International Journal of Business Excellence

ISSN online: 1756-0055 - ISSN print: 1756-0047
https://www.inderscience.com/ijbex

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DOI: 10.1504/IJBEX.2023.10061213

Article History:

Received:	21 May 2023
Last revised:	27 May 2023
Accepted:	05 June 2023
Published online:	04 June 2025

Comparison of the financial performance of Thai public hospitality firms: using the technique for order of preference by similarity to ideal solution

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Abstract: This study applied the 'technique for order of preference by similarity to ideal solution' (TOPSIS), a well-known multiple-criteria decision-making (MCDM) method, to rank the comprehensive financial performance of 13 hospitality firms listed on the Stock Exchange of Thailand based on ten financial ratios from 2018 to 2022. Spearman's rank correlations were performed to investigate the consistency of rankings across years and the association between firm size and TOPSIS rankings. Total assets and revenue were selected to measure firm size. The TOPSIS rankings varied across the years, and no association was found between the TOPSIS rankings and the rankings of assets or revenue. This study provides additional insights into implementing MCDM tools for analysing business performance in Thailand, where their use is limited.

Keywords: financial performance; TOPSIS; multiple-criteria decision-making; MCDM.

Reference to this paper should be made as follows: Thuannadee, S. (2025) 'Comparison of the financial performance of Thai public hospitality firms: using the technique for order of preference by similarity to ideal solution', *Int. J. Business Excellence*, Vol. 36, No. 6, pp.1–15.

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1 Introduction

Tourism is a key economic driver in Thailand (Kasikorn Bank, 2019; Yoopetch et al., 2023), as evidenced by the industry's average annual growth rate of 13% since 2010, and share of approximately 15% of the country's gross domestic product (GDP) (Young and Gabriella, 2019). The industry is expected to continue contributing to GDP growth in the

future due to ongoing investment in infrastructure expansion and supporting policies (EIU, 2022). One main sector of the tourism industry is the hospitality business, encompassing hotels, resorts, and guesthouses, which contributed 6.1% to Thailand's GDP in 2019 through its accommodation and food service activities. Although the COVID-19 pandemic adversely impacted the hospitality business in 2020 and 2021, it is expected to recover as the pandemic subsides due to an expected increase in foreign and domestic travellers, as well as ongoing government initiatives to support the sector. Investing in the hospitality business in Thailand is promising, given the expansion of hotels across the country and the bright outlook for the Thai tourism industry (Lunkam, 2021). Therefore, it is necessary to understand how firms perform in this sector.

Financial ratio analysis is a common method for gaining insight into a firm's financial performance, growth prospects, and stability (Singh and Schmidgall, 2013). These ratios are standardised data obtained by calculating the ratio of two values extracted from financial statements, primarily income statements and balance sheets. Firms can compare their financial ratios across years against other firms or the overall industry average, regardless of their size or capital structure (Türegün, 2022). However, each financial ratio represents only one aspect of financial performance (Kharusi and Başci, 2017). Some ratios can indicate better performance than other firms, while some can reveal worse performance. Therefore, applying tools that can combine several financial indicators to compare the comprehensive financial performance of organisations concurrently is advantageous (Deng et al., 2000; Halkos and Salamouris, 2004). One such tool is multiple-criteria decision-making (MCDM), which has been widely used in various disciplines, including financial performance analyses, as it allows an aggregation approach to evaluate the financial performance of firms (Taherdoost and Madanchian, 2023; Zavadskas et al., 2014; Zopounidi et al., 2015).

The 'technique for order of preference by similarity to ideal solution' (TOPSIS) is a widely adopted MCDM ranking method for analysing financial performance due to its quantitative attributes and simple computational procedure (Hsu, 2013). Its main principle is that the best alternatives are those with the shortest distance from the positive ideal solutions (PISs) and the greatest distance from the negative ideal solutions (NISs) (Athawale and Chakraborty, 2011; Yoon and Hwang, 1995). PIS is the maximum value for a benefit criterion and NIS is the minimum value, whereas the opposite is true for the cost criterion (Ksenija et al., 2017; Obaid et al., 2022). TOPSIS has been used to rank firms' financial performance based on multiple financial ratios in several business sectors (Zavadskas et al., 2014), such as technology (Bulgurcu, 2012), banking (Gupta et al., 2021) and production (Deng et al., 2000). However, only a few studies have used TOPSIS to rank the financial performance of firms in Thailand. This study explores this method in ranking the comprehensive financial performance of hospitality firms in Thailand due to their importance to the Thai economy. This study focuses on the financial performance of 13 firms that primarily provide hospitality services that are listed on the Stock Exchange of Thailand (SET).

