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Evaluation on the Financial Performance of the Malaysian Banks with TOPSIS Model

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Abstract

Banking sector plays a dominant role in the economies. The financial performance of the banking sector company can be determined by using a multi-criteria decision making model, namely Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) model. The objective of this study is to evaluate, compare and rank the financial performance of the Malaysian banks in Malaysia stock market with TOPSIS model. The overall financial performance of the companies is determined by six financial ratios. In this study, the data consists of eight Malaysian banks which are listed in Malaysia stock market. The period of study is from year 2011 until 2015. The results of this study show that CIMB Group Holdings Berhad achieves the first ranking, followed by Alliance Financial Group Berhad, AMMB Holdings Berhad, Affin Holdings Berhad, RHB Capital Berhad, Public Bank Berhad, Hong Leong Bank Berhad and Malayan Banking Berhad within the study period. This study is significant because it is able to evaluate, compare and rank the overall financial performance of the Malaysian banks by considering the important and significant financial ratios by using TOPSIS mathematical model.

Keywords

Malaysian Banks, TOPSIS, Optimal Solution, Ranking, Financial Ratios

1. Introduction

Nowadays, the key factors to determine the performance of the companies in different sector have been an important research topic [1]. Performance measurement has a great deal of attention by the researchers in the past decades [2, 3]. Banking sector's performance is one of the most popular topics that the researchers strive to find the best key indicators to evaluate the banks' performances in an effective way. Banking sector plays a dominant role in the economies [4]. In general, measurement of performance is traditionally important for strategic decision-makers [1]. The financial performance of the banking sector has been attracting the attention from the public, organization as well as the country. They will observe the financial trend of the banking sector from time to time. Based on the studies conducted [5-16], some of the most significant and important financial ratios are employed in this study. As a result, current ratio, debt to assets ratio, debt to equity ratio, earnings per share (EPS), return on asset and return on equity (ROE) are the important financial ratio that needed to be considered in this study. In the financial service sector, especially when it comes to banking activities, there is an increasing need for measuring performance [17]. Therefore, TOPSIS model is utilized to evaluate the financial performance of the Malaysian banks based on multiple financial ratios.

TOPSIS is a multi-criteria decision making model which was developed by [18] in 1981. TOPSIS model aims to identify an alternative which is farthest to the negative ideal solution and closest to the ideal solution in a multi-dimensional computing space [19]. TOPSIS model has

numerous advantages. It has a simple process. It is easy to use and programmable. The number of steps remains the same regardless of the number of attributes [20]. TOPSIS model has been applied extensively in the various area such as automotive industry [15], lodging companies [10], textile firms [13], pension companies [21], scholarship selection [22], car selection [23] and so forth. Therefore, TOPSIS model is popular nowadays due to its ease of use and ability to evaluate multi-criteria and alternatives simultaneously. Each of the alternatives will be assigned a score of relative closeness to the ideal solution by using TOPSIS model. The alternative with the highest score of relative closeness to the ideal solution will be considered as the best alternative among all the alternatives available.

Based on the past research, TOPSIS model has been applied in different fields and countries to evaluate the financial performance of the companies based on multiple criteria. However, TOPSIS model has not been studied actively in Malaysia banking sector. Therefore, this paper aims to fill the research gap by evaluating the performance of the Malaysian banks by using TOPSIS model. The objective of this paper is to evaluate, compare and rank the overall financial performance of the Malaysian banks with TOPSIS 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 eight Malaysian banks, which are listed in Malaysia stock market from year 2011 until 2015 as presented in Table 1.

Table 1. *Malaysian Banks in Malaysia Stock Market.*

Company Name	Abbreviations	Code
Affin Holdings Berhad	AFFIN	5185
Alliance Financial Group Berhad	AFG	2488
AMMB Holdings Berhad	AMBANK	1015
CIMB Group Holdings Berhad	CIMB	1023
Hong Leong Bank Berhad	HLBANK	5819
Malayan Banking Berhad	MAYBANK	1155
Public Bank Berhad	PBBANK	1295
RHB Capital Berhad	RHBCAP	1066

Source: [24]

There are total of six financial ratios considered in this study, such as current ratio, debt to assets ratio, debt to equity ratio, earnings per share (EPS), return on asset (ROA) and return on equity (ROE). The data are extracted from their respective companies' financial annual report on Bursa Malaysia from year 2011 until 2015 [24].

