Sharia requirements and limitation in the investment universe, Islamic REITs provide consistent better performance (Chuweni et al., 2017) particularly in efficient resource allocation and scale of operation.

The proxy of leverage, loans/Total Asset, show negative relationship (statistically significant at 10 percent level) with technical efficiency, implying that the more efficient REIT, *ceteris paribus*, they use less leverage compared to their counterpart. Excessive debt could limit the management to take up rewarding prospects which could contribute to inefficiency in management (Topuz et al., 2005).

Our empirical evidence indicates that board size and board diversity are not statistically significant for technical efficiency. However, board size is significant at 10 percent level for PTE while board diversity is significant at 5 percent level for SE. This shows that higher number of board directors contribute to higher efficiency in managerial decisions. In the matter of board diversity and efficiency, having female directors in the composition of board could lead to greater efficiency. High index value indicates low diversification or higher concentration for property sector and geographical area. Our results for both indexes show positive relationship, and

they are statistically significant at 1 percent level for technical efficiency, implying that higher concentration in sector and location could enhance REIT efficiency.

The literature suggest that REIT size and efficiency are correlated. Our findings in Table 3 fail to attain this. Similar to the findings of Topuz et al., (2005), REIT size seems to display significantly negative relationship with REIT efficiency, implying smaller size REITs are more efficient. This finding corroborates earlier findings of return to scale when majority REITs are operating at diseconomies of scale.