Previous research has examined the relationship between the financial performance of organisations and firm size. Sales and assets have been commonly used to represent firm size (Dang et al., 2018; Hashmi et al., 2020). However, previous studies have yielded inconclusive results regarding the association between firm size and financial performance. Some found a positive correlation between firm size and financial performance, such as Hung et al. (2021), Isik et al. (2017) and Serrasqueiro and Nunes (2008). Meanwhile, others, such as Abeyrathna and Priyadarshana (2019) and Niresh and

Velnampy (2014), found no significant correlation. Additionally, Becker-Blease et al. (2010) found that the relationship between size and profitability varied by industry. Therefore, this study aims to investigate the relationship between firm size and TOPSIS rankings to gain further insight into the financial performance of the Thai hospitality business. Specifically, this study uses TOPSIS to analyse hospitality firms' financial performance from 2018 to 2022, with the following objectives:

1 rank the comprehensive financial performance of firms using the TOPSIS method

2 evaluate the stability of the annual TOPSIS rankings

3 examine the relationship between the rankings of total assets, total revenue, and comprehensive financial performance determined by TOPSIS.

2 TOPSIS method

TOPSIS is an MCDM method in which the rankings of the alternatives are based on their proximity to the PISs and the distance from the NISs. This study employs the TOPSIS method proposed by Yoon and Hwang (1995) as follows:

Step 1 Construct the decision matrix

A matrix of size $m \times n$ is constructed as follows, where m is the number of alternatives and n is the number of criteria:

$$\begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{in} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mj} & \cdots & x_{mn} \end{bmatrix} \tag{1}$$

where x_{ij} is the element ij in the decision matrix.

Step 2 Calculate the weight of each criterion

MCDM employs different weighting methods to determine the importance of each criterion. The weighting methods can be categorised into three types: subjective, objective, and hybrid. Subjective weighting methods can be time-consuming, and reaching a consensus is difficult if they rely on multiple decision-makers' viewpoints, which may differ (Gupta et al., 2021). Examples of subjective weighting methods include the analytical hierarchy process (AHP), the Delphi method, and point allocation (Odu, 2019). Objective weighting methods compute criterion weights based on the data in the decision matrix using a specific algorithm (Keshavarz-Ghorabaee et al., 2021). Typical objective weighting methods include standard deviation (SD), coefficient of variance (CV), entropy, mean weight (MW) or equal weight, and criteria importance through inter-criteria correlation (CRITIC). Hybrid methods, such as

multiplication and additive synthesis, combine the characteristics of subjective and objective methods (Odu, 2019; Vavrek, 2019).

Several studies have compared various objective weighting methods to determine the most appropriate method for a specific application. For example, Vavrek (2019) compared five objective weighting methods – CV, CRITIC, MW, SD, and statistical variance process (SVP) – for the TOPSIS method used in evaluating the financial management efficacy of a self-governing administration. Sałabun et al. (2020) conducted a simulation experiment to compare the rankings obtained from various MCDM tools, including TOPSIS, VIKOR, COPRAS, and PROMETHEE II. They applied the equal weight, entropy, and SD methods to weigh the criteria. Nguyen et al. (2020) used grey relational analysis in combination with SD weighting to rank the financial performance of retail businesses registered in Vietnam's stock markets. The SD weighting method was chosen because of its ability to evaluate the market's stability and the security of investments. Keshavarz-Ghorabaee et al. (2021) compared the SD, entropy, and CRITIC methods with their proposed objective weighting method called method based on the removal effects of criteria (MEREC). Şahin (2021) applied six weighting methods, including the SD method, with seven MCDM methods, one of which was TOPSIS, to rank electricity-generating technologies based on sustainability criteria.

