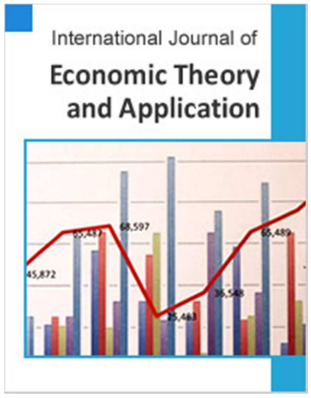
International Journal of Economic Theory and Application
2017; 5(1): 7-12
http://www.aascit.org/journal/ijeta
ISSN: 2375-298X

AASCIT American Association for Science and Technology



Keywords
Financial Ratio,
Retailers,
Multi-criteria Decision Making,
Ranking

Received: December 6, 2017
Accepted: December 19, 2017
Published: January 11, 2018

A Study on the Performance of the Retailers in Malaysia with TOPSIS Model

Lam Weng Hoe[1, 2, 3, *], Lam Weng Siew[1, 2, 3], Chen Jia Wai[1]

[1]Department of Physical and Mathematical Science, Faculty of Science, Universiti Tunku Abdul Rahman, Kampar, Perak, Malaysia
[2]Centre for Mathematical Sciences, Universiti Tunku Abdul Rahman, Kampar, Perak, Malaysia
[3]Centre for Business and Management, Universiti Tunku Abdul Rahman, Kampar, Perak, Malaysia

Email address

whlam@utar.edu.my (L. W. Hoe), lamws@utar.edu.my (L. W. Siew),
jiawai_chen@hotmail.com (Chen Jia Wai)

[*]Corresponding author

Citation

Lam Weng Hoe, Lam Weng Siew, Chen Jia Wai. A Study on the Performance of the Retailers in Malaysia with TOPSIS Model. *International Journal of Economic Theory and Application.* Vol. 5, No. 1, 2017, pp. 7-12.

Abstract

Retailers play a significant role in contributing and developing the economy of country. It supplies consumers with various selection of goods through different distributors. In Malaysia, AEON CO. (M) BHD. (AEON), The Store Corporation Berhad (The Store) and Parkson Holding Berhad (Parkson) are the three retailers listed in Bursa Malaysia. The financial performance of the retailers is the main concern in this study. The objective of this study is to propose a conceptual framework in evaluating the financial performance of the retailers with Technique For Order Preference By Similarity To Ideal Solution (TOPSIS) model. Current ratio, return on equity, profit margin, debt to equity ratio, earnings per share, dividend yield and price earning ratio are the financial ratios investigated for the period of 2012-2016 withTOPSIS model. The result of this study shows that Parkson has the top ranking, followed by The Store and AEON. This indicates that Parkson is the closest to the ideal solution and farthest from the negative-ideal solution among the retailers. The robustness of TOPSIS method is it can identify the optimal alternative based on multiple criteria. Decision makers can select the best or optimal solution based on this multiple-criteria decision making problem (MCDM).

1. Introduction

Retailers play a significant role in supplying consumers with goods through various distributions. It can be either a concrete building or through online system. It contributes to a country's economy and encourages employment [1]. There are many retailers in Malaysia such as AEON CO. (M) BHD. (AEON), The Store Corporation Berhad (The Store), Parkson Holding Berhad (Parkson), GCH Retail (M) Sdn Bhd (GIANT) and Tesco PLC (TESCO). AEON, The Store and Parkson are the listed companieson Bursa Malaysia.

The earliest established retailer among the three listed retailers is The Store in 1968 [2]. The first outlet was opened at Bukit Mertajam, Penang. Later on, Pacific Hypermarket & Departmental Store was established one year after The Store listed in Bursa Malaysia and Milimewa Superstore joined the group in 2005. Thus, The Store has 75 outlets in total. The second earliest retailer is Parkson in 1982 [3]. Its original name was Amalgamated Cement Mills Sdn Bhd. The name changed to current name after the

company converted to public company in 1992. The company has coverage in four Asia countries, which are Malaysia, Vietnam, Indonesia and Myanmar. Lastly, AEON is named as Jaya Jusco when it was first set up in Malaysia in 1984 [4]. It originates from Japan in order to transfer the expertise and human resource development.

