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DISCUSSION ON THE ENTERPRISE COMPETITIVENESS OF TAIWAN'S FINANCIAL HOLDING COMPANY WITH TOPSIS METHOD

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Abstract

TOPSIS evaluation method is the abbreviation of Technique for Order Preference by Similarity to Ideal Solution. It is a multi-criteria evaluation method developed by Yoon and Hwang (1981). This method can be used in n project A $=\{A_i \mid i=1,2,\ldots,n\}$, and evaluate under m evaluation criteria $C=\{C_j \mid j=1,2,\ldots,m\}$. And the performance value of the A_i project in the C_j criterion can be measured in a quantitative way, so that an evaluation matrix can be constructed to determine the best plan selection.

This article uses the TOPSIS method to explore the corporate competitiveness of Taiwan's financial holding companies, and objectively evaluates the order of operating performance of each financial holding company. According to the evaluation indicators selected for financial holding companies in this article, it is found that the top 5 financial holding companies for performance evaluation are China National Bills Financial Holdings (2889), Cathay Pacific Financial Holdings (2882), Fubon Financial Holdings (2881), CITIC Financial Holding (2891) and Development Financial Holding (2883), the results can be used as a reference for the financial industry's operating performance evaluation.

Keywords

TOPSIS, Financial Holdings, Corporate Competitiveness, Business Performance

1. Introduction

Multi-criteria decision making is also called multi-criteria decision aid (Multi-Criteria Decision Aid, MCDA for short) or multi-criteria decision analysis (multi-criteria decision analysis). In an increasingly complex society, decision-making must make trade-offs among many conflicting goals, which cannot be solved by traditional single-criterion decision-making methods (Chen, Chun-Ho, 2015; Deng Zhen-yuan, 2012).

Multiple Criteria Decison-Making (MCDA) has been widely used in complex resource allocation problems, such as transportation planning, energy planning, urban planning, and water resource allocation, based on its rationalization concepts and analysis techniques. (Keeney and Raiffa, 1976)

TOPSIS evaluation method is the abbreviation of Technique for Order Preference by Similarity to Ideal Solution, which is a multi-criteria evaluation method developed by Yoon and Hwang (1981). It can be evaluated under n projects $A=\{Ai \mid i=1,2,\ldots,n\}$ under m evaluation criteria $C=\{Cj \mid j=1,2,\ldots,m\}$, Ai plan is in Cj The performance value of the criterion can be measured in a quantitative way, so as to construct the evaluation matrix and decide the choice of the best plan accordingly.

The evaluation of the performance of financial holding companies is multi-level and not a single criterion. Therefore, this article uses the TOPSIS method to objectively evaluate the performance of financial holdings, and the evaluation results can be used as a reference for the financial industry's operating performance evaluation.

2. Research methods

This section describes the meaning and evaluation steps of the TOPSIS method as follows:

(1) The meaning of TOPSIS (Deng Zhenyuan, 2012)

TOPSIS evaluation method is the abbreviation of Technique for Order Preference by Similarity to Ideal Solution, which is a multi-criteria evaluation method developed by Yoon and Hwang (1981). It can be evaluated under n projects A={Ai│i=1,2,…,n} under m evaluation criteria C={Cj│j=1,2,…,m}, Ai plan is in Cj The performance value of the criteria can be measured in a quantitative way, so that an evaluation matrix can be constructed to determine the selection of the best plan.

The TOPSIS evaluation method assumes that each evaluation criterion has monotony increasing or monotony decreasing utility. Therefore, when the evaluation criterion belongs to the maximization criterion (benefit criterion), the greater the performance value, the greater the utility preference; if the assessment criterion belongs to the minimization criterion (cost criterion), the greater the performance value, the smaller the utility preference.

The basic concept of TOPSIS evaluation method. First define the ideal solution (ideal solution) consisting of the best values of m criteria and the negative-ideal solution (negative-ideal solution) consisting of m worst values; "Furthest solution" analysis logic to find the best plan.

