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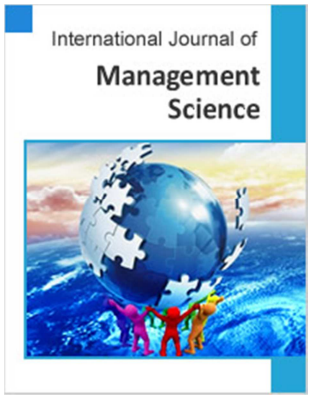

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Performance Evaluation on Financial Companies in Malaysia with Data Envelopment Analysis Model

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Abstract

The investors are facing the difficulties and challenges in making the investment decisions nowadays. The unreliable information and resources which is related to the investment will definitely influence the investors to diminish their confidence in making the investment decisions. Therefore, the investors are willing to find out some tools or alternatives in order to analyze the performance of the companies before they make the decisions. In this study, Data Envelopment Analysis (DEA) model is used to determine the financial performance of the financial companies. The objective of this study is to evaluate, compare and rank the financial performance of the financial companies in Malaysia with DEA model. The overall financial performance of the companies is determined by thefinancial factors. In this study, the data consists of the companies from the financial sector in Malaysia for the study period from year 2012 to 2016. The resultsof this study show that ALLIANZ, AMBANK, APEX, BURSA, LPI, MAYBANK, OSK, P&O and PBBANKare ranked as efficient financial companies within the study period. This indicates that these efficient companies are able to control their resources by converting them into the outcomes or outputs optimally. This study is significant because it helps to evaluate, compare and rank the overall financial performance of the financial companies in Malaysia by considering the important and significant financial factorswith the aid of DEA model.

1. Introduction

In this new era of millennium, the success of the financial companies is mostly depending on the financial performance evaluation of the company. According to the Spronk and Hallerbach [1], financial performance evaluation are important and valuable research subject that contributes a lot of useful and beneficial messages to the investors. In fact, the investors can conduct the analysis about the companies' financial performance in term of efficiency. This is because the efficiency measurement is an important aspect of the company's performance [2]. Efficiency evaluation can describe how well or efficientlythe company is performing in transforming the inputs into

outputs. Moreover, current assets, current liabilities, total assets, total liabilities, net income after taxes and revenue are the important financial factors that needed to be considered in this study. The objective of this study is to evaluate, compare and rank the financial performance of the companies from the financial sectorin Malaysia with Data Envelopment Analysis (DEA) model.

Hu et al. [3] have compared the performance efficiency of 14 financial holding companies in Taiwan by using DEA model. The listed companies are Cathay, China Development, Chinatrust, E.SUN, First, Fubon, Hua Nan, Jih Sun, Mega, Shin Kong, SinoPac, Taishin, Waterland, and Yuanta. Based on the results, four companies have achieved fully efficiency in operating performance.

Mousa [4] has evaluated the efficiency of the banking sector in the Bahrain Bourse with DEA model. The efficiency assessment of banking sector in Bahrain Bourse was conducted over the four-year period between 2010 and 2013. Eight banks were selected in this study, namely Ahli United Bank (AUB), AlSalam Bank (SALAM), Bahrain Islamic Bank (BISB), Bank of Bahrain and Kuwait (BBK), Khaleeji Commercial Bank (KHCB), National Bank of Bahrain (NBB), The Bahraini Saudi Bank (BSB), Ithmar Bank (ITHMR). The results revealed that two banks were able to achieve efficiency score of 1 in the four consecutive years. In conclusion, the DEA model suggests that the quantities of outputs should be increased while the quantities of inputs should be decreased in order to improve the operational efficiency of banks.

Based on the past research, DEA model has been applied in different fieldssuch as nursing home [5], fast food restaurant [6], construction [7], manufacturing [8], sport [9], healthcare companies [10-12] and so forth. However, DEA model has not been studied actively in Malaysia. Therefore, this paper aims to fill the research gap by evaluating and comparing the financial performance of the financial companies in MalaysiawithDEA model. The rest of the paper is organized as follows. The next section discusses about the data and methodology of the study. Section 3 presents the empirical results of this study. Section 4 concludes the paper.

2. Data and Methodology

2.1. Data

In this study, the data consists of the listed companies from the financial sector in Malaysia stock market as presented in Table 1. The study period is from year 2012 to 2016.