The current ratio is the measures a company's ability to counter balance current assets with the current liabilities [25]. Debt to assets ratio is a measure of financial leverage defined as debt divided by total assets while debt to equity ratio is the relative proportion of shareholders' equity and debt used to finance a company's assets [26]. Earnings per share (EPS) is the monetary value of earnings per outstanding share of common stock for a company [26]. Return on asset (ROA) is defined as how productively a company uses its assets to yield profits [27]. Return on equity (ROE) is the measures a company's efficiency at generating profits from every unit of shareholders' equity [28]. Table 2 presents the formula for the financial ratios used in this study [29].

Table 2. *Formula for the Financial Ratio.*

Financial Ratio	Formula
CR	$\frac{CA}{CL}$
DAR	$\frac{TL}{TA}$
DER	$\frac{TL}{TE}$
EPS	$\frac{NP}{NS}$
ROA	$\frac{NP}{TA} \times 100\%$
ROE	$\frac{NP}{TE} \times 100\%$

where
CR: Current ratio;
CA: Current assets;
CL: Current liabilities;
DAR: Debt to assets ratio;
TL: Total liabilities;
TA: Total assets;
DER: Debt to equity ratio;
TE: Total shareholders' equity;
EPS: Earnings per share;
NP: Net profit;
NS: Number of shares;
ROA: Return on asset;
ROE: Return on equity.

The best ideal alternatives seek the criteria that need to be minimized are debt to assets ratio and debt to equity ratio, while the financial ratios such as current ratio, EPS, ROA and ROE are should be maximized in this study.

2.2. Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)

TOPSIS model is a multi-criteria decision making model which was introduced by Hwang and Yoon [18]. TOPSIS model aims to select alternatives having the farthest distance from the negative ideal solution and the shortest distance to the positive ideal solution. TOPSIS model is able to rank the alternatives based on the score of the relative closeness to the ideal solution that achieve by each alternative. The best alternative selection has the farthest distance from the negative ideal solution and also has the closest distance to the positive ideal solution. TOPSIS model consists of seven steps as presented below:

Step 1: Formation of decision matrix ($(x_{ij})_{m\times n}$):

Construct an evaluation matrix which consists of m alternatives and n criteria. The score of each alternative with respect to each criterion is given as x_{ij} , and then a matrix

$(x_{ij})_{m\times n}$ is formed as below.

$$(x_{ij})_{m\times n}=\begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \quad (1)$$

Step 2: Formation of normalized decision matrix:

Construct normalized decision matrix $R=(r_{ij})_{m\times n}$ by transforms various attribute dimensions into non-dimensional attributes, which allows comparisons across criteria by using the normalization method as shown below.

$$r_{ij}=\frac{x_{ij}}{\sqrt{\sum_{i=1}^{m}x_{ij}^2}}, i=1,2,...,m, j=1,2,...,n \quad (2)$$

$$\mathbf{R}=(r_{ij})_{m\times n}=\begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix} \quad (3)$$

Step 3: Formation of nominal normalized decision matrix (T):

Calculate the weighted normalized decision matrix as follow.

$$\mathbf{T}=(t_{ij})_{m\times n}=(w_j r_{ij})_{m\times n}, i=1,2,...,m \quad (4)$$

where $w_j=\frac{W_j}{\sum_{j=1}^{n}W_j}, j=1,2,...,n$

$\sum_{j=1}^{n}w_j=1$ and W_j is the original weight given to the indicator w_j ,*j*=1, 2, …,*n*.

$$\mathbf{T}=\begin{bmatrix} w_1r_{11} & w_2r_{12} & \dots & w_nr_{1n} \\ w_1r_{21} & w_2r_{22} & \dots & w_nr_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ w_1r_{m1} & w_2r_{m2} & \dots & w_nr_{mn} \end{bmatrix} \quad (5)$$