This study applies the SD method because of its frequent use in MCDM, as evidenced by the previous reviews, and Vavrek (2019) recommended its use with TOPSIS analysis. The SD approach assigns greater weight to criteria with greater dispersion. The SD weighting calculation for each criterion j is as follows:

$$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m} \left(x_{ij} - \overline{x}_j\right)^2}{m}} \tag{2}$$

$$W_j = \frac{\sigma_j}{\sum_{j=1}^{n} \sigma_j} \tag{3}$$

where σ_j is the SD of the criterion j; w_j is the weight of the criterion j; $i = 1, 2, \ldots, m$; and $j = 1, 2, \ldots, n$.

Step 3 Normalise the decision matrix

Each criterion in the decision matrix is normalised using the vector method (Sałabun et al., 2020) as follows:

$$r_{ij} = \frac{x_j}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \tag{4}$$

where r_{ij} is the element ij in the normalised matrix; $i = 1, 2, \ldots, m$; and $j = 1, 2, \ldots, n$.

Step 4 Calculate the weighted normalised decision matrix

Each element of the normalised decision matrix obtained in Step 3 is weighted as follows:

$$v_{ij} = w_j r_{ij} \tag{5}$$

where v_{ij} is the element ij in the weighted normalised decision matrix; and w_j is the weight of criterion j computed using the SD method in equations (2) and (3).

Step 5 Identify PIS (v^+) and NIS (v^-) values

v^+ and v^- of each criterion are identified from the weighted normalised values as illustrated below.

- For a benefit criterion:

$$\begin{aligned} v_j^+ &= \max\left\{v_{ij}, i = 1, 2, ..., m\right\} \\ v_j^- &= \min\left\{v_{ij}, i = 1, 2, ..., m\right\} \end{aligned} \tag{6}$$

- For a cost criterion:

$$\begin{aligned} v_j^+ &= \min\left\{v_{ij}, i = 1, 2, ..., m\right\} \\ v_j^- &= \max\left\{v_{ij}, i = 1, 2, ..., m\right\} \end{aligned} \tag{7}$$

where v_j^+ is the PIS of criterion j; and v_j^- is the NIS of criterion j.

Step 6 Ranking based on the similarities to the positive-ideal solution

TOPSIS ranks the alternative based on the similarities to positive-ideal solution, which will be represented by C^*, with the alternative having the highest C^* value being assigned the highest rank. The C^* value of each alternative is computed from its distance from the PISs and NISs. The computations are as follows:

$$S_i^+ = \sqrt{\sum_{j=1}^{n}\left(v_{ij} - v_j^+\right)^2} \tag{8}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n}\left(v_{ij} - v_j^-\right)^2} \tag{9}$$

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^+} \tag{10}$$

where S_i^+ is the distance of each alternative from the PISs; S_i^- is the distance of each alternative from the NISs; and C_i^* is the similarities to the positive-ideal solution value of the alternative i.

3 Applying TOPSIS in evaluating multiple financial ratios

Financial ratios are computed from numerical values taken from income statements, balance sheets, and cash flow statements, and are primarily classified into four categories:

liquidity, solvency, efficiency, and profitability. Liquidity ratios compare current assets and current liabilities to determine a firm's ability to cover its short-term obligations using its existing current assets. Typical ratios in this category include working capital, current, and quick ratios. Solvency ratios indicate a firm's ability to pay its long-term debt; the two main ratios in this category are the debt-to-equity (D/E) ratio and time-interest-earned ratio. Efficiency ratios assess a firm's ability to utilise its assets to generate revenue. Examples of efficiency ratios include the turnover of fixed assets, total assets, accounts receivables, and inventory. Profitability ratios quantify a firm's ability to generate income from its revenue, assets, and equity. Typical profitability metrics include return on assets, return on equity, net profit margin, earnings before interest and tax margins, and gross profit margin (Hsu, 2013; Rezaie et al., 2014; Türegün, 2022).

Several studies have examined the use of TOPSIS to analyse financial ratios. For example, Kumar (2016) used TOPSIS to rank ten cement makers in India from 2011 to 2015, based on 16 financial ratios with identical weights and found a weak correlation between the rankings obtained from TOPSIS and those of market capitalisation. Aras et al. (2018) analysed the performance of 55 intermediary institutions classified as bank-origin and non-bank-origin from 2005 to 2016 using TOPSIS with weights calculated from the entropy, survey, equal weights methods, and the average weights of these three methods. In all the examined years, the average rank of bank-origin intermediary institutions was greater than that of non-bank-origin institutions.