The main concern for organising retailers is to earn profit. Thus, financial performance of the company will influence the assessment towards the company. A strong financial based will be a competitive advantages to develop business. In this study, a conceptual framework is proposed based on Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) model to evaluate the financial performance of three retailers and the ranking for the best retailer can be identified. The financial ratios include current ratio (CR), return on equity (ROE), profit margin (PM), debt to equity ratio (DER), earnings per share (EPS), dividend yield (DY) and price earning ratio (PER).

TOPSIS model is able to deal with multiple criteria and select an optimal decision alternative [5]. The robustness of TOPSIS model is that it can identify the relative closeness or the distance between the ideal solution and negative-ideal solution. An optimal solution is the alternative that has the closest distance to the ideal solution. TOPSIS is a mathematical model which helps to solve multiple-criteria decision making problem (MCDM) [6-10]. MCDM evaluates multiple criteria in decision making process [11-35].

Besides that, TOPSIS model has been applied in other sectors such as supply chain [36], warehouse [37], sport [38], oil and gas [39]. It shows that TOPSIS method is widely used in different sectors for its ability to identify optimal decision alternative. Thus, this study aims to determine the best retailer using TOPSIS method through evaluation of financial ratios. 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

The data of this study consists of listed retailers in Malaysia, which are AEON, The Store and Parkson. This study can determine the optimal decision alternatives among the three retailers based on the study period of 2012-2016. The financial ratios are used to evaluate the financial performance as well as identify the best retailers [40-45]. In the proposed conceptual framework with TOPSIS model, the financial ratios are current ratio (CR), return on equity (ROE), profit margin (PM), debt to equity ratio (DER), earning per share (EPS), dividend yield (DY) and price earnings ratio (PER). The annual report are obtained from Bursa Malaysia. As a point of view from the investors, the ideal criteria CR, ROE, PM, EPS and DY are preferred the higher the better while negative-ideal criteria DER and PER should be lower. Table 1 presents the formula for the financial ratios used in this study [8, 45].

Table 1. *Formula for the Financial Ratio.*

Financial Ratio	Formula
CR	$\frac{\text{CA}}{\text{CL}}$
ROE	$\frac{\text{NP}}{\text{TE}} \times 100\%$
PM	$\frac{\text{NP}}{\text{S}}$
DER	$\frac{\text{TL}}{\text{TE}}$
EPS	$\frac{\text{NP}}{\text{NS}}$
DY	$\frac{\text{DPS}}{\text{PPS}}$
PER	$\frac{\text{PPS}}{\text{EPS}}\%$

where
CR: Current ratio;
CA: Current assets;
CL: Current liabilities;
ROE: Return on equity;
NP: Net profit;
TE: Total shareholders' equity;
PM: Profit margin;
S: Net sales
DER: Debt to equity ratio;
TL: Total liabilities;
EPS: Earnings per share;
NS: Number of shares;
DY: Dividend yield;
DPS: Dividend per share;
PPS: Market price per share;
PER: Price earnings ratio.

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

TOPSIS modelis designed for multi-criteria decision making (MCDM) problems by obtaining an optimal solution or best alternative under multiple criteria. Distance of each criterion between the positive and negative ideal solution is the consideration factor in this model. The best alternative has the closest distance to the ideal solution while farthest distance from the negative ideal solution. Hence, TOPSIS model can identify the preference order of decision alternatives through distance comparison.

The steps of TOPSIS model are shown as below:

Step 1: Formulate ($m \times n$) matrix (x)

Given that there are m decision alternatives and n criteria for the problem. The matrix formulation will be ($m \times n$) matrix with x_{ij} as the elements and $i = 1,2,3,...,m$ while $j = 1,2,3,...,n$.

$$x = \begin{bmatrix} x_{11} & x_{12} & \cdots & \cdots & \cdots & x_{1n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & \cdots & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Step 2: Construct Normalized Decision Matrix (R)

Normalization enables the convertion of dimensional

criteria into non-dimensional criteria. All entries in matrix x will be normalized based on the formula below.