Step 4: Determination of the positive/best ideal (A_b) solution and negative/worst ideal (A_w) solution:

$$A_b=\{\langle \min(t_{ij}\mid i=1,2,...,m)\mid j\in J_-\rangle, \left\langle \max(t_{ij}\mid i=1,2,...,m)\mid j\in J_+\rangle\right\}\equiv\{t_{bj}\mid j=1,2,...,n\}, \quad (6)$$

$$A_w=\{\langle \max(t_{ij}\mid i=1,2,...,m)\mid j\in J_-\rangle, \left\langle \min(t_{ij}\mid i=1,2,...,m)\mid j\in J_+\rangle\right\}\equiv\{t_{wj}\mid j=1,2,...,n\}, \quad (7)$$

where,

$J_+=\{j=1,2,...,n\mid j$ associates with the criteria having a positive impact, and

$J_-=\{j=1,2,...,n\mid j$ associates with the criteria having a negative impact.

Step 5: Calculation of separation measures for each alternative:

Calculate the separation measures for each alternative. The separation from the positive ideal solution is formulated as follow:

$$d_{ib}=\sqrt{\sum_{j=1}^{n}(t_{ij}-t_{bj})^2}, i=1,2,...,m \quad (8)$$

The separation from the negative ideal solution is formulated as follow:

$$d_{iw}=\sqrt{\sum_{j=1}^{n}(t_{ij}-t_{wj})^2}, i=1,2,...,m \quad (9)$$

Step 6: Calculation of relative distances from the ideal solution:

Calculate the relative closeness to the ideal solution s_{iw} in which s_{iw} represents the relative closeness coefficient.

$$s_{iw}=\frac{d_{iw}}{d_{ib}+d_{iw}}, 0\le s_{iw}\le 1, i=1,2,...,m \quad (10)$$

$s_{iw}=0$ if and only if the alternative solution has the worst condition whereas $s_{iw}=1$ if and only if the alternative solution has the best condition.

Step 7:

Alternatives are calculated in the context of existing criteria and ranked depending on their proximity to the ideal solution. Rank the alternatives according to s_{iw} $(i=1,2,...,m)$ in descending order and select the alternative with the highest value of s_{iw} which is closest to 1. The alternative that is closest to the ideal solution is the best alternative.

3. Empirical Results

The empirical results for the overall financial performance of the Malaysian banks are presented based on the five years period from year 2011 to 2015.

Table 3. *Multi Criteria Decision Making Matrix.*

Company	Current ratio	Debt to assets ratio	Debt to equity ratio	EPS	ROA	ROE
AFFIN	2.151	0.274	0.377	0.176	5.071	7.012
AFG	98.461	0.051	0.067	0.160	13.065	13.377
AMBANK	4.767	0.124	0.146	0.305	9.928	11.358
CIMB	174.665	0.286	0.403	0.203	7.200	10.106
HLBANK	1.107	0.922	11.821	0.818	1.007	12.867
MAYBANK	1.146	0.898	8.875	0.568	1.202	11.831
PBBANK	1.063	0.919	11.503	1.037	1.488	18.736
RHBCAP	23.103	0.282	0.398	0.115	2.414	3.352

Table 4. *Normalized Decision Matrix (2011-2015).*

Company	Current ratio	Debt to assets ratio	Debt to equity ratio	EPS	ROA	ROE
AFFIN	0.01065	0.16480	0.02011	0.11650	0.26825	0.20887
AFG	0.48765	0.03056	0.00358	0.10608	0.69118	0.39845
AMBANK	0.02361	0.07452	0.00778	0.20251	0.52520	0.33833
CIMB	0.86507	0.17253	0.02148	0.13446	0.38088	0.30102
HLBANK	0.00548	0.55528	0.63067	0.54267	0.05330	0.38329
MAYBANK	0.00568	0.54123	0.47351	0.37689	0.06361	0.35241
PBBANK	0.00526	0.55355	0.61372	0.68829	0.07874	0.55809
RHBCAP	0.11442	0.16999	0.02122	0.07623	0.12772	0.09984

Table 5. *Weighted Normalized Decision Matrix (2011-2015).*

Company	Current ratio	Debt to assets ratio	Debt to equity ratio	EPS	ROA	ROE
AFFIN	0.00178	0.02747	0.00335	0.01942	0.04471	0.03481
AFG	0.08128	0.00509	0.00060	0.01768	0.11520	0.06641
AMBANK	0.00393	0.01242	0.00130	0.03375	0.08753	0.05639
CIMB	0.14418	0.02876	0.00358	0.02241	0.06348	0.05017
HLBANK	0.00091	0.09255	0.10511	0.09044	0.00888	0.06388
MAYBANK	0.00095	0.09021	0.07892	0.06281	0.01060	0.05874
PBBANK	0.00088	0.09226	0.10229	0.11472	0.01312	0.09301
RHBCAP	0.01907	0.02833	0.00354	0.01270	0.02129	0.01664

Positive ideal (A_b) and negative ideal (A_w) solutions sets are formed and presented in Table 6.