Several studies, including Hsu (2013), Inani and Gupta (2017) and Kharusi and Başci (2017), found ranking correlations between years, indicating consistency in firms' relative performance. Hsu (2013) applied TOPSIS with entropy weights to 11 financial ratios of Taiwan's 50 listed optoelectronic firms for 2007 and 2008 and discovered a slight correlation between the ranks of the two years. The TOPSIS by Kharusi and Başci (2017) covered seven financial and non-financial criteria of Oman's financial institutions between 2011 and 2015, and the analysis revealed a significant correlation between the specific years. Inani and Gupta (2017) evaluated the performance of nine IT firms listed on the National Stock Exchange of India via the TOPSIS method with equal weights using ten specific financial ratios from 2011 to 2015. The results revealed that the rankings of most IT firms remained the same from 2011 to 2015.

However, some studies revealed inconsistent rankings across years. For example, Yadav et al. (2016) ranked the financial performance of oil and gas businesses in India using TOPSIS with entropy weight and a total of ten financial ratios. The evaluations of six firms from 2011 to 2013 and seven from 2014 to 2015 revealed changing rankings. Yadav and Kapoor (2018), who used TOPSIS with entropy weights based on ten financial indicators from 2012 to 2016, revealed the fluctuating rankings of automobile businesses listed on the Bombay Stock Exchange of India. Gupta et al. (2021) utilised the CRITIC weight with TOPSIS to compare the rankings of the public sector banks' financial performance in India based on nine financial ratios from 2013 to 2018. They discovered that the rankings of firms varied from year to year; therefore, they used the interval-valued TOPSIS method to determine the rankings of firms based on the combined performance for all five years.

4 Analysis and results

4.1 Ranking the comprehensive financial performance of firms using the TOPSIS method

This study employs TOPSIS to rank the yearly comprehensive financial performance of hospitality firms listed on the SET from 2018 to 2022. After conducting an extensive literature review focusing on the application of MCDM in financial analysis (Hsu, 2013; Kharusi and Başci, 2017; Türegün, 2022; Yadav et al., 2016), ten financial ratios from the four categories: profitability, solvency, liquidity, and efficiency, were selected as the criteria for this study which are presented in Table 1.

Table 1 Financial ratios used in the study

No.	*Financial ratios*	*Ideal value*
1	Return on equity	Max.
2	Return on assets	Max.
3	Net profit margin	Max.
4	Earnings before interest and taxes margin (EBIT margin)	Max.
5	Gross profit margin	Max.
6	Debt to equity ratio (D/E ratio)	Min.
7	Current ratio	Max.
8	Quick ratio	Max.
9	Fixed asset turnover	Max.
10	Total asset turnover	Max.

Table 2 Financial ratios of 2018

Firms	*Return on equity*	*Return on assets*	*Net profit margin*	*EBIT margin*	*Gross profit margin*	*D/E ratio*	*Current ratio*	*Quick ratio*	*Fixed asset turnover*	*Total asset turnover*
C-1	0.0561	1.1752	0.1878	7.8451	27.4545	0.7293	0.4013	0.3191	0.1564	0.1498
C-2	–0.8534	0.5001	–0.8389	0.7246	6.0629	0.4924	3.8219	2.4821	1.9977	0.6901
C-3	17.8179	11.3342	10.4478	0.7246	6.0629	0.9708	1.0967	0.8243	1.1006	0.8456
C-4	5.9185	4.6466	6.8234	9.7543	30.7461	0.9040	1.3527	1.2500	1.1906	0.4764
C-5	9.9508	6.7737	9.4042	17.7172	55.0306	1.9691	0.4407	0.3550	0.4374	0.3823
C-6	6.9696	4.7609	7.6275	14.6995	38.9821	1.9983	1.4146	0.6162	0.6008	0.3239
C-7	0.6448	1.7234	1.3792	6.5601	40.0168	0.6439	1.6531	0.3804	0.4797	0.2627
C-8	4.1285	4.1624	6.0144	10.9780	31.1335	0.6852	3.0825	3.0254	0.6939	0.3792
C-9	33.4717	17.3524	11.7581	14.7610	44.8559	1.3715	0.6225	0.5648	1.5503	1.1756
C-10	15.4481	15.0723	15.0233	18.4435	64.1043	0.2411	3.9818	3.8844	1.8519	0.8172
C-11	8.1692	9.6992	26.4394	32.9011	67.7368	0.0751	8.7191	8.6697	1.4682	0.2948
C-12	1.9363	3.1876	14.6826	25.3627	42.9542	1.0352	0.3398	0.2898	0.1694	0.1257
C-13	17.5873	8.3188	9.6975	16.3596	35.3818	2.5666	1.1315	0.0995	0.7415	0.5085