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

The normalized matrix is represented by R with r_{ij} as entries.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & \cdots & \cdots & r_{1n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \cdots & \cdots & \cdots & r_{mn} \end{bmatrix} \tag{3}$$

Step 3: Construct Weighted Normalized Decision Matrix (V)

The weighted normalized decision matrix is determined as follows.

$$W = (w_1, w_2, ..., w_n) \text{ where } \Sigma_{j=1}^{n} w_j = 1.$$

Taking W and R together, V is generated as below.

$$V = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \cdots & \cdots & \cdots & w_n r_{1n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ w_1 r_{m1} & w_2 r_{m2} & \cdots & \cdots & \cdots & w_n r_{mn} \end{bmatrix} \tag{4}$$

where $v_{ij} = w_n r_{mn}$.

Step 4: Determine Ideal Solution and Negative-Ideal Solution

Let A^+ be ideal decision alternative and A^- be negative ideal decision alternative.

$$\begin{aligned} A^+ &= \{(\max v_{ij} \mid \mathrm{j} \in \mathrm{J}),\ (\min v_{\mathrm{ij}} \mid \mathrm{j} \in \mathrm{J}'), \mathrm{i} = 1, 2, ..., \mathrm{m}\} \\ &= \{v_1^+, v_2^+, ..., v_n^+\} \end{aligned} \tag{5}$$

$$\begin{aligned} A^- &= \{(\min v_{ij} \mid \mathrm{j} \in \mathrm{J}),\ (\max v_{\mathrm{ij}} \mid \mathrm{j} \in \mathrm{J}'), \mathrm{i} = 1, 2, ..., \mathrm{m}\} \\ &= \{v_1^-, v_2^-, ..., v_n^-\} \end{aligned} \tag{6}$$

where

$$\mathrm{J} = \{\mathrm{j} = 1, 2, ..., \mathrm{n} \text{ and } \mathrm{j} \text{ is associated with benefit criteria}\}$$

$$\mathrm{J}' = \{\mathrm{j} = 1, 2, ..., \mathrm{n} \text{ and } \mathrm{j} \text{ is associated with loss criteria}\}$$

In other words, J is the set of benefit attributes with the higher the better whereas J' is the set of negative attributes with the lower the better.

Step 5: Calculate Separation Measure (s_i^+ and s_i^-) from Positive-Ideal Solution and Negative-Ideal Solution

Separation distance measures the distance of each alternative from the positive-ideal solution and negative-ideal solution.

$$s_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2}, \ \mathrm{i} = 1,2,..., \mathrm{m}. \tag{7}$$

$$s_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}, \ \mathrm{i} = 1,2,..., \mathrm{m}. \tag{8}$$

Step 6: Calculate Relative Closeness to the Ideal Solution (C_i^*)

The best decision alternative will has the closest distance to the positive-ideal solution while farthest distance from the negative-ideal solution. Hence, a higher value of C_i^* is more preferred.

$$C_i^* = \frac{s_i^-}{s_i^+ + s_i^-} \tag{9}$$

where $0 \le C_i^* \le 1$ and $\mathrm{i} = 1, 2, ..., \mathrm{m}$.

$C_i^* = 1$ if and only if the decision alternative is the best alternative and vice versa for $C_i^* = 0$.

Step 7: Rank the Preference Order

Sort the C_i^* value in descending order and the best or optimal decision alternative is selected from the highest C_i^* value where its is closest to 1.

3. Result and Discussion

Table 2 until Table 4 indicate the decision matrix, normalized matrix and weighted normalized matrix of the financial performance of three retailers from 2012 until 2016. Table 3 is the normalization of table 2 based on equation (2) whereas Table 4 applies equal weight for each financial ratios.

Table 2. *Decision Matrix.*

Company	CR	ROE	PM	DER	EPS	DY	PER
Aeon	0.5497	10.6913	4.9811	1.0229	0.3282	2.9054	21.0153
The Store	1.1413	2.8586	0.7160	1.2696	0.1894	1.3664	-11.1386
Parkson	1.5725	14.0892	10.8003	1.7940	0.3508	14.4370	3.6918

Table 3. *Normalized Decision Matrix.*

Company	CR	ROE	PM	DER	EPS	DY	PER
Aeon	0.2722	0.5968	0.4181	0.4219	0.6355	0.1964	0.8731
The Store	0.5652	0.1596	0.0601	0.5237	0.3668	0.0924	-0.4628
Parkson	0.7787	0.7864	0.9064	0.7400	0.6794	0.9762	0.1534

