An empirical evaluation on the performance of food service industry in Malaysia with TOPSIS model

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Abstract: The food service industry makes impacts on society and plays a key role in expanding economic and business opportunity. Besides that, the economic sector is also contributed by the food and beverage industry. Therefore, performance evaluation is vital for the food service industry in a highly competitive environment in order to improve the decision-making process in an organization. The objective of this study is to propose a conceptual framework in evaluating and ranking the financial performance of the food companies from the consumer products sector in Malaysia 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 earnings ratio are the financial ratios employed in this study. The results of this study show that HEXZA gives the highest performance, followed by TGUAN, 3A and finally CANONE. This study is significant as it helps to evaluate the financial performance of food service industry in Malaysia with the proposed conceptual framework using TOPSIS model.

1. INTRODUCTION

The contribution of food service industry to economic growth may appear trivial at first sight, but it actually contributes to a country's Gross Domestic Product (GDP), income, employment, and foreign exchange earnings [1]. In today's fast-changing business world, maintaining competitive advantage in their industry has been a significant challenge to the food and beverage companies. Hence, performance evaluation is essential to the growing economy as it allows the food companies to defend their market position. The evaluation system helps the organization to improve their performance over time and creating sustainable business performance. It can be a huge benefit to the employer to realign their business and change management strategies in the case of outpacing their competitors. It is ubiquitous in competitive settings where it shapes performance and improves efficiency [2]. The management team is given the chance to review the outcomes of their past decisions, allowing them to make informed decisions in the future. Not only is the evaluation system beneficial to the company itself, it is of great importance to the companies in the same sector as well.

The financial performance of these companies is normally reflected by the items in the balance sheet and income statement. The significance of financial statement demonstrates the strengths and
weaknesses of the firms in terms of liquidity, solvency, growth, and profitability [3]. Therefore, financial ratios are used as the indicators for performance comparisons within the context of financial analysis [4]. In light of the practicality of the model itself, performance evaluation is carried out in this study with the proposed conceptual framework using TOPSIS model.

TOPSIS is a multi-criteria decision-making (MCDM) tool where it has the ability to deal with multiple criteria in the case of ranking the alternatives and identifying the best alternative through distance measures [5]. The selection of the best alternative from all feasible alternatives is done with the TOPSIS model where all of the possible alternatives are examined based on a set of attributes. In this study, this problem-solving tool is used to comparatively rank the firms in the food sector and has been deemed one of the MCDM models that provide robust final results with high computational efficiency [6]. This is the reason why a great number of studies in the literature have shown significant interest in the use of TOPSIS model in ranking and identifying the optimal decision alternative [7-10]. An accurate performance measurement is beneficial to the decision makers as it provides them valuable information to make informed decisions.

In Malaysia, there is no comprehensive study done on the financial performance evaluation of food service industry. Therefore, the motivation of this study is to analyse and evaluate the financial performance of food service industry in Malaysia with the proposed conceptual framework using TOPSIS model. The remainder of this paper is organized as follows. The data and methodology of the study will be discussed in Section 2. Next section presents the main findings obtained in this study. Conclusions are drawn in the last section of the paper.

2. METHODOLOGY

2.1. Data

The sample data of this study consists of four food companies that listed in Malaysian stock market. CANONE, TGUAN, HEXZA and 3A are the food companies listed on Bursa Malaysia Stock Market, Malaysia. The data are obtained based on a 5-year study period which is from year 2013 to 2017. The proposed conceptual framework in this study with TOPSIS model is presented in Table 1.

| Decision Criteria (Financial Ratios) | Decision Alternatives (Food Companies) |
|-------------------------------------|---------------------------------------|
| Current ratio (CR)                  | CANONE                                |
| Return on equity (ROE)              | TGUAN                                 |
| Profit margin (PM)                  | HEXZA                                 |
| Debt to equity ratio (DER)          | 3A                                    |
| Earnings per share (EPS)            |                                       |
| Dividend yield (DY)                 |                                       |
| Price earnings ratio (PER)          |                                       |

The analysis is performed based on the financial ratios as decision criteria, namely CR, ROE, PM, DER, EPS, DY and PER. CANONE, TGUAN, HEXZA and 3A are the decision alternatives in this study. In financial management, the financial ratios such as CR, ROE, PM, EPS and DY are need to be maximized. On the other hand, DER and PER are the decision criteria that need to be minimized [11-14].

