

Investing in Malaysian healthcare using technique for order preference by similarity to ideal solution

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ABSTRACT

The purpose of this research is to assess the financial performance of Malaysian Healthcare companies using the multi-criteria and decision-making method, namely technique for order preference by similarity to ideal solution (TOPSIS). The financial data of 20 companies in 2019 are retrieved from Datastream. For many years, ratios of financial aspects have been employed to analyse the companies' financial performance. However, some studies indicate that the traditional ratio analysis is insufficient to measure a firm's financial performance. Thus, this paper employs the technique for order preference by similarity to ideal solution, or simply TOPSIS, to gain a more comprehensive result. The TOPSIS approach involves seven steps, utilizing significant ratios in financial aspect such as debt ratio, debt to equity ratio, current ratio, return on equity (ROE), acid-test ratio, earnings per share (EPS), and return on asset (ROA), as the criteria to evaluate the companies' financial performances. The result of this study ranks 20 healthcare companies in Malaysia and makes recommendations for investment-worthy companies to the investors, allowing the maximization of investment benefits. The results from this research are crucial for investors, companies, market participants, public and private policymakers to enhance their investment decision-making.

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1. INTRODUCTION

Investment refers to obtaining an asset with the intention that the asset will appreciate in value and grow over time. With that, wealth created can be used to fulfill many financial objectives such as giving extra income, saving up for retirement, paying debt and obligations, payment of tuition fees, purchase of other assets and so on. Historically, stock market investment has delivered wonderful returns over time. Moreover, over the long term, no other types of investment tend to perform better than stock investment. This was proven by one of the world's richest men, Warren Buffett, who had become rich through stock investing. However, being successful in the stock market is an extremely difficult task. The basic concept in stock investing is to find "cheap" or "undervalued" stocks and sell "rich" or "overvalued" stocks to get capital gain (profit). Most of the time, stock market investors need to conduct a fundamental and technical analysis to decide on which stocks to invest in. These kinds of evaluations require a lot of expertise and also consume a

lot of time. However, investors can utilize a simple yet powerful decision technique named technique for order preference by similarity to ideal solution (TOPSIS) in making investment decisions. TOPSIS, which was proposed by [1], examines a number of alternatives according to a pre-specified criterion, identifies each criterion's weight, normalises each criterion's score, and between each alternative, it ultimately calculates the geometric distance and the ideal option, see also [2]-[7]. According to [8]-[13], financial ratios are crucial because they can be used to assess the competitive advantage and the level of companies' sustainability within industries. Relevant studies that utilised TOPSIS as the methodology can be seen in the paper by [14]-[23]. Whereas, studies by [24], [25] also adopted financial ratio analysis using TOPSIS to analyse the performances of the service and telecommunication industry in the Malaysia context. The fact that the TOPSIS method allows attributing weights to the level of importance of each criterion and at the same time considers the uncertainty, subjectivity, and complexity of the decision process lead the investors to rank companies from worst to the best. Healthcare companies in Malaysia can be defined as businesses related to medical services, manufacturers of medical equipment and drugs, or suppliers of healthcare to patients. According to ASEAN Briefing on October 6, 2020, Malaysian healthcare is expected to rise compared to other neighboring countries like Singapore and Thailand. This is due to Malaysia's healthcare system that has reached the world-class level-fueled by high-quality human resources. Bursa Malaysia has divided the country's healthcare sector into three sub-sectors, namely health care equipment and services (for example; Top Glove Corporation Berhad and Hartalega Holdings Berhad), health care providers (for instance; Kumpulan Perubatan Johor (KPJ Healthcare Berhad) and IHH Healthcare Berhad which was previously known as Integrated Healthcare Holdings Berhad) and pharmaceuticals like Pharmedia Holdings and Duopharma Biotech Berhad. All these companies are included in the data for this study.

Other previous researches which incorporate healthcare sectors in their studies are well documented in [24], [25]. However, there were no comprehensive studies on the application of the fuzzy TOPSIS method in evaluating the financial performance of Malaysian healthcare companies. Hence, the objective of this study is to propose a conceptual framework for evaluating, comparing, and ranking the financial performance of healthcare companies in Malaysia with the TOPSIS model. The remainder of this article is arranged in the following manner: Section 2 summarises the data and methodology used, followed by a discussion on the findings, and the final section concludes with recommendations for further research.