Table 4. *Weighted Normalized Decision Matrix.*

Company	CR	ROE	PM	DER	EPS	DY	PER
Aeon	0.0389	0.0853	0.0597	0.0603	0.0908	0.0281	0.1247
The Store	0.0807	0.0228	0.0086	0.0748	0.0524	0.0132	-0.0661
Parkson	0.1112	0.1123	0.1295	0.1057	0.0971	0.1395	0.0219

Next, A^+ and A^- are determined based on Table 4. For maximization problem, largest value will be selected as the A^+ whereas smallest value will be selected as A^+ under minimization problem. In this study, all criteria are maximization problem except DER and PER. The ideal and negative ideal solutions are shown in Table 5.

Table 5. *Ideal and Negative-Ideal Solutions.*

	CR	ROE	PM	DER	EPS	DY	PER
A^+	0.1112	0.1123	0.1295	0.0603	0.0971	0.1395	-0.0661
A^-	0.0389	0.0228	0.0086	0.1057	0.0524	0.0132	0.1247

Separation distances of decision alternative from the positive-ideal and negative-ideal solution are obtained through formula (7) and (8). Table 6 indicates the distance of each retailer towards the positive-ideal solution and negative-ideal solution.

Table 6. *Separation Distances.*

Company	S_i^+	S_i^-
Aeon	0.2443	0.1014
The Store	0.2042	0.1978
Parkson	0.0991	0.2374

Steps 6 and 7 are performed to determine the relative closeness of decision alternative to the ideal solution and the results are shown in Table 7.

Table 7. *Relative Closeness.*

Company	C_i^*	Ranking
Aeon	0.2932	3
The Store	0.4920	2
Parkson	0.7056	1

As shown in Table 7, Parkson gives the highest C_i^* value of 0.7056 which indicates that Parkson is the best retailer among the others. The resultentails also Parkson has a better overall performance over the five years that enables the company to stand for the first ranking. The second ranking falls on The Store with relative closeness of 0.4920. Lastly, AEON is the farthest from the ideal solution with a lowest relative closeness of 0.2932.

4. Conclusion

TOPSIS model enables decision makers to deal with MCDM problems. In this study, a conceptual framework is proposed based on TOPSIS model to evaluate the financial performance and determine the ranking of three listed retailers in Malaysia. The financial ratios are used to assess the company's financial performance over five years. The result of this study shows that Parkson achieves the first ranking in the evaluation on financial performance because it gives the highest relative closeness to the ideal solution. The ranking of financial performance is followed by The Store and AEON. In summary, TOPSIS is a robust model because it can consider multiple criteria and identify the optimal solution among all decision alternatives.

References

[1] Ersoy N, "Performance measurement in retail industry by using a multi-criteria decision making methods,"Ege Akademik Bakis, Vol. 17, no. 4, pp. 539-551, 2017.

[2] Tstore.com.my. (n.d.). The Store Corporation Berhad | Operator of Supermarkets | Departmental Stores | Hypermarkets. [online] Available at: https://www.tstore.com.my/about.php [Accessed 23 Nov. 2017].

[3] Lion.com.my. (n.d.). PARKSON HOLDINGS BERHAD. [online] Available at: http://www.lion.com.my/WebCorp/phb.nsf/corp_profile [Accessed 23 Nov. 2017].

[4] AEON CO. (M) BHD. (n.d.). AEON CO. (M) BHD.. [online] Available at: http://www.aeonretail.com.my/corporate/about/history/ [Accessed 23 Nov. 2017].

[5] Hwang C L and Yoon K, Multiple Attribute Decision Making, Verlag Berlin Heidelberg, Springer, 1981.

[6] Kabir G and Hasin M A A, "Framework for benchmarking online retailing performance using fuzzy AHP and TOPSISmethod,"International Journal of Industrial Engineering Computations, Vol. 3, pp. 561-576, 2012.

[7] Mandic K, Delibasic B, Knezevic S, Benkovic S, "Analysis of the financial parameters of Serbian banks through the application of the fuzzy AHP and TOPSIS methods," Economic Modelling, Vol. 43, pp. 30-37, 2014.