Table 6. *Positive Ideal (A_b) and Negative Ideal (A_w) Solutions.*

	Current ratio	Debt to assets ratio	Debt to equity ratio	EPS	ROA	ROE
A_b	0.14417796	0.00509336	0.00059642	0.11471501	0.11519700	0.09301449
A_w	0.00087710	0.09254719	0.10511217	0.01270488	0.00888266	0.01664040

The distance of all alternatives from positive ideal solution (d_{ib}) and the distance of all alternatives from negative ideal solution (d_{iw}) are calculated by using the equation (8) and (9) respectively. Table 7 presents the distance of all alternatives from positive ideal solution (d_{ib}) and the distance of all alternatives from negative ideal solution (d_{iw}).

Table 7. *Distance of the alternatives from positive ideal solution (d_{ib}) and negative ideal solution (d_{iw}).*

Company	d_{ib}	d_{iw}
AFFIN	0.195511	0.127477
AFG	0.118661	0.197078
AMBANK	0.168476	0.159425
CIMB	0.116616	0.197769
HLBANK	0.227677	0.090968
MAYBANK	0.220687	0.070551
PBBANK	0.221117	0.127535
RHBCAP	0.203123	0.122172

By using equation (10), the relative closeness to the ideal solution, s_{iw} for each alternative is determined. After their proximity to the ideal solution is determined, all the alternatives are arranged in descending order depending on s_{iw} so that the rank of preference can be determined. The relative closeness distance of each decision alternative to the ideal solution, s_{iw} for overall financial performance is shown in Table 8. If the relative closeness to the ideal solution, s_{iw} is higher, the particular alternative is farthest from the negative ideal solution and closest to the distance from the positive ideal solution.

Based on Table 8, CIMB achieves the first ranking among the Malaysian banks with 0.6290675 relative closeness to the ideal solution,which is the highest among the banks. On the other hand, the relative closeness to the ideal solution, for AFG, AMBANK, AFFIN, RHBCAP, PBBANK, HLBANK and MAYBANK are 0.6241815, 0.4861995, 0.3946810, 0.3755732, 0.3657940, 0.2854828 and 0.2422451 respectively. Therefore, AFG, AMBANK, AFFIN, RHBCAP obtain the second, third, fourth and fifth ranking respectively. In addition, the sixth to eighth ranking are achieved by PBBANK, HLBANK and MAYBANK respectively. In other

words, it can be concluded that MAYBANK is not performing well from year 2011 to 2015 as relative to other banks. In summary, TOPSIS model is able to rank the financial performances of Malaysian banks effectively in this study based on multiple criteria.

Table 8. *Overall Financial Performance of the Companies Over the Five Years Period.*

Company	Relative Closeness to the Ideal Solution, s_{iw}	Rank, T
CIMB	0.6290675	1
AFG	0.6241815	2
AMBANK	0.4861995	3
AFFIN	0.3946810	4
RHBCAP	0.3755732	5
PBBANK	0.3657940	6
HLBANK	0.2854828	7
MAYBANK	0.2422451	8

4. Conclusion

TOPSIS model is a mathematical model which involves multi-criteria assessment and has been utilized in this study for the evaluation of the financial performance of the Malaysian banks. The results of this study show that CIMB is ranked as the most outstanding financial performance as compared to the other Malaysian banks. In summary, the major findings of this study reveal that CIMB achieves the first ranking in the evaluation, followed by AFG, AMBANK, AFFIN, RHBCAP, PBBANK, HLBANK and finally MAYBANK. This study is significant because it is able to evaluate, compare and rank the overall financial performance of the Malaysian banks by considering the significant and important financial ratios with TOPSIS model.

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