Table 1. *Listed Companies from the Financial Sector in Malaysia Stock Market.*

CompanyName	Abbreviations	Code
AEON Credit Service (M) Berhad	AEONCR	5139
Affin Holdings Berhad	AFFIN	5185
Alliance Financial Group Berhad	AFG	2488
Allianz Malaysia Berhad	ALLIANZ	1163
AMMB Holdings Berhad	AMBANK	1015
APEX Equity Holdings Berhad	APEX	5088
BIMB Holdings Berhad [S]	BIMB	5258
Bursa Malaysia Berhad	BURSA	1818
CIMB Group Holdings Berhad	CIMB	1023
Hong Leong Bank Berhad	HLBANK	5819
Hong Leong Financial Group Berhad	HLFG	1082
InsasBerhad	INSAS	3379
Kenanga Investment Bank Berhad	KENANGA	6483
LPI Capital Bhd	LPI	8621
MAA Group Berhad	MAA	1198
Manulife Holdings Berhad	MANULFE	1058
Malayan Banking Berhad	MAYBANK	1155
Malaysia Building Society Berhad	MBSB	1171
MNRB Holdings Berhad	MNRB	6459
OSK Holdings Berhad	OSK	5053
Pacific & Orient Berhad	P&O	6009
Public Bank Berhad	PBBANK	1295
RCE Capital Berhad	RCECAP	9296
RHB BankBerhad	RHBBANK	1066
TA Enterprise Berhad	TA	4898
Syarikat Takaful Malaysia Berhad [S]	TAKAFUL	6139

Source: [13]

Based on past studies [14-18], the important financial factors are investigated in this study. Current assets, current liabilities, total assets, total liabilities, net income after taxes and revenue are the inputs and outputs that employed in this study. Current assets, current liabilities, total assets and total liabilitiesarethe input variables whereas net income after taxes and revenue are the output variables in this study [3, 4]. The data are extracted from their respective companies' financial annual report on Bursa Malaysia from year 2012 to 2016 [13].

2.2. Data Envelopment Analysis

DEA is a mathematical linear programming model which was developed by Charnes et al. [19] and further improved by Banker et al. [20]. The DEA model aims to evaluate and compare the relative efficiency of a set of companies by considering the important inputs and outputs [21]. DEA model seeks to optimize the company's efficiency as it is calculated as the ratio of sum-weightedoutputs tosum-weighted inputs. In DEA model, each company is assigned an efficiency score between 0 and 1, with higher efficiency score indicating a more efficient company, relatively to other companies. The companies with an efficiency score of 1 will be identified as fully efficient companies, whereas the rest of the company will be categorized as inefficient companies since they achieve an efficiency score that is less than 1 [12, 15]. The DEA model is formulated as follows:

$$\text{Maximize } h_k = \frac{\sum_{r=1}^{s} t_r y_{rk} - \alpha}{\sum_{i=1}^{m} w_i x_{ik}} \quad (1)$$

Subject to

$$\frac{\sum_{r=1}^{s} t_r y_{rj} - \alpha}{\sum_{i=1}^{m} w_i x_{ij}} \leq 1, \; j = 1, 2, 3, ..., n \tag{2}$$

$$t_r \geq 0, \; r = 1, 2, 3, ..., s \tag{3}$$

$$w_i \geq 0, \; i = 1, 2, 3, ..., m \tag{4}$$

where
h_k is the relative efficiency of DMU_k
s is the number of outputs
t_r is the weights to be determined for output r
y_{rj} is the observed magnitude of r-type output for entity j
m is the number of inputs
w_i is the weights to be determined for input i
x_{ij} is the observed magnitude of i-type input for entity j
n is the number of entities
α is the free variable

Equation (1) is an objective function which optimizes the efficiency for k-decision-making unit (DMU). Constraint (2) ensures that the efficiency is $0 < h_k \leq 1$ for each DMU. The weights w_i and t_r show the importance of each input and output in maximizing the efficiency which is determined by the model. Equation (3) and (4) are rearranged and written in the linear form as follows [10, 22].