[8] Liew K F, Lam W S and Lam W H, "Financial analysis on the company performance in malaysia with multi-criteria decision making model," Systems Science and Applied Mathematics, Vol. 1, no. 1, pp. 1-7, 2016.

[9] Al Kharusi S and Başci E S, "Financial institutions performance evaluation in a unique developing market using TOPSIS approach," Banks and Bank Systems, Vol. 12, no. 1, pp. 54-59, 2017.

[10] A. Çelen, "Comparative analysis of normalization procedures in TOPSIS method: With an application to Turkish deposit banking market," Informatica (Netherlands), Vol. 25, no. 2, pp. 185-208, 2014.

[11] Lam W S, Lam W H, "Strategic decision making in portfolio management with goal programming model," American Journal of Operations Management and Information Systems, vol 1, no. 1, pp. 34-38, 2016.

[12] Lam W S, Lam W H, "Portfolio optimization for index tracking problem with mixed-integer programming model," Journal of Scientific Research and Development vol. 2, no. 10, pp. 5-8, 2015.

[13] Lam W S, Lam W H, "Mathematical modeling of enhanced index tracking with optimization model," Journal of Numerical Analysis and Applied Mathematics vol. 1, no. 1, pp. 1-5, 2016.

[14] Lam W H, Lam W S, "Mathematical modeling of risk in portfolio optimization with mean-extended Gini approach," SCIREA Journal of Mathematics vol. 1, no. 2, pp. 190-196, 2016.

[15] Lam W S, Jaaman S. H, Ismail H, "Index tracking modeling in portfolio optimization mixed integer linear programming," Journal of Applied Science and Agriculture vol. 9, no. 18, pp. 47-50, 2014.

[16] Lam W S, Jaaman S. H, Lam W H, "Enhanced index tracking in portfolio optimization with two-stage mixed integer programming model," Journal of Fundamental and Applied Sciences vol. 9, no. 5, pp. 1-12, 2017.

[17] Lam W H, Jaaman S. H, Lam W S, "Portfolio optimization of the construction sector in Malaysia with mean-semi absolute deviation model," Journal of Fundamental and Applied Sciences vol. 9, no. 5, pp. 13-22, 2017.

[18] Lam W S, Chen J W, Lam W H, "Data driven decision analysis in bank financial management with goal programming model," Lecture Notes in Computer Science, Vol. 10645, pp. 681-689, 2017.

[19] Lam W H, Lam W S, Liew K F, "Improvement on the efficiency of technology companies in Malaysia with data envelopment analysis model," Lecture Notes in Computer Science, Vol. 10645, pp. 19-30, 2017.

[20] Chen J W, Lam W S, Lam W H, "Optimization on the financial management of the bank in Malaysia with goal programming," Journal of Fundamental and Applied Sciences, Vol. 9, no. 6, pp. 442-451, 2017.

[21] Lam W S, Bishan R S and Lam W H, "An empirical study on the mold machine-tool selection in semiconductor industry with analytic hierarchy process model," Advanced Science Letters, Vol. 23, no. 9, pp. 8286-8289, 2017.

[22] Lam W S, Jaaman S. H, Ismail H, "An empirical comparison of different optimization models in enhanced index tracking problem," Advanced Science Letters, Vol. 21, no. 5, pp. 1278-1281, 2015.

[23] Lam W S, Jaaman S. H, Ismail H, "The impact of human behaviour towards portfolio selection in Malaysia," Procedia-Social and Behavioral Sciences, Vol. 172, pp. 674-678, 2015.

[24] Lam W S, Jaaman S. H, Ismail H, "The impact of different economic scenarios towards portfolio selection in enhanced index tracking problem," Advanced Science Letters, Vol. 21, no. 5, pp. 1285-1288, 2015.

[25] Lam W S and Lam W H, "An empirial investigation on portfolio management problem with mean-risk model in Malaysia stock market," Advanced Science Letters, Vol. 21, no. 5, pp. 1293-1294, 2015.

[26] Lam W S, Chen J W and Lam W H, "An empirical study on the selection of fast food restaurants among undergraduates with AHP model," American Journal of Information Science and Computer Engineering, Vol. 2, no. 3, pp. 15-21, 2016.

[27] Lam W S and Lam W H, "Financial risk management in portfolio optimization with lower partial moment," American Journal of Business and Society, Vol. 1, no. 4, pp. 200-204, 2016.

