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EFFICIENCY ANALYSIS OF HOTELS LISTED IN THE INDONESIAN STOCK EXCHANGE MARKET

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Abstract

This paper aims to assess managerial efficiency of the hotels listed in the Indonesian Stock Exchange (IDX) market by applying a Data Envelopment Analysis (DEA) approach. An input oriented DEA assuming both CRS and VRS was employed utilizing data recorded in the companies' annual reports of year 2017 which encompassed that of revenue, costs and manpower. Research results alluded to identification of both efficient and inefficient hotels, as well as classification for inefficient units, and recognition of peer and peer groups each inefficient hotel can refer to as to project for improvements. Moreover, DEA results provided numerical figures for input reduction each inefficient unit may endeavor. DEA efficiency scores under CRS were proven to be robust, while those under VRS pointed to low discriminatory power. Overall, the application of DEA proved to be a simple yet highly applicable tool for hotel managers to assess performances in regards to managerial efficiency.

***Keywords**: Hotel Efficiency, DEA, Indonesian Stock Exchange*

INTRODUCTION

The tourism industry holds a significant role in the Indonesian economy, in which it contributes as the third largest source of national foreign income just behind the oil and gas and crude palm oil industries. Accordingly, the national government has placed tourism to be the leading sector within the national strategic development plan (Kementrian Pariwisata Indonesia, 2019). Within the tourism industry itself, accommodation is regarded as the main element of superstructure tourism facilities (Lowry, 2016), and one which is heavily dominated by the hotel business.

The hotel sector as an instrumental construct for providing accommodation services to tourists has been realizing compelling growth within the national scale. The Central Body of Statistics of Indonesia (2019) reported that between years 2016 to 2018, the number of hotels in Indonesia has increased by 49.93% with an increase in supply of rooms of 35.10%. Moreover, the number of international tourist visits marked an increase of 67.65% in the last 5 years. This suggests that hotels in Indonesia are subject to a highly competitive environment due to the rapid growth of hotel businesses as a result of high market demand. Coupled with a continuously changing macro climate, it is imperative for hotels to review and strengthen their marketing and operational strategies, and enhance the quality of services. In order to realize this, one must start by assessing performances of their business relative with the competitors within their industry in order to gain insights regarding to strengths and weaknesses which in turn will provide means for improvements.

The Data Envelopment Analysis (DEA) is a popular benchmarking tool developed by Charnes, Cooper, and Rhodes (1978), which has widely been used to assess managerial performances in terms of efficiency. DEA is able to minimize the complexity of analysis by virtue of its capacity to incorporate multiple inputs and outputs to produce a single composite index to mark the efficiency levels from a wide number of performers. Efficiency describes the alternatives with a set of attributes (inputs and outputs) that collectively dominate the others based on simultaneous analysis of all alternatives and their attributes. An alternative is deemed DEA-efficient if its costs (inputs) are offset by its benefits (outputs). Due to its universality, DEA has been found suitable to be applied in the hotel sector (Sigala, 2004).

This paper aims to measure relative efficiencies of hotels listed in the Indonesian Stock Exchange (IDX) market as a means to assess managerial performances. The analysis serves as a basis for determining their efficiency levels relative to their competitors,

and further to identify the best performers which can be set as a reference for planning for future improvements. Moreover, the analysis serves as an empirical study upon the applicability of DEA to measure efficiency within the hotel sector in Indonesia, which to the best of the researcher's knowledge, is the first of its kind to be conducted upon hotels in the IDX market.

LITERATURE REVIEW

1. Performance Measurement

Performance measurement is an integral part to management control (Hwang & Chang, 2003). Aside from serving as a reference for decision-making, it further provides as the basis for future improvements. Moreover, it is viewed as a system that supports a performance management philosophy (Lebas, 1995). Therefore, performance measurement is considered imperative for striving for business success. Neely et al. (1995) defined performance measurement as the process of quantifying efficiency and effectiveness of actions. That is, by quantifying, one expects to translate the complex realm of performances into a set of numbers or symbols to signify meaning and communicate. If a performance assessment manages to point out weaknesses, one may re-examine its current practices in order to plan for improvements (Lapide, 2000). Accordingly, performance measurement will allow people and resources to prioritize on particular areas of the business deemed necessary for reevaluation (Waggoner et al., 1999; Neely et al., 1996), instead of undertaking unnecessary efforts towards departments that do not actually require improvements. Selecting appropriate measurement means is deemed critical. Researchers have pointed to the importance for performance measurement systems to embed characteristics of clarity and simplicity (Garengo et al., 2005). Moreover, Beamon in Beamon (1999) presents inclusiveness, universality, measurability, and consistency as criteria of effective performance measurements.