$$\text{Maximize } h_k = \sum_{r=1}^{s} t_r y_{rk} - \alpha \tag{5}$$

Subject to

$$\sum_{i=1}^{m} w_i x_{ij} - \sum_{r=1}^{s} t_r y_{rj} + \alpha \geq 0, \; j = 1, 2, 3, ..., n \tag{6}$$

$$\sum_{r=1}^{m} w_i x_{ik} = 1 \tag{7}$$

$$t_r \geq 0, \; r = 1, 2, 3, ..., s \tag{8}$$

$$w_i \geq 0, \; i = 1, 2, 3, ..., m \tag{9}$$

In this study, the goal programming model is solved with LINGO software. LINGO is an optimization modelling software for solving linear programming model, non-linear programming model, goal programming model and integer programming model [23-29].

3. Empirical Results

The empirical results for the overall performance efficiencyof the financial companies in Malaysia are presented in Table 2.

Table 2. *Performance Efficiency of the Financial Companies in Malaysia.*

Company	Efficiency score	Rank
AEONCR	0.6170	17
AFFIN	0.3438	22
AFG	0.3352	23
ALLIANZ	1	1
AMBANK	1	1
APEX	1	1
BIMB	0.4327	21
BURSA	1	1
CIMB	0.7376	14
HLBANK	0.7588	13
HLFG	0.8533	11
INSAS	0.8884	10
KENANGA	0.2271	24
LPI	1	1
MAA	0.6860	15
MANULFE	0.1504	26
MAYBANK	1	1
MBSB	0.5281	19
MNRB	0.1701	25
OSK	1	1
P&O	1	1
PBBANK	1	1
RCECAP	0.6691	16
RHBBANK	0.5756	18
TA	0.4832	20
TAKAFUL	0.8252	12

As presented in Table 2, the companies such as ALLIANZ, AMBANK, APEX, BURSA, LPI, MAYBANK, OSK, P&O and PBBANK manage to obtain an efficiency score of 1. Therefore, these companies are ranked as efficient companies and achieve the first ranking in the evaluation. This shows that ALLIANZ, AMBANK, APEX, BURSA, LPI, MAYBANK, OSK, P&O and PBBANK are efficient in optimal control of their resources and convert them into the outputs.

The companies such as INSAS, HLFG and TAKAFUL achieve higher efficiency score, which is above 0.80. The efficiency score that obtained by the INSAS, HLFG, TAKAFUL are 0.8884, 0.8533 and 0.8252 respectively. As a result, INSAS, HLFG and TAKAFUL obtain tenth, eleventh and twelfth ranking respectively. In addition, the ranking of the companies from thirteenth to twenty fourth are as follows: HLBANK (0.7588), CIMB (0.7376), MAA (0.6860), RCECAP (0.6691), AEONCR (0.6170), RHBBANK (0.5756), MBSB (0.5281), TA (0.4832), BIMB (0.4327), AFFIN (0.3438), AFG (0.3352) andfinally KENANGA (0.2271). On the other hand, MNRB and MANULFE obtain an efficiency score of 0.1701 and 0.1504 respectively. Since MNRB and MANULFE achieve the lowest efficiency score among the financial companies, therefore both of them obtain the last two ranking in this study.

DEA model is able to identify the efficient companies as well as provide the benchmark for the inefficient companies in order to enhance their level of efficiency. As a result, the inefficient companies included AEONCR, AFFIN, AFG, BIMB, CIMB, HLBANK, HLFG, INSAS, KENANGA, MAA, MANULFE, MBSB, MNRB, RCECAP, RHBBANK, TA and TAKAFUL should take the efficient companies as a

benchmark for further improvement.

Table 3 presents the optimal control of input and output weights in maximizing the efficiency for each financial company.