The financial ratios from 2018 to 2022 of 13 public hospitality firms, referred to as C-1 to C-13, were collected from the SET. For brevity, only the financial ratios of 2018 are presented in Table 2, where rows (i) represent the hospitality firms (i.e., alternatives), and columns (j) represent the ten financial ratios (i.e., criteria).

Table 3 Weights of financial ratios of 2018 to 2022

Financial ratios	*2018*	*2019*	*2020*	*2021*	*2022*
Return on equity	0.1717	0.2594	0.0889	0.0431	0.1344
Return on assets	0.0939	0.0909	0.0392	0.0118	0.0356
Net profit margin	0.1285	0.1611	0.3072	0.3526	0.2577
EBIT margin	0.1616	0.1823	0.3546	0.3518	0.2159
Gross profit margin	0.3311	0.1768	0.1505	0.2202	0.2664
D/E ratio	0.0130	0.0346	0.0098	0.0032	0.0206
Current ratio	0.0413	0.0443	0.0252	0.0084	0.0325
Quick ratio	0.0425	0.0411	0.0222	0.0085	0.0335
Fixed asset turnover	0.0109	0.0068	0.0016	0.0003	0.0020
Total asset turnover	0.0054	0.0028	0.0008	0.0002	0.0015

Table 4 Normalised data for 2018

Firms	*Return on equity*	*Return on assets*	*Net profit margin*	*EBIT margin*	*Gross profit margin*	*D/E ratio*	*Current ratio*	*Quick ratio*	*Fixed asset turnover*	*Total asset turnover*
C-1	0.0012	0.0383	0.0045	0.1345	0.1822	0.1596	0.0358	0.0306	0.0385	0.0721
C-2	–0.0180	0.0163	–0.0203	0.0124	0.0402	0.1077	0.3406	0.2378	0.4922	0.3322
C-3	0.3750	0.3692	0.2524	0.0124	0.0402	0.2124	0.0977	0.0790	0.2712	0.4071
C-4	0.1246	0.1514	0.1648	0.1672	0.2041	0.1978	0.1206	0.1197	0.2933	0.2293
C-5	0.2095	0.2207	0.2272	0.3037	0.3653	0.4308	0.0393	0.0340	0.1077	0.1840
C-6	0.1467	0.1551	0.1843	0.2520	0.2587	0.4372	0.1261	0.0590	0.1480	0.1559
C-7	0.0136	0.0561	0.0333	0.1125	0.2656	0.1409	0.1473	0.0364	0.1182	0.1265
C-8	0.0869	0.1356	0.1453	0.1882	0.2067	0.1499	0.2747	0.2898	0.1710	0.1825
C-9	0.7045	0.5653	0.2840	0.2530	0.2977	0.3001	0.0555	0.0541	0.3820	0.5659
C-10	0.3252	0.4910	0.3629	0.3162	0.4255	0.0527	0.3549	0.3721	0.4562	0.3934
C-11	0.1720	0.3160	0.6387	0.5640	0.4496	0.0164	0.7771	0.8305	0.3617	0.1419
C-12	0.0408	0.1038	0.3547	0.4348	0.2851	0.2265	0.0303	0.0278	0.0417	0.0605
C-13	0.3702	0.2710	0.2343	0.2805	0.2348	0.5615	0.1008	0.0095	0.1827	0.2448

The weight of each financial ratio for each year was calculated using equations (2) and (3) and is presented in Table 3. Ratios related to the profitability metrics carried the highest weight across all five years. For example, gross profit margin was the most heavily weighted ratio in 2018 and return on equity was the most heavily weighted ratio in 2019. In contrast, total asset turnover and fixed asset turnover, which are efficiency indicators, had the lowest and second-lowest weight values across all five years. These

weights reveal differences among firms in their profit-generating capability while also highlighting similarities in how efficiently they utilise their assets to generate revenue over this period of five years.