2. RESEARCH METHODOLOGY

Referring to Datastream, a set of data consisting of 20 Malaysian listed healthcare companies for the year 2020 was retrieved as represented in Table 1. The 20 healthcare companies in the year 2020 were analyzed using the TOPSIS method based on seven types of ratios of the financial aspect. The financial ratios that are considered in this paper include current ratio, dividend yield, p/e ratio, gross profit margin, return on equity (ROE), total debt % total asset, and earnings per share (EPS) to evaluate the companies' financial performances. Current ratio, dividend yield, gross profit margin, EPS, and ROE are the greatest ideal alternatives for maximising the criteria that need to be maximised, whilst total debt % total asset and P/E ratio need to be minimised.

Table 1. Healthcare Companies in Malaysia stock market

COMPANY	CODE
ADVENTA BHD	C1
APEX HEALTHCARE BHD	C2
CAREPLUS GROUP B	C3
DUOPHAMA	C4
HARTALEGA HOLDINGS	C5
IHH HEALTHCARE	C6
KOSSAN RUBBER	C7
KOTRA INDUSTRIES BHD	C8
KPJ HEALTHCARE BHD	C9
LKL INTERNATIONAL	C10
LYC HEALTHCARE BHD	C11
MALAYSIAN GENOMICS	C12
NOVA PHARMA SOL	C13
OPTIMAX	C14
PHARMANIAGA BERHAD	C15
SMILELINK HEALTH	C16
SUPERMAX CORP BHD	C17
TMC LIFE SCIENCES	C18
TOP GLOVE CORP	C19
YSP SOUTHEAST ASIA	C20

The TOPSIS method is designed to help with multi-criteria decision-making. The TOPSIS method takes the geometric distance between positive and negative ideal solutions into account. The TOPSIS method is broken down into seven steps as following and was performed in MS Excel:

- Step 1: Decision matrix $((x_{ij})_{m \times n})$ formation. A decision matrix that consists of m alternatives (companies), and n criteria (financial ratio) is formed. Concerning each criterion, the score of each alternative is given as x_{ij} , and then a matrix $(x_{ij})_{m \times n}$ is constructed as shown in (1).

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

- Step 2: Decision matrix normalization. Various attribute dimensions are transformed into non-dimensional attributes, and a normalized decision matrix $R = (r_{ij})_{m \times n}$ is constructed, as (2) and (3).

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

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

- Step 3: Weighted normalized decision matrix (T) Formation. The weighted normalized decision matrix is calculated in (4) and (5).

$$T = (t_{ij})_{m \times n} = (w_j r_{ij})_{m \times n}, i = 1, 2, \dots, m \text{ where } w_j = \frac{W_j}{\sum_{j=1}^n W_j}, j = 1, 2, \dots, n \tag{4}$$

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

$$T = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \dots & w_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & \dots & w_n r_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ w_1 r_{m1} & w_2 r_{m2} & \dots & w_n r_{mn} \end{bmatrix} \tag{5}$$

- Step 4: The positive/best ideal (A_b) solution and the negative/worst ideal (A_w) solution determination.

$$A_b = \{ \{ \min(t_{ij} | i = 1, 2, \dots, m) | j \in J_- \}, \{ \max(t_{ij} | i = 1, 2, \dots, m) | j \in J_+ \} \} \equiv \{ t_{bj} | j = 1, 2, \dots, n \}, \tag{6}$$

$$A_w = \{ \{ \max(t_{ij} | i = 1, 2, \dots, m) | j \in J_- \}, \{ \min(t_{ij} | i = 1, 2, \dots, m) | j \in J_+ \} \} \equiv \{ t_{wj} | j = 1, 2, \dots, n \}, \tag{7}$$

where,

$J_+ = \{ j = 1, 2, \dots, n | j \text{ associates with the criteria having a positive impact, and}$

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

- Step 5: The separation measures for each alternative from the best ideal solution and negative ideal solution calculation. The separation measures for each alternative are calculated in (8):

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

The distance from the negative ideal solution is calculated in (9):

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

- Step 6: The relative closeness to the ideal solution for each alternative calculation: For each alternative, the relative closeness to the ideal solution S_{iw} is computed as shown in (10).

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

$s_{iw} = 0$ 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: Rank the alternatives. The alternatives based on the relative closeness coefficient in s_{iw} are ranked in descending order. The best alternative is the alternative with the highest s_{iw} .