2. Data Envelopment Analysis (DEA)

DEA is an analytical approach for performance measurement that embeds all characteristics as mentioned above. It is a nonparametric method empirically used to measure productive efficiency of decision making units (DMUs). DEA was proposed by Charnes et al. (1978) introducing the constant returns to scale (CRS) model, and subsequently extended by Banker et al. (1984) to introduce the variable returns to scale (VRS) model. DEA produces a single efficiency score (index) (Cooper et al., 2006) which is simple yet in a sense more meaningful as the single judgement is seen as more straightforward and clarifying compared to multiple indexes that possibly may lead managers to lean and favor on certain metrics therefore undermining the others. The DEA efficiency score distinguishes between efficient and inefficient DMUs by establishing whether a DMU is located on the efficient frontier or inside the production possibility set. Moreover, the efficiency score indicates how far a DMU is from the efficient frontier (Morita and Avkiran, 2009). The quantitative nature of DEA justifies for measurability and consistency, which lacks in qualitative approaches. Moreover, the advantage of DEA which can incorporate multiple inputs and outputs without requiring an explicit functional form relating the inputs and outputs (Berg, 2010), renders the technique to be applicable and favorable as a performance measurement approach across industries, which applies as well to the hotel sector.

3. Variable Identification (Inputs and Outputs)

Organizational activities encompass the conversion of inputs to produce output. Outputs are viewed as a concrete measurement that indicates that an organization has reached its targets. The evaluation criteria of input-output factors can be determined once the targets have been established. Studies related to hotel efficiency have provided a variety of variables that can be used as the input-output combination for DEA. Ball et al. (1986) identified that measurement units in DEA can be that of financial, non-financial, or a combination of the previous two. The study conducted by Johns et al. (1997) employed number of room nights available, total labor hours, total food costs, total beverage costs and total utilities costs as inputs, and number of room nights sold, total covers served and total beverage revenue as outputs. Anderson et al. (2000) used five inputs as number of rooms, full-time workers, total gaming-related expenditure, total food and beverage expenditure, and other expenditures, and two outputs as total revenue and other revenue. Moreover, Hwang and Chang (2003) in their DEA study employed number of full-time employees, guest rooms, total area of meal department and operating expenses as the inputs, and room revenue, food and beverage revenue, and other revenue as outputs.

Outputs are largely dominated by revenue, whilst inputs generally encompass manpower, costs and capital investments. Hotel businesses in Indonesia mostly generate

revenue from two primary sources, which are room revenue and food and beverage revenue. Therefore, this research uses the two criteria as the output factors in DEA. Inputs used in this research include number of employees to represent manpower, and room costs and food and beverage costs to represent costs.

RESEARCH METHOD

1. Selection of Research Methodology

This research undertakes that of a quantitative pathway. Hotel managerial performance in terms of DEA efficiency takes an external perspective. Accordingly, data will lean towards numerical figures that serve as the inputs and outputs for DEA. A deductive approach aided by the use of graphs and tables will be employed to reason upon results obtained from the DEA test to break down the essential findings.

2. Description of Research Approach

a. Number of Cases

The number of cases for the DEA test is in this study is 10, which comprise all hotel emitters enlisted in the Indonesian Stock Exchange market that fulfil the criteria of data availability. The number of cases in this study complies with the empirical rule set by Anderson et al. (2000) and Golany & Roll (1989), which suggest that the minimum number of observations to be at least twice the number of DEA variables.

b. Data Collection Method

Data collection aims to extract the numerical figures for running the DEA test, all of which is that of secondary data captured in the yearly reports published by the 10 hotel companies listed in the Indonesian Stock Exchange year 2017. Figure 1 depicts the classification of metrics for the DEA test.

c. Measurement Technique and Associated Analysis

In aim to measure relative performances of hotels listed in the IDX market, this study employs the Data Envelopment Analysis (DEA) technique aided through the DEAP version 2.1. software. DEA efficiency ratings are denominated between 0 and 1, where efficient DMUs will be identified with an efficiency score of 1, and inefficient DMUs will be identified by scores less than 1. The DEA test angles towards an input-oriented evaluation, which emphasizes on the ability of a hotel, or in the DEA reference, a decision-making unit (DMU), to reduce its inputs for a fixed amount of outputs (Coelli, 1996). Moreover, constant returns to scale (CRS) and variable returns to scale (VRS) assumptions are deployed in the test. The exercise of both models aims to further identify whether any scale inefficiencies occur among the sample set (Coelli, 1996).