Therefore, when the evaluation criterion belongs to the maximization criterion (benefit criterion), the greater the performance value, the greater the utility preference; if the assessment criterion belongs to the minimization criterion (cost criterion), the greater the performance value, the smaller the utility preference. In order to make utility preferences have a consistent unit of measurement and avoid extreme values affecting the measurement of similarity distance, the TOPSIS evaluation method uses statistical normalization methods to normalize performance values (Van Delft and NijKamp, 1977). [1] Take $g_i(P_i)$ to represent the normalized value of the P_i project in the c_j criterion, then

$$g_i(P_i) = \frac{x_{ij}}{\sum_i x_{ij}} \cdot \forall \mathbf{i}, \mathbf{j} \ldots\ldots (1)$$

After normalization of the performance value of the evaluation matrix, the following normalized evaluation matrix G is obtained:

$$G=[g_i(P_i)]_{nxm} \ldots\ldots (2)$$

Since the importance of the m evaluation criteria is different, they have different weights. The weights $W=\{w_j|j = 1,2, \ldots, m\}$ of M evaluation criteria satisfy the following two conditions (Hwang and Yoon, 1981):

$$\sum_j w_j = 1 \ldots\ldots (3)$$

$$0< w_j <1 \ldots\ldots (4)$$

The ideal solution and the negative ideal solution are both a sample point in the m-dimensional space, and the ideal solution (P^*) is composed of the best performance values of m evaluation criteria, that is, the maximum value of the maximization criterion and the minimum criterion formed by the minimum value, which is defined as follows:

$$P^* = \{(max_i\, v_{ij}|j \in C_b), (min_i\, v_{ij}|j \in C_c)\}$$
$$=\{v_j^*|j = 1, 2, \ldots, m\} \ldots\ldots (5)$$

Where

$$C_b = \{C_j|j = 1, 2, \ldots, m_1\} \ldots\ldots (6)$$

$$C_c = \{C_j|j = 1, 2, \ldots, m_2\} \ldots\ldots (7)$$

In the above formula, C_b is a set composed of m_1 maximization criteria, and C_c is a set composed of m_2 minimization criteria, while satisfying the following conditions:

$$m_1 + m_2 = m \ldots\ldots (8)$$

The negative ideal solution (P^-) is composed of the worst performance values of m evaluation criteria, that is, the minimum value of the maximization criterion and the maximum value of the minimization criterion, which are defined as follows:

$$P^- = \{(min_i\, v_{ij}|j \in C_b), (max_i\, v_{ij}|j \in C_c)\}$$
$$=\{v_j^-|j = 1, 2, \ldots, m\} \ldots\ldots (9)$$

The distance between N items to the ideal solution (P^*) and the negative ideal solution (P^-) can be represented by the m-dimensional Euclidean distance, which is called the separation of the projects degree (separation). The distance between the project P_i and the ideal solution P^* is expressed by the degree of separation S_i^* and is defined as follows:

[1] In order to carry out the comprehensive comparison of n projects, besides the normalization of the unit, the normalization of the direction must be carried out at the same time, that is, the benefit criterion or the cost criterion.

$$S_i^* = \sqrt{\sum_{j=1}^{m}(v_{ij} - v_j^*)^2} \quad \forall i \ldots\ldots(10)$$

The distance between the project P_i and the ideal solution P^* is expressed by the degree of separation S_i^* and is defined as follows:

$$S_i^- = \sqrt{\sum_{j=1}^{m}(v_{ij} - v_j^-)^2} \quad \forall i \ldots\ldots(11)$$

If P_i is closer to P^*, it means that the location of project P_i is better; in other words, the farther P_i is from P^-, it also means that the location is better. It can be measured by the index RC_i^* of relative closeness, which is defined as follows:

$$RC_i^* = \frac{S_i^*}{S_i^* + S_i^-} \quad \forall i \ldots\ldots(12)$$

This index is a measure of the relative position from the ideal solution.

(2) The solution steps of the TOPSIS evaluation method

Step 1: Define the decision problem and the decision maker (or decision group).
Step 2: Develop a feasible plan P={$P_1, P_2, \ldots, P_n$}.
Step 3: Develop evaluation criteria C={$C_1, C_2, \ldots, C_m$} for the decision-making problem.
Step 4: The decision maker or decision group decides the weight W={$w_1, w_2, \ldots, w_n$} of m evaluation criteria.
Step 5: Measure the project performance value X_{ij}(i=1,2,...,n ; j=1,2,...,m), and obtain the evaluation matrix D=[X_{ij}].
Step 6: Normalize the evaluation matrix data to obtain the normalized evaluation matrix G=[$g_i(A_i)$].
Step 7: Establish a weighted normalization matrix V=[v_{ij}], and multiply the full weight of the criterion by the normalized performance value.
Step 8: Determine the ideal solutions P^* and P^- .
Step 9: Calculate the degree of separation S_i^* and P_i.
Step 10: Find the relative proximity RC_i^* (i=1,2,…,n) to the ideal solution.
Step 11: Sorting the pros and cons of the n projects.
Step 12: Make a decision.

3. Empirical Analysis

This section evaluates the performance of 14 financial holding companies in Taiwan. The relevant indicators of financial holding companies are summarized in Table 1, including indicators such as paid-in capital, total assets, total liabilities, operating expenses, operating income, and operating profits. This paper conducts empirical analysis on the basis of TOPSIS method.