To avoid excessive repetition, only the normalised and weighted normalised data for 2018 calculated using equations (4) and (5) are presented in Tables 4 and 5, respectively. Data for the remaining years were calculated in the same manner.

Table 5 Weighted normalised data for 2018

Firms	*Return on equity*	*Return on assets*	*Net profit margin*	*EBIT margin*	*Gross profit margin*	*D/E ratio*	*Current ratio*	*Quick ratio*	*Fixed asset turnover*	*Total asset turnover*
C-1	0.0002	0.0036	0.0006	0.0217	0.0603	0.0021	0.0015	0.0013	0.0004	0.0004
C-2	–0.0031	0.0015	–0.0026	0.0020	0.0133	0.0014	0.0141	0.0101	0.0054	0.0018
C-3	0.0644	0.0347	0.0324	0.0020	0.0133	0.0028	0.0040	0.0034	0.0030	0.0022
C-4	0.0214	0.0142	0.0212	0.0270	0.0676	0.0026	0.0050	0.0051	0.0032	0.0012
C-5	0.0360	0.0207	0.0292	0.0491	0.1209	0.0056	0.0016	0.0014	0.0012	0.0010
C-6	0.0252	0.0146	0.0237	0.0407	0.0857	0.0057	0.0052	0.0025	0.0016	0.0008
C-7	0.0023	0.0053	0.0043	0.0182	0.0879	0.0018	0.0061	0.0015	0.0013	0.0007
C-8	0.0149	0.0127	0.0187	0.0304	0.0684	0.0020	0.0114	0.0123	0.0019	0.0010
C-9	0.1210	0.0531	0.0365	0.0409	0.0986	0.0039	0.0023	0.0023	0.0042	0.0031
C-10	0.0558	0.0461	0.0466	0.0511	0.1409	0.0007	0.0147	0.0158	0.0050	0.0021
C-11	0.0295	0.0297	0.0821	0.0911	0.1489	0.0002	0.0321	0.0353	0.0040	0.0008
C-12	0.0070	0.0098	0.0456	0.0702	0.0944	0.0030	0.0013	0.0012	0.0005	0.0003
C-13	0.0636	0.0254	0.0301	0.0453	0.0778	0.0073	0.0042	0.0004	0.0020	0.0013

Table 6 Positive-ideal solutions (v^+) and negative-ideal solutions (v^-) for 2018

Financial ratios	v^+	v^-
Return on equity	0.1210	–0.0031
Return on assets	0.0531	0.0015
Net profit margin	0.0821	–0.0026
EBIT margin	0.0911	0.0020
Gross profit margin	0.1489	0.0133
D/E ratio	0.0002	0.0073
Current ratio	0.0321	0.0013
Quick ratio	0.0353	0.0004
Fixed asset turnover	0.0054	0.0004
Total asset turnover	0.0031	0.0003

All the selected financial ratios, except the D/E ratio, serve as the benefit criteria, with the highest weighted normalised value being the PIS (v^+) and the lowest weighted normalised value being the NIS (v^-). As a cost criterion, the smallest weighted normalised value of the D/E ratio represents the PIS, whereas the largest value represents the NIS. Table 6

presents the PIS and NIS for each financial ratio in 2018 as a representative sample. The results for the other years are not presented for brevity.

C^* values were calculated in equation (10) using the S^+ and S^- values, calculated in equations (8) and (9), respectively. Hospitality firms were then ranked with respect to their C^* values. The same process was repeated to determine the C^* values for each firm from 2019 to 2022. Table 7 presents the C^* values and rankings for each year of the study.