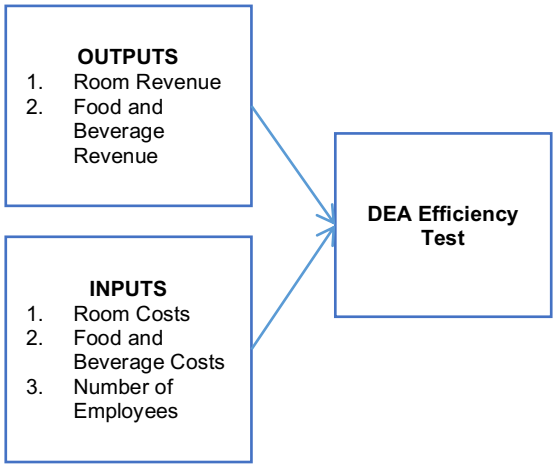

Figure 1. Classification of Metrics for DEA

RESULT AND DISCUSSION

1. Technical Efficiency

Table 1 exhibits the DEA test result for all 10 hotels. Column 2 presents the constant returns to scale technical efficiency (CRSTE), where 6 DMUs are rendered to be efficient as they produce efficiency scores of 1. These 6 hotels are HOTL, ICON, INPP, MABA, PSKT, and SHID, which are the pool of best performers under the CRS assumption thus making up the efficient frontier. This further implies that no other hotels of the 10 can manage to reduce their inputs for given amount of outputs better than those 6. Bordering the efficient frontier is PNSE which obtained the highest CRSTE among the inefficient hotels. With its efficiency rating of 0.924, PNSE has the better chance to gain full efficiency. As classified by Norman & Stoker (1999), DMUs of TEs between 0.9 and 1 are categorized as those of marginally inefficient. Moreover, Norman & Stoker further classifies those with TEs below 0.9 to be that of distinctly inefficient. This is the case for BUVA, GMCW and HOME, indicating that they would have difficulty in attaining efficiency status in the short term. The least efficient unit is attributed to HOME with an efficiency rating of 0.727. The variable returns to scale technical efficiency (VRSTE) are displayed in column 3. As observed, 8 hotels

are pointed out to be efficient. These hotels are GMCW, HOTL, ICON, INPP, MABA, PSKT, and SHID, leaving BUVA and HOME as the only two inefficient performers, with HOME rendered as the sole distinctly inefficient hotel with its TE as 0.886.

Table 1. DEA Test Results

DMU	CRS TE	VRS TE	SE	IRS/ DRS
BUVA	0.774	0.904	0.856	DRS
GMCW	0.861	1	0.861	IRS
HOME	0.727	0.821	0.886	IRS
HOTL	1	1	1	-
ICON	1	1	1	-
INPP	1	1	1	-
MABA	1	1	1	-
PNSE	0.924	1	0.924	DRS
PSKT	1	1	1	-
SHID	1	1	1	-

Running DEA under CRS and VRS alludes to the identification of scale efficiency (SE). It is the ratio of CRSTE over VRSTE. An SE of 1 indicates that a hotel is efficient under both assumptions, thus has no scale inefficiency. As evident in column 4, 4 hotels were subject to having SEs, with the lowest to be attributed to BUVA. In accordance with SEs, column 5 presents the situation of increasing returns to scale (IRS) or decreasing returns to scale (DRS). GMCW and HOME features IRS, which means that proportionate increase in all of its inputs results in a greater than proportionate increase in its outputs. This suggests that can GMCW and HOME firstly increase or expand in scale and actually allow for input increases to enhance performance. On the other hand, DRS is exhibited by BUVA and PNSE, indicating that proportionate increases in all of their inputs results in a lesser than proportionate increase in their outputs, which may suggest for the hotels to scale down, as this will likely enhance their efficiencies.

In light of the TE scores, it can be reasoned that DEA provides a means for a comprehensive performance measurement. If the hotels were to be judged based on revenue, which is perhaps the most traditional indicator for performance measurement, those with the highest revenues would come out as the best performers. However, PNSE which had the highest food and beverage revenue and the 3rd highest room revenue was rendered inefficient under CRS. Moreover, BUVA which had the 2nd highest room revenue and the third highest food and beverage revenue was considered inefficient under both assumptions. On the other hand, lower inputs do not necessarily ensure one to be efficient. GMCW which had the lowest room and food and beverage expenses was deemed inefficient under both assumptions.