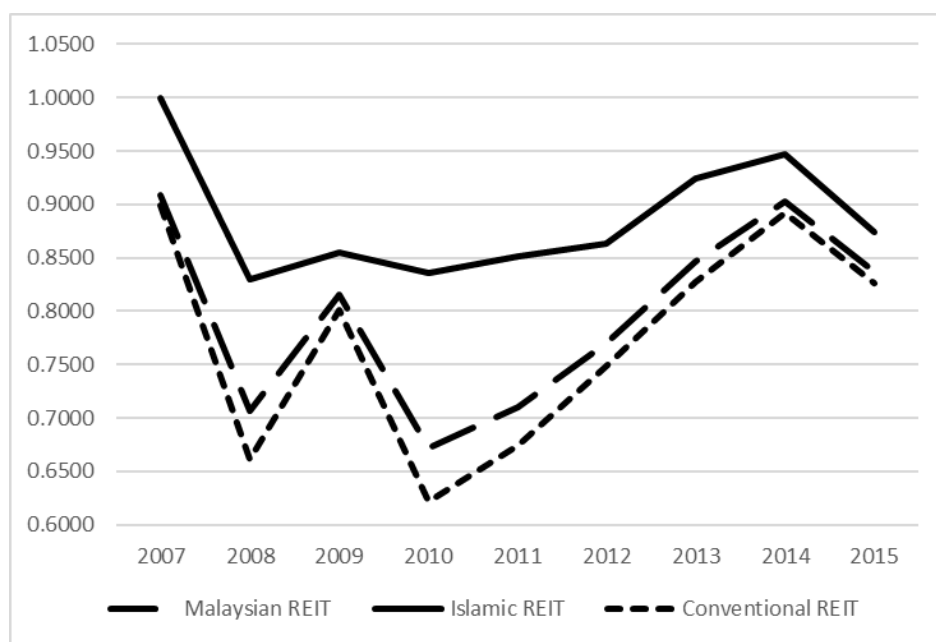


Figure 1: Technical efficiency scores

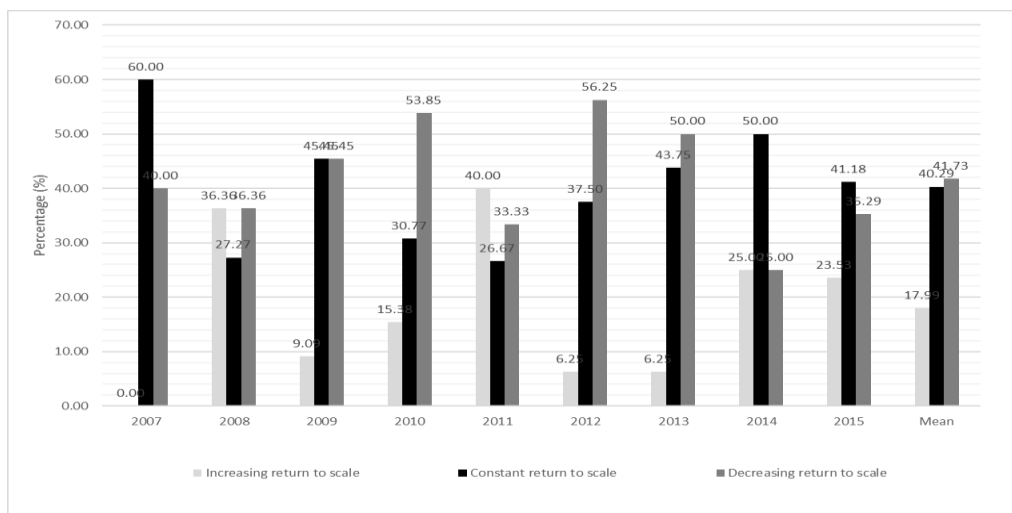


Figure 2: Return to scale in Malaysian REITs

Table 3: Multivariate GLS regression Analysis of REIT efficiency

Variable	Technical efficiency	Pure Technical Efficiency	Scale Efficiency
Constant	0.4452 (0.2864)	0.6319*** (0.1721)	0.9301*** (0.1949)
<i>Determinant Variables</i>			
Loan/Total Asset	-0.4868* (0.2894)	-0.2532 (0.1698)	-0.1161 (0.1876)
Board size	0.0055 (0.0095)	0.0104* (0.0062)	-0.0053 (0.0061)
Board diversity	0.0496 (0.0322)	0.0149 (0.0240)	0.0470** (0.0204)
Capital risk	-0.0610 (0.2633)	0.0643 (0.1408)	-0.0664 (0.1781)
Property index	0.3130*** (0.0654)	0.0630 (0.0487)	0.0907** (0.0452)
Geographic index	0.2568***	0.2086***	0.0306

	(0.0698)	(0.0545)	(0.0635)
Size	-0.0000***	-0.0000***	-9.09e-06
	(6.22e-06)	(5.61e-06)	(6.43e-06)
Islamic REIT	0.2601***	0.1868***	0.0542
	(0.0402)	(0.0283)	(0.0385)

Notes: The multivariate GLS regression coefficient with standard errors in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

CONCLUSION

We examined performance for Malaysian REITs in terms of technical, managerial and scale efficiencies using non-parametric approach of DEA in the first stage and GLS regression in the second stage. Our DEA results indicate that on average, Malaysian REIT suffer inefficiency, which comprises of scale and managerial inefficiencies. The average TE, PTE and SE scores of Malaysian REIT industry are 0.7982, 0.8811 and 0.9068 respectively, over the period of 2007 to 2015. The majority of Malaysian REITs suffered from diseconomies of scale and could have improved their performance by downsizing their portfolio or asset. We found a positive relationship between Shariah compliance and technical efficiency, implying that efficient REITs are Islamic REITs compared to their peers. Furthermore, our results also show that technically more efficient REITs are those that are smaller in size with higher concentration in property sector and geographical area.

Further analysis on productivity, technical change, or technological progress/regression by employing the Malmquist Total Factor Productivity Index. Moreover, the scope of this study could be expanded to other changes in allocative or cost efficiency over time to achieve more robust results. Despite these limitations, our study is expected to contribute significantly to the existing knowledge of the operating performance of the REIT industry in the emerging market of Malaysia. The study has also provided empirical evidence in improving managerial decision for investors and portfolio managers particularly in achieving and maintaining optimal utilization of resources capacities, optimise resource allocation as well as operation scale in the REIT industry. In addition, this study could also facilitate future directions for long-term competitiveness of Islamic REIT operations.

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