Table 7 The similarities to positive-ideal solution values (C^*)

Firms	*2018*		*2019*		*2020*		*2021*		*2022*	
	C^*	*Rank*	C^*	*Rank*	C^*	*Rank*	C^*	*Rank*	C^*	*Rank*
C-1	0.2080	12	0.6430	10	0.7494	3	0.4568	5	0.5458	8
C-2	0.0725	13	0.6488	9	0.9556	1	0.9661	1	0.4760	11
C-3	0.3105	8	0.7764	5	0.6970	4	0.4825	3	0.6775	4
C-4	0.2980	9	0.7799	4	0.6478	6	0.4546	6	0.4865	10
C-5	0.5074	4	0.7808	3	0.5144	7	0.3633	9	0.6262	7
C-6	0.3798	7	0.6004	12	0.4227	11	0.2264	12	0.1419	13
C-7	0.2976	10	0.7297	7	0.6841	5	0.4218	7	0.6364	5
C-8	0.2974	11	0.7468	6	0.4319	10	0.0952	13	0.2889	12
C-9	0.6382	3	0.0032	13	0.5041	8	0.3378	11	0.7178	2
C-10	0.6492	2	0.8637	2	0.4777	9	0.3899	8	0.7512	1
C-11	0.6724	1	0.9013	1	0.2164	13	0.3392	10	0.5320	9
C-12	0.4428	6	0.6019	11	0.3257	12	0.4684	4	0.6823	3
C-13	0.4655	5	0.7210	8	0.7989	2	0.4831	2	0.6359	6

4.2 Evaluating the stability of the annual TOPSIS rankings

This study uses Spearman's rank correlations to investigate the monotonic association between TOPSIS rankings for each pair of years from 2018 to 2022 (Schober et al., 2018). Table 8 illustrates the Spearman's rank correlation coefficients and corresponding p-values from 2018 to 2022.

Table 8 Spearman's rank correlation coefficients and corresponding p-values of TOPSIS rankings from 2018 to 2022

Years	*2018*	*2019*	*2020*	*2021*	*2022*
2018	1	0.319 (0.289)	–0.549 (0.055)	–0.330 (0.272)	0.495 (0.089)
2019	0.319 (0.289)	1	–0.126 (0.683)	–0.066 (0.835)	0.022 (0.950)
2020	–0.549 (0.055)	–0.126 (0.683)	1	0.709 (0.009)	0.005 (0.993)
2021	–0.330 (0.272)	–0.066 (0.835)	0.709 (–0.009)	1	0.220 (0.470)
2022	0.495 (0.089)	0.022 (0.950)	0.005 (0.993)	0.220 (0.470)	1

Note: The p-values are presented in parentheses.

Spearman's correlation coefficients range from –1 to 1, where –1 denotes a perfect negative monotonic association, 0 denotes no association, and 1 denotes a perfect positive

monotonic association. The Spearman's correlation coefficient levels in this study are interpreted using a conventional scale, according to the one presented by Schober et al. (2018), which defined 0.00–0.09 for negligible correlation, 0.10–0.39 for weak correlation, 0.40–0.69 for moderate correlation, 0.70–0.89 for strong correlation, and 0.90–1.00 for very strong correlation.

From Table 8, seven out of ten pairs demonstrate negligible or weak correlations, with p-values greater than 0.10. Two pairs (2018 and 2020; 2018 and 2022) demonstrate a moderate level of correlation, and one pair (2020 and 2021) demonstrates a strong correlation, with all three having p-values less than 0.10.

4.3 Examining the relationship between the rankings of total assets, total revenue, and comprehensive financial performance determined by TOPSIS

Spearman's rank correlation coefficients were calculated to investigate the pairwise association of three rankings: total assets, total revenue, and the comprehensive financial performance determined by TOPSIS, where total assets and total revenue represent the firm size. Table 9 presents the total asset and revenue rankings for 2018–2022.