In general, VRSTE yield higher scores than CRSTE. These differences are associated with the nature of the underlying returns to scale assumptions. Under the constant returns, all DMUs are assumed to be operating at optimal scales, whereas when assuming variable returns, the DMUs are not operating at optimal scales. Under VRS, either an IRS or DRS situation may apply, and the analysis envelopes its data points more tightly than that of CRS, therefore will typically produce TE scores greater than or equal than those of constant returns.

2. Peers and Projection for Input Reduction

In addition to TE, DEA report efficiency references referred to as peers, which include efficient DMUs in which each inefficient DMU is most directly inefficient against. If a DMU's efficiency score is 1, its peer is therefore its own unit. DEA constructs a hypothetical envelopment frontier, also known as the efficient frontier which is made up by all of the efficient units. All inefficient hotels lie analogous towards the efficient frontier, providing perspective on how close or far each inefficient hotel is relative to the frontier. Peers are selected based on the efficient DMU's ability to independently or collectively provide the closest hypothetical efficiency reference to the inefficient DMUs.

As presented in Table 2, similar grouping of peers are found for GMCW and HOME under CRS, where both hotels are referred to HOTL, MABA and PSKT. The linear combination of these three units (HOTL, MABA, and PSKT) determines the inefficiencies of GMCW and HOME, and provisions the percentage of each input reduction that can be aimed in order to be efficient without affecting their output levels. The highest input reduction assuming CRS is pointed to HOME with the possibility of 27.20%, while the lowest is found for PNSE as of 7.50%. Further, results also point to HOTL being referred to a total of 4 times and by all inefficient hotels under CRS. Assuming the categorization by Norman & Stoker (1991), HOTL is categorized as that of a robustly efficient unit as it manages to be referred to the most and more than twice. A robustly efficient hotel will likely to still remain efficient unless there were major disruptions to occur Under the VRS assumption, peers are distributed evenly where each efficient hotel gets referred to as only

once. Similar to that of CRS, the highest input reduction is attributed to HOME with a possibility of 17.80%.

Table 2. Peers and Input Reduction Projection

DMU	CRS		VRS	
	Peer	Input Reduction	Peer	Input Reduction
BUVA	HOTL, INPP, SHID	22.50%	ICON, PNSE, PSKT, SHID	9.50%
GMCW	HOTL, MABA, PSKT	13.90%		
HOME	HOTL, MABA, PSKT	27.20%	GMCW, MABA	17.80%
PNSE	HOTL, ICON, SHID	7.50%		

The information on peers can be sought to be beneficial for the inefficient hotels to reference on a subgroup of efficient performers rather than the entire set in terms of seeking for improvements. This may avoid the inefficient group to undertake unnecessary directions by trying to emulate best practices in redundancy or trying to achieve unrealistic targets.

CONCLUSION

This research provided an efficiency analysis of hotels listed in the IDX market in year 2017. DEA is concluded to be a highly applicable performance measurement tool for the hotel sector as it provides a direct assessment of efficiency with the ability to incorporate multiple metrics, encompassing both financial and non-financial measures. The DEA efficiency scores were robust under the CRS assumption, meaning that they discriminate between efficient and inefficient hotels, where robustly efficient, marginally inefficient, and distinctly inefficient units were identified. However, lower discriminatory power is identified under the VRS assumption, suggesting that the rule of thumb recommended by Anderson et al. (2000) and Golany & Roll (1998) regarding the minimum number of DMUs respective to the number of inputs and outputs may work well only under CRS. This further advocates that a larger set of sample may be suitable for VRS DEA. In addition to efficiency scores, DEA is able to point out to efficiency references and possible areas for improvement in which hotel managers may use to craft appropriate strategies for increasing productivity.

This study was limited to the number of DMUs and the number and variety of variables it could include in DEA as data were obtained through annual reports, limiting the inclusion of non-financial metrics. Only 10 out of the total 12 hotel emitters in IDX published complete data required, and additional variables were hindered due to the limited number of DMUs, as low discriminatory power would be apparent if variables were to be added not in proportion to the number of DMUs (Thomas, 1994). Further studies can aim to investigate the correlation and effect hotel efficiency has with and towards stock prices, which could enrich literature related to efficiency and the stock market.

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