[28] Lam W S and Lam W H, "Index tracking in portfolio optimization with tracking error variance model," SCIREA Journal of Economics, Vol. 1, no. 2, pp. 16-24, 2016.

[29] Lam W S, Chen J W and Lam W H, "An empirical study on the preference of laptop in Malaysia with analytic hierarchy process model," SCIREA Journal of Computer Science and Technology, Vol. 1, no. 2, pp. 127-141, 2016.

[30] Lam W S, Jaaman S. H, Ismail H, "An empirical study on the characteristics of high risk aversion behaviour in portfolio decision making using regression model," Advances in Environmental Biology, Vol. 9, no. 7, pp. 17-20, 2015.

[31] Lam W S, Jaaman S. H, Ismail H, "Investigation on relationship between human behaviour and portfolio selection problem in Malaysia using decision making model," Advances in Environmental Biology, Vol. 9, no. 7, pp. 6-10, 2015.

[32] Lam W S, Jaaman S. H, Ismail H, "Comparison between two-stage regression model and variance model in portfolio optimization," Journal of Applied Science and Agriculture vol. 9, no. 18, pp. 36-40, 2014.

[33] Lam W S, Leong W B and Lam W H, "Selection of mobile network operator based on multi-criteria decision making model using analytic hierarchy process," Mathematics and Statistics Journal, Vol. 1, no. 1, pp. 12-18, 2015.

[34] Lam W S and Lam W H, "Portfolio management for index tracking problem in Malaysian stock market," International Journal of Administration and Governance, Vol. 1, no. 3, pp. 15-17, 2015.

[35] Lam W S, Lee W K and Lam W H, "Multi-criteria decision making in job selection problem using analytic hierarchy process model," Mathematics and Statistics Journal, Vol. 1, no. 2, pp. 3-7, 2015.

[36] Shahroudi K and Tonekaboni S M S, "Application of topsis method to supplier selection in iran auto supply chain," Journal of Global Strategic Management, Vol. 6, no. 2, pp. 123-131, 2012.

[37] Ashrafzadeh M, Rafiei F M, Isfahani N M and Zare Z, "Application of fuzzy TOPSIS method for the selection ofwarehouse location: a case study,"Interdisciplinary Journal of Contemporary Research in Business, Vol. 3, no. 9, pp. 655-671, 2012.

[38] Sakinc I, Acikalin S, Soyguden A, "Evaluation of the relationship between financial performance and sport success in European football," Journal of Physical Education and Sport, Vol. 17, no. 3, pp. 16-22, 2017.

[39] Yadav S K, Kapoor R and Dhaigude A S, "Financial performance ranking of oil and gas companies in India using TOPSIS method," International Journal of Applied Business and Economic Research, Vol. 14, no. 6, pp. 4463-4473, 2016.

[40] Lam W S, Liew K F, Lam W H, "An empirical comparison on the efficiency of healthcare companies in Malaysia with data envelopment analysis model," International Journal of Service Science, Management and Engineering vol 4, no. 1, pp. 1-5, 2017.

[41] Lam W S, Liew K F, Lam W H, "Evaluation on the efficiency of healthcare companies in Malaysia with data envelopment analysis model," SCIREA Journal of Mathematics vol. 1, no. 1, pp. 95-106, 2016.

[42] Lam W S, Liew K F, Lam W H, "An empirical investigation on the efficiency of healthcare companies with data envelopment analysis model," Biomedical Statistics and Informatics vol. 1, no. 1, pp. 19-23, 2016.

[43] Liew K F, Lam W S and Lam W H, "An empirical evaluation on the efficiency of the companies in Malaysia with data envelopment analysis model," Advanced Science Letters, Vol. 23, no. 9, pp. 8264-8267, 2017.

[44] Lam W S, Liew K F, Lam W H, "An empirical investigation on the efficiency of the financial companies in Malaysia with DEA model," American Journal of Information Science and Computer Engineering, Vol. 3, no. 3, pp. 32-38, 2017.

[45] Lam W S, Liew K F, Lam W H, "Evaluation on the financial performance of Malaysian banks with TOPSIS model," American Journal of Service Science and Management, Vol. 4, no. 2, pp. 11-16, 2017.