Table 9 Rankings of total assets and total revenue for 2018 to 2022

Firms	*Total asset rankings*					*Total revenue rankings*				
	2018	*2019*	*2020*	*2021*	*2022*	*2018*	*2019*	*2020*	*2021*	*2022*
C-1	7	7	7	8	8	11	9	9	8	11
C-2	9	9	9	7	7	5	12	11	11	6
C-3	1	2	1	1	1	1	1	1	1	1
C-4	6	6	4	3	3	4	4	2	3	4
C-5	4	4	5	5	5	2	2	4	4	5
C-6	5	5	6	6	6	6	6	7	7	8
C-7	3	3	3	4	4	3	3	3	5	3
C-8	13	13	13	13	13	13	13	13	13	13
C-9	11	11	10	11	11	10	10	8	9	7
C-10	12	12	12	9	9	12	11	12	12	12
C-11	8	8	8	10	10	8	7	10	10	10
C-12	2	1	2	2	2	7	5	5	2	2
C-13	10	10	11	12	12	9	8	6	6	9

Table 10 presents the Spearman's rank correlation coefficients and their corresponding p-values for the three pairs of rankings: total asset rankings vs. total revenue rankings, TOPSIS rankings vs. total asset rankings, and TOPSIS rankings vs. total revenue rankings, from 2018 to 2022.

Table 10 shows a strong positive correlation between the rankings of total assets and total revenue for all five years (with coefficients ranging from .813 to .874 and p-values < 0.01), indicating a strong positive relationship between the two firm size metrics. This finding suggests that firms with higher assets tend to have higher revenue. However, the correlation between the TOPSIS rankings and the total asset rankings are either weak or negligible every year (with coefficients range from -0.126 to 0.385, p-value > 0.10).

Similarly, the TOPSIS and total revenue rankings for each year exhibit either a weak or moderate correlation (with coefficients ranging from –0.132 to 0.407, p-value > 0.10).

Table 10 Spearman's rank correlation coefficients for total asset rankings, total revenue rankings, and TOPSIS rankings

Years	*Total asset rankings vs. total revenue rankings*		*TOPSIS rankings vs. total asset rankings*		*TOPSIS rankings vs. total revenue rankings*	
	Coefficients	*p-values*	*Coefficients*	*p-values*	*Coefficients*	*p-values*
2018	0.813	0.001	–0.126	0.683	–0.132	0.670
2019	0.874	0.000	–0.082	0.793	0.203	0.505
2020	0.846	0.000	0.027	0.935	0.225	0.459
2021	0.813	0.001	0.385	0.196	0.407	0.170
2022	0.863	0.000	0.143	0.643	0.258	0.394

5 Discussion and conclusions

TOPSIS was employed to rank the financial performance of the hospitality firms listed on the SET from 2018 to 2022, using ten financial ratios selected from four categories: liquidity, solvency, efficiency, and profitability. Only three out of ten pairs demonstrate moderate or strong levels of Spearman's correlation for TOPSIS rankings between two years during 2018 to 2022, with the remaining pairs showing either weak or negligible correlations. This indicates that financial performance was unstable over the years, consistent with previous studies such as Gupta et al. (2021) and Kharusi and Başci (2017) which also reported variations in rankings from year to year. The findings suggest that the hospitality business climate in Thailand is dynamic and volatile, with changing relative performance of firms over time. This can be attributed to a number of factors, such as rapid product innovation, shifting consumer preferences, and globalisation (Mufudza, 2018). Hence, hospitality firms need to constantly adapt their strategies to succeed in the dynamic and competitive environment.

Additionally, although the firm size metrics (total assets and total revenue) used in this study are strongly correlated, the TOPSIS rankings are not related to either of them. This suggests that firm size may not necessarily drive the comprehensive financial performance, which aligns with previous studies such as Abeyrathna and Priyadarshana (2019) and Niresh and Velnampy (2014). This suggests that factors affecting the hospitality business's comprehensive financial performance beyond firm size, such as cost management, working capital management, and efficiency improvement, should be explored.

This study uses the TOPSIS method with SD weights to rank hospitality firms based on ten specific financial ratios. Future research could explore other MCDM tools and weighting methods to rank the financial performance of firms. Additional financial and non-financial metrics can be included as performance measurements. Furthermore, it is worth investigating factors beyond total revenue and assets that influence hospitality firms' comprehensive financial performance. While the limited timeframe of five years for the financial data may impact the generalisability of this research's findings, it does provide additional evidence for the use of MCDM in evaluating Thai businesses, which is currently an area of limited research.

Appendices/Supplementary materials are available on request by emailing the corresponding author.

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