3. RESULTS AND DISCUSSION

From the decision-making matrix shown in Table 2, the normalised decision matrix, and weighted normalised decision matrix were performed to get the positive ideal solution and the negative ideal solution for each decision criterion shown in Table 3. Using (8) and (9), Table 4 shows the distance of all options from the positive ideal solution (D_{ib}) and the negative ideal solution (D_{iw}). For each alternative, the relative closeness to the ideal solution, s_{iw} is obtained using (10). Table 5 shows the relative closeness distance of each decision alternative to the ideal solution, s_{iw} . The companies' overall financial performance status is determined by their relative closeness distance to the ideal solution, s_{iw} , which is listed in descending order. The company with the highest s_{iw} value is considered the greatest alternative, as it provides the best financial results.

Table 2. Multicriteria decision making matrix

Company	Current Ratio	Dividend Yield	P/E	Gross Profit Margin	Return On Equity (ROE)	Total Debt % Total Assets	EPS
C1	2.17	0	-19.9	-12.99	-19.22	23.19	-0.077
C2	2.82	1.05	29.89	21.21	12.55	4.48	0.118
C3	1.28	0.14	9.09	28.5	68.29	7	0.228
C4	3.06	1.63	39.95	40.92	9.99	28.89	0.085
C5	2.67	0.81	53.4	25.36	18.08	8.41	0.129
C6	1.31	0.73	242.5	20.27	0.9	31.26	0.023
C7	2.27	1	10.59	44.81	57.06	15.7	0.425
C8	2.65	3.01	14.25	66.12	16.33	13	0.204
C9	0.87	1.2	38.74	37.65	5.6	52.47	0.026
C10	3.41	0	35.43	34.32	7.37	14.28	0.01
C11	0.92	0	-5.81	23.96	-43.73	50.24	-0.029
C12	11.12	0	2.09	-636.61	130.6	0	0.165
C13	6.07	0.77	37.77	41.35	-6.37	0.93	-0.004
C14	2.68	0	47.56	68.9	16	31.53	0.025
C15	0.78	2.5	19.92	2.48	8.14	43.91	0.105
C16	2	0.57	54.1	47.27	2.87	19.4	0.004
C17	1.27	0	40.04	42.78	39.57	10.32	0.196
C18	2.66	0.26	14.54	9.05	2.08	9.3	0.009
C19	2.01	4.9	1.73	39.4	47.32	21.26	0.219
C20	4.76	3.07	2.38	42	6.55	12.78	0.157

The result in Table 5 indicates the ranking of the healthcare companies in all sectors. Tables 6-8 show the ranking result of the healthcare companies in equipment sectors, provider sectors, and pharmaceuticals in terms of their financial performances using the TOPSIS approach, respectively. Based on the tables, it is observed that Top Glove Corp steadily ranked first among all the healthcare sectors and healthcare equipment subsector. For that reason, Top Glove Corp is said to have the highest ranking in terms of financial performance. Apart from that, IHH healthcare, Kossan Rubber, Kotra Industries Bhd and

Careplus Group Berhad are found to be among the top five companies for all healthcare sectors and within their own subsectors. It is not surprising that two out of five highest rank companies are medical glove producers (Top Glove Corp and Kossan Rubber) since there is a surge in demand for gloves worldwide that pushed their earnings to a record high. While IHH healthcare ranked high in all sectors, it is an international premium healthcare provider in many markets where the demand for quality care is strong and growing. On the other hand, the fact that Adventa Bhd, LYC healthcare Bhd and Nova Pharma SOL ranked lowest within their subsectors are confirmed as these companies also ranked lowest in all healthcare sectors.

Table 3. Positive ideal (A_b) and negative ideal (A_w) solutions

Ideal Solution	Current Ratio	Dividend Yield	P/E	Gross Profit Margin	Return on equity (ROE)	Total Debt % Total Assets	EPS
Positive ideal solution (A_b)	0.09704323	0.092604908	0.124645797	0.014974696	0.1034922	0.067727814	0.088473355
Negative ideal solution (A_w)	0.006807	0	-0.01022867	-0.138360541	-0.03465	0	-0.01602929

Table 4. Distance of the alternatives from the positive ideal solution (d_{ib}) and negative ideal solution (d_{iw})