2.2. TOPSIS

TOPSIS is a decision tool which helps to solve MCDM problems [15]. TOPSIS chooses the best alternative based on the ideal solution concept. The chosen alternative has the farthest distance from the negative ideal solution (NIS) while having the shortest distance from the positive ideal solution (PIS) [16]. Euclidean distance is used to calculate the distance of all the feasible alternatives to the PIS.
and NIS. In TOPSIS model, ordering and ranking of decision alternatives help in the comparison of their relative distances \[17\]. The main steps of the TOPSIS are shown as follows \[18\]:

**Step 1:** Draw the decision matrix \((x_{ij})\)

The decision matrix with a size of \(m \times n\) is constructed where it consists of \(n\) decision criteria and \(m\) decision alternatives. There are columns of alternatives \(i = 1,2,\ldots,m\) and rows of criteria \(j = 1,2,\ldots,n\).

\[
x_{ij} = \begin{bmatrix}
x_{i1} & x_{i2} & \cdots & x_{in} \\
x_{i2} & x_{i2} & \cdots & x_{i2n} \\
\vdots & \vdots & \ddots & \vdots \\
x_{im} & x_{im2} & \cdots & x_{imn}
\end{bmatrix}
\]  

(1)

**Step 2:** Draw the normalized decision matrix \((R)\)

\[
r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^2}}, \quad i = 1,2,\ldots,m; \quad j = 1,2,\ldots,n
\]

(2)

\[
R_{ij} = \begin{bmatrix}
r_{1j} & \cdots & r_{nj} \\
\vdots & \ddots & \vdots \\
r_{mj} & \cdots & r_{mn}
\end{bmatrix}
\]

(3)

**Step 3:** Draw the weighted normalized decision matrix \((V)\)

\[
W = (w_1,w_2,\ldots,w_n) \text{ where } \sum_{j=1}^{n} w_j = 1
\]

(4)

To construct the weighted normalized decision matrix, each of the elements in the rows of \(R\) matrix is multiplied by \(w_j\). Equation (5) represents the normalized decision matrix \((V)\). The financial ratios are equally important in the evaluation of financial performance \[19-21\].

\[
V_{ij} = \begin{bmatrix}
w_1r_{i1} & \cdots & w_nr_{in} \\
\vdots & \ddots & \vdots \\
w_1r_{m1} & \cdots & w_nr_{mn}
\end{bmatrix}
\]

(5)

**Step 4:** Determine the PIS \(A^+\) and NIS \(A^-\)

\[
A^+ = \left\{ \max_{j \in J} V_{0j} | j \in J \right\} = \left\{ v_1^+, v_2^+, \ldots, v_n^+ \right\}
\]

(6)

\[
A^- = \left\{ \min_{j \in J} V_{0j} | j \in J \right\} = \left\{ v_1^-, v_2^-, \ldots, v_n^- \right\}
\]

(7)

**Step 5:** Compute the distance of each alternative from PIS \((d_i^+)\) and NIS \((d_i^-)\)

\[
d_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2}, \quad i = 1,2,\ldots,m
\]

(8)

\[
d_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}, \quad i = 1,2,\ldots,m
\]

(9)

**Step 6:** Compute the relative closeness of the alternative from the ideal solution \((C_i^*)\)

\[
C_i^* = \frac{d_i^-}{d_i^- + d_i^+} \text{ where } C_i^* \in [0,1], \quad i = 1,\ldots,m
\]

(10)
The value of $C_i^*$ is in the range of $0 \leq C_i^* \leq 1$. $C_i^* = 1$ when it is in close proximity to the PIS stands for it is the best alternative. On the contrary, $C_i^* = 0$ when the decision alternative is close to the NIS. Higher value of $C_i^*$ indicates higher performance of the decision alternative.

Step 7: Ranking of decision alternatives

$C_i^*$ value is ranked and sorted in descending order where the best decision alternative can be identified considering their proximity to the ideal solution. The decision alternative with the highest value and is also closest to 1 will be selected as the best option.

3. RESULTS AND DISCUSSION

Table 2 shows the decision matrix and Table 3 illustrates the normalized decision matrix of the studied food companies in Malaysia.