Company Name(*: Rating)	Paid-in Capital	Total Assets	Total Liabilities	Operating Expenses	Operating Profit	Operating Income
2880 South China Gold **	1104.65	25995.44	24302.68	61.45	35.48	109.55
2881 Fubon Gold **	1150.03	69687.36	64429.7	136.15	161.29	1121.19
2882 Cathay Gold **	1339.65	89619.66	83530.74	190.2	217.99	1211.44
2883 Development Fund *	1495.73	25338.18	22877.14	16.55	44.17	579.56
2884 Jade Mountain Gold *	1018.55	21218.6	19673.14	61.47	56.82	124.93
2885 Yuan Daikin *	1882.02	22949.19	20641.77	103.28	70.47	241.08
2886 Mega Gold **	1359.98	34917.34	31767.49	72.99	82.85	151.98
2887 New gold	1070.67	17353.95	15777.57	54.38	39.83	100.62
2888 Shin Kong Gold *	1064.12	34399.45	32675.01	63.55	122.06	701.36
2889 National Ticket Gold *	278.67	2516.3	2149.62	7.53	7.47	15
2890 Wing Fung Gold *	1106.01	16239.93	14828.68	48.69	33.09	81.32
2891 CITIC Gold **	1983.03	54338.55	51068.3	153.53	132.24	761.32
2892 First Gold *	1221.64	26554.74	24536.96	99.39	51.59	150.98
5880 Alloy Kujin *	1220.27	34435.01	32331.16	60.74	45.51	122.96

Table 1 Main Indicator Data of Taiwan Financial Holding Company in Q1 2018
(Unit: 100 million dollars)

Sources: 1. Taiwan Stock Exchange (http://wwwc.twse.com.tw);
2. Public Information Observatory (http://www.tybio.com.tw/mops/taiyen_mop.htm);
3. Summary of this study.

After the empirical analysis of the TOPSIS method, it is known that the optimal solution distance, worst solution distance, optimal solution proximity and operational performance evaluation ranking of the 14 financial holding companies are shown in Table 2.

Company Name (*: Rating)	Optimal solution distance D+	Worst solution distance D-	Optimal solution Proximity C	Rating ranking
2880 South China Gold **	1.4315	0.2667	0.1571	12
2881 Fubon Gold **	1.2534	0.8321	0.399	3
2882 Cathay Gold **	1.2453	1.0253	0.4516	2
2883 Development Fund *	1.2101	0.5501	0.3125	5
2884 Jade Mountain Gold *	1.4094	0.2693	0.1604	11
2885 Yuan Daikin *	1.3908	0.4189	0.2315	7
2886 Mega Gold **	1.3862	0.3824	0.2162	8
2887 New gold	1.4151	0.2554	0.1529	14
2888 Shin Kong Gold *	1.2824	0.5376	0.2954	6
2889 National Ticket Gold *	1.0616	1.2382	0.5384	1
2890 Wing Fung Gold *	1.414	0.2598	0.1552	13
2891 CITIC Gold **	1.2823	0.7017	0.3537	4
2892 First Gold *	1.4291	0.2952	0.1712	10
5880 Alloy Kujin *	1.414	0.3232	0.186	9

Table 2: The evaluation of the optimal (inferior) solution, the degree of proximity to the optimal solution, and the ranking of the evaluation of Taiwan's financial holding companies in Q1 2018

Source: Estimates for this study

It can be seen from Table 2 that among the 14 financial holding companies investigated under the existing index conditions, Guopiao Financial Holdings (2889) has the best performance, followed by Cathay Financial Holdings (2882), and then Fubon Financial Holdings (2881) , CITIC Financial Holdings (2891) and Development Financial Holdings (2883). The order of poor performance is Taishin Financial Holdings (2887), Yongfeng Financial Holdings (2890) and South China Financial Holdings (2880).

4. Conclusion

The corporate competitiveness of financial holdings-operating performance evaluation is a multi-factor consideration, and through the analysis of the TOPSIS evaluation method, it will be possible to objectively evaluate the order of evaluation of each financial holding. According to the evaluation indicators of financial holding companies in this article, it is found that the top 5 financial holding companies for performance evaluation are China National Bills Financial Holdings (2889), Cathay Pacific Financial Holdings (2882), Fubon Financial Holdings (2881), CITIC Financial Holdings Taishin Financial Holdings (2891) and Kaifa Financial Holdings (2883). The order of poor performance is Taishin Financial Holdings (2887), Yongfeng Financial Holdings (2890) and South China Financial Holdings (2880). The results can be used as a reference for the financial industry's operating performance evaluation.

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