Table 3. *Optimal Control of Input and Output Weights (%) in Maximizing the Efficiency.*

Company	Current assets (Input 1)	Current liabilities (Input 2)	Total assets (Input 3)	Total liabilities (Input 4)	Net income after taxes (Output 1)	Revenue (Output 2)	Efficiency
AEONCR	64.30	0.00	35.70	0.00	82.70	17.30	0.6170
AFFIN	0.00	0.00	100.00	0.00	92.73	7.27	0.3438
AFG	0.00	0.00	100.00	0.00	92.73	7.27	0.3352
ALLIANZ	0.00	0.00	0.00	100.00	0.00	100.00	1
AMBANK	0.00	85.83	0.00	14.17	95.15	4.85	1
APEX	100.00	0.00	0.00	0.00	100.00	0.00	1
BIMB	0.00	0.00	100.00	0.00	92.73	7.27	0.4327
BURSA	0.00	0.00	67.13	32.87	95.41	4.59	1
CIMB	0.00	100.00	0.00	0.00	91.03	8.97	0.7376
HLBANK	0.00	100.00	0.00	0.00	100.00	0.00	0.7588
HLFG	0.00	100.00	0.00	0.00	100.00	0.00	0.8533
INSAS	0.00	0.00	0.00	100.00	78.02	21.98	0.8884
KENANGA	0.00	0.00	100.00	0.00	0.00	100.00	0.2271
LPI	0.00	0.00	0.00	100.00	0.00	100.00	1
MAA	0.00	41.12	58.88	0.00	100.00	0.00	0.6860
MANULFE	64.30	0.00	35.70	0.00	82.70	17.30	0.1504
MAYBANK	100.00	0.00	0.00	0.00	0.00	100.00	1
MBSB	0.00	0.00	100.00	0.00	92.73	7.27	0.5281
MNRB	0.00	0.00	100.00	0.00	100.00	0.00	0.1701
OSK	0.00	13.46	86.54	0.00	100.00	0.00	1
P&O	0.00	0.00	40.81	59.19	0.00	100.00	1
PBBANK	0.00	0.00	0.00	100.00	92.01	7.99	1
RCECAP	100.00	0.00	0.00	0.00	96.00	4.00	0.6691
RHBCAP	0.00	100.00	0.00	0.00	95.40	4.60	0.5756
TA	43.55	0.00	0.00	56.45	0.00	100.00	0.4832
TAKAFUL	3.88	96.12	0.00	0.00	0.00	100.00	0.8252
Average	18.31	24.48	35.57	21.64	68.44	31.56	0.6170

As presented in Table 3, the optimal control of input and output weights in maximizing the efficiency for each financial company have been provided by the DEA model. The optimal control of input and output weights is crucial for the companies as it can help to identify which inputs and outputs are important to maximize the efficiency of the companies. Figure 1 shows the overall input and output weights in the maximization of the efficiency.

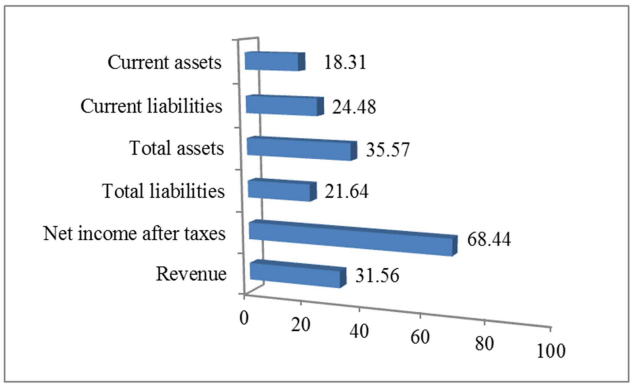

Figure 1. *Overall Input and Output Weights in the Maximization of the Efficiency.*

As presented in Figure 1, the overall input weights in the maximization of efficiency is mostly contributed by total assets (35.57%), followed by current liabilities (24.48%), total liabilities (21.64%) and lastly current assets (18.31%). On the other hand, the overall output weights in the maximization of efficiency is significantly contributed by net income after taxes (68.44%) and finally revenue (31.56%).

4. Conclusion

DEA is a mathematical linear programming model which evaluates the financial performance of the companies. The important inputs and outputs such as current assets, current liabilities, total assets, total liabilities, net income after taxes and revenueare investigated in this study. The results of this study show thatthe companies such as ALLIANZ, AMBANK, APEX, BURSA, LPI, MAYBANK, OSK, P&O, PBBANK are able to achieve an efficiency score of 1. Therefore, these companies are ranked as fully efficient companies since they achieve the first ranking in the evaluation. This study is significant because it helps to evaluate, compare and rank the overall financial performance of the financial companies in Malaysia. Moreover, this is a pioneer study in Malaysia.

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