Company Name	d_{ib}	d_{iw}
C1	0.244189293	0.140679621
C2	0.198149969	0.159613572
C3	0.193654773	0.182035692
C4	0.186316025	0.16827092
C5	0.189556027	0.164259138
C6	0.178796152	0.205176172
C7	0.176869785	0.201037281
C8	0.18280053	0.181949963
C9	0.201537164	0.171677889
C10	0.209564162	0.157817814
C11	0.246798051	0.158022142
C12	0.234251672	0.172894267
C13	0.208150127	0.16137485
C14	0.199880208	0.171279151
C15	0.193581976	0.168171819
C16	0.205374932	0.161379413
C17	0.193035707	0.174742738
C18	0.219125317	0.148596451
C19	0.171739744	0.200391822
C20	0.186934402	0.175183698

Table 5. Ranking of healthcare companies in all sectors

Code	Companies	Relative closeness to the ideal solution, s_{iv}	Rank
C19	TOP GLOVE CORP	0.538497242	1
C6	IHH HEALTHCARE	0.53435146	2
C7	KOSSAN RUBBER	0.531975448	3
C8	KOTRA INDUSTRIES BHD	0.498834043	4
C3	CAREPLUS GROUP B	0.484536364	5
C20	YSP SOUTHEAST ASIA	0.483775039	6
C17	SUPERMAX CORP BHD	0.475130449	7
C4	DUOPHAMA	0.474554753	8
C15	PHARMANIAGA BERHAD	0.464879211	9
C5	HARTALEGA HOLDINGS	0.464251266	10
C14	OPTIMAX	0.461470651	11
C9	KPJ HEALTHCARE BHD	0.459997226	12
C2	APEX HEALTHCARE BHD	0.446142644	13
C16	SMILELINK HEALTH	0.440020452	14
C13	NOVA PHARMA SOL	0.436708911	15
C10	LKL INTERNATIONAL	0.429574188	16
C12	MALAYSIAN GENOMICS	0.424649372	17
C18	TMC LIFE SCIENCES	0.404100231	18
C11	LYC HEALTHCARE BHD	0.390351432	19
C1	ADVENTA BHD	0.365526069	20

Table 6. Companies ranking in the healthcare equipment sector

Code	Companies	Relative closeness to the ideal solution, s_{iw}	Rank
C19	TOP GLOVE CORP	0.595250172	1
C7	KOSSAN RUBBER	0.548957974	2
C5	HARTALEGA HOLDINGS	0.515778735	3
C17	SUPERMAX CORP BHD	0.498682853	4
C3	CAREPLUS GROUP B	0.471696299	5
C10	LKL INTERNATIONAL	0.462888102	6
C12	MALAYSIAN GENOMICS	0.422282041	7
C1	ADVENTA BHD	0.369262634	8

Table 7. Companies ranking in the healthcare provider sector

Code	Companies	Relative closeness to the ideal solution, s_{iw}	Rank
C6	IHH HEALTHCARE	0.695754977	1
C14	KPJ HEALTHCARE BHD	0.648451308	2
C9	OPTIMAX	0.619869593	3
C18	SMILELINK HEALTH	0.552866384	4
C16	TMC LIFE SCIENCES	0.477479238	5
C11	LYC HEALTHCARE BHD	0.187713071	6

Table 8. Companies ranking in the healthcare pharmaceutical sector

Code	Companies	Relative closeness to the ideal solution, s_{iw}	Rank
C8	KOTRA INDUSTRIES BHD	0.641227737	1
C4	DUOPHAMA	0.610813443	2
C20	YSP SOUTHEAST ASIA	0.527174627	3
C15	PHARMANIAGA BERHAD	0.519468737	4
C2	APEX HEALTHCARE BHD	0.480733053	5
C13	NOVA PHARMA SOL	0.377588248	6

4. CONCLUSION

In conclusion, this article has fulfilled its objective to evaluate 20 Malaysian healthcare companies using the TOPSIS multi-criteria decision-making method. The findings from this paper can be used to assist investors in making investment decisions alongside other techniques. This paper, which utilizes financial ratios as the criteria, has managed to evaluate the companies' financial performances and ranked them accordingly. It is found that the top five companies from the overall three sub-sectors in the healthcare industry (Top Glove Corp, IHH healthcare, Kossan Rubber, Kotra Industries Bhd and Careplus Group) also stood up as the top two companies in their respective sub-sectors. One of the profound factors is that these top companies also posit themselves as leading players in the healthcare industry. It is recommended that the study is conducted in different industries in future research by utilizing more advanced techniques and methodology. Further studies should also consider confirming the ranking results using TOPSIS techniques with a different set of methodology. By doing so, the result's robustness can be obtained.

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