Table 2. Decision matrix.

| Company name | CR      | ROE    | PM    | DER    | EPS    | DY    | PER   |
|--------------|---------|--------|-------|--------|--------|-------|-------|
| CANONE       | 1.4165  | 11.4556| 8.8361| 1.0386 | 0.4199 | 1.4665| 7.5491|
| 3A           | 4.8076  | 9.6135 | 8.8216| 0.2496 | 0.0603 | 1.8214| 15.5775|
| TGUAN        | 2.6582  | 9.1803 | 5.6381| 0.4630 | 0.3298 | 3.2744| 9.3967 |
| HEXZA        | 10.8164 | 5.9470 | 898.8065| 0.0906| 0.0687 | 5.9066| 11.5693|

Table 3. Normalized decision matrix.

| Company name | CR      | ROE    | PM    | DER    | EPS    | DY    | PER   |
|--------------|---------|--------|-------|--------|--------|-------|-------|
| CANONE       | 0.1160  | 0.6183 | 0.0098| 0.8894 | 0.7751 | 0.2052| 0.3305|
| 3A           | 0.3936  | 0.5189 | 0.0098| 0.2138 | 0.1113 | 0.2549| 0.6819|
| TGUAN        | 0.2176  | 0.4955 | 0.0063| 0.3965 | 0.6089 | 0.4582| 0.4114|
| HEXZA        | 0.8856  | 0.3210 | 0.9999| 0.0776 | 0.1268 | 0.8265| 0.5065|

Table 4 presents the weighted normalized decision matrix where the values obtained are used to calculate the PIS and NIS.

Table 4. Weighted normalized decision matrix.

| Company name | CR      | ROE    | PM    | DER    | EPS    | DY    | PER   |
|--------------|---------|--------|-------|--------|--------|-------|-------|
| CANONE       | 0.0166  | 0.0883 | 0.0014| 0.1271 | 0.1107 | 0.0293| 0.0472|
| 3A           | 0.0562  | 0.0741 | 0.0014| 0.0305 | 0.0159 | 0.0364| 0.0974|
| TGUAN        | 0.0311  | 0.0708 | 0.0009| 0.0566 | 0.0870 | 0.0655| 0.0588|
| HEXZA        | 0.1265  | 0.0459 | 0.1428| 0.0111 | 0.0181 | 0.1181| 0.0724|

The PIS and NIS are displayed in Table 5. These values are then used to compute the relative distances of the decision alternatives from $A^+$ and $A^-$ as mentioned in Step 5.

Table 5. PIS and NIS.

|       | CR    | ROE    | PM    | DER    | EPS    | DY    | PER   |
|-------|-------|--------|-------|--------|--------|-------|-------|
| $A^+$ | 0.1265| 0.0883 | 0.1428| 0.0111 | 0.1107 | 0.1181| 0.0472|
| $A^-$ | 0.0166| 0.0459 | 0.0009| 0.1271 | 0.0159 | 0.0293| 0.0974|
Figure 1 and Figure 2 present the separation distance of all companies from the PIS and NIS respectively.

![Figure 1. Separation distance from the PIS.](image1)

![Figure 2. Separation distance from the NIS.](image2)

As shown in Figure 1, HEXZA (0.1050) has the shortest distance from the PIS among the studied food companies, followed by TGUAN (0.1874), 3A (0.2091) and lastly CANONE (0.2311). This shows that HEXZA is the closest to the PIS.

Based on Figure 2, HEXZA (0.2328) gives the largest distance from the NIS among the studied food companies, followed by TGUAN (0.1168), CANONE (0.1154) and 3A (0.1083). This implies that HEXZA is the farthest from the NIS.

Table 6 presents the relative closeness and ranking of the studied food companies.
Table 6. Relative closeness and ranking of companies.

| Company name | Ci* | Ranking |
|--------------|-----|---------|
| CANONE       | 0.3330 | 4 |
| 3A           | 0.3414 | 3 |
| TGUAN        | 0.3840 | 2 |
| HEXZA        | 0.6893 | 1 |

Table 6 depicts that HEXZA has the closest proximity to the ideal solution according to the highest Ci* value, 0.6893 which implies that it is ranked first among the studied food companies. TGUAN is ranked second according to the findings of this study with Ci* of 0.3840. 3A is the third-ranking food company, followed by CANONE. CANONE has the farthest proximity to the ideal solution where its Ci* is merely 0.3330. In this study, HEXZA gives the best financial performance among the studied food companies in Malaysia based on financial ratios with TOPSIS model.

4. CONCLUSION

This study aims to analyse and evaluate the financial performance of food service industry in Malaysia with the proposed conceptual framework using TOPSIS model. The main findings of this study reveal that HEXZA gives the best financial performance among the studied food companies, followed by TGUAN, 3A and finally CANONE. This study is significant because it helps to measure the financial performance of food service industry in Malaysia with the proposed conceptual framework based on TOPSIS model. In addition, this study provides an analysis on the separation distance from the positive ideal solution and negative ideal solution for each company for further improvement.

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