IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN:2278-487X, p-ISSN: 2319-7668. Volume 25, Issue 11. Ser. 2 (November. 2023), PP 24-30
www.iosrjournals.org

Research On The Competitiveness Of China Southern Airlines Based On Grey Correlation Analysis

Lin Yan，Guo Chihui

School of Air Transportation, Shanghai University of Engineering Science, China

Abstract:
With the development of the civil aviation transportation industry, people's demand for it is constantly increasing. While domestic airlines in China are facing opportunities, they are also facing significant challenges. In the increasingly fierce market competition, if airlines want to remain invincible for a long time, they must formulate scientific and objective strategic strategies to enhance their competitiveness. The paper constructs a competitiveness evaluation system, using entropy method and grey correlation analysis method to provide a comprehensive competitiveness evaluation model for China Southern Airlines, in order to reflect the development status of China Southern Airlines and provide reference for the operation and management of airlines.

Keywords –*grey correlation, airlines, competitiveness*

Date of Submission: 29-10-2023 Date of Acceptance: 09-11-2023

I. INTRODUCTION

The air transportation industry is not only an important part of China's economic development, but also an important pillar of national competitiveness. Since entering the 21st century, China has become a major civil aviation country, ranking second in the world in terms of passenger and total transportation turnover. In the environment where the situation in Covid-19 is gradually easing, the future of China's aviation industry is also gradually becoming clear. However, in recent years, due to the volatility of the international situation, fluctuations in international oil prices, and the impact of exchange gains and losses on corporate finance, as well as the rise of low-cost airlines, Chinese airlines are facing enormous pressure and urgently need to improve their competitiveness.

II. DEVELOPMENT STATUS OF CHINA SOUTHERN AIRLINES

China Southern Airlines was established on February 1, 1991, headquartered in Guangzhou, and is the largest airline in China. As of December 2021, China Southern Airlines has operated over 860 passenger and cargo transport aircraft, operated over 1000 routes, and provided over 500000 seats. Its annual passenger transportation volume has also ranked first among Chinese airlines for 43 consecutive years. In addition, China Southern Airlines also operates Asia's largest hangar, largest operational control center, and aviation food production base.

China Southern Airlines holds an important position in the Chinese aviation market, but in the increasingly competitive context, it has also encountered various challenges and threats. How to reasonably evaluate its own competitiveness, formulate competitive strategies, and improve business efficiency is the problem that Southern Airlines needs to solve today.

III. CONSTRUCTION OF AIRLINE COMPETITIVENESS EVALUATION SYSTEM

Factors affecting the competitiveness of airlines

(1) Operational capability

Operational capability can be reflected and analyzed through indicators such as business cycle, accounts receivable turnover, and current asset turnover. Operational capability can reflect the level of operational efficiency of an enterprise, mainly reflected in the management's ability to manage the company and the efficiency of resource utilization. Therefore, operational capability is also the ability to monetize, reflecting the operational status of the enterprise and an important component of its competitiveness.

(2) Service quality

Service quality is a characteristic of a company's products meeting potential needs. For airlines, factors such as flight safety, flight attendant services, check-in services, information service capabilities for ticket purchases, refunds, and changes all constitute the overall service quality of the enterprise. The service quality of an airline is judged by passengers and determined by their satisfaction.

(3) Enterprise size

The civil aviation transportation industry has economies of scale and network economy, which indicates that in order for civil aviation companies to gain greater advantages in the air transportation market, they must obtain a larger operating scale. Generally speaking, large enterprises represent advanced productivity and production methods, which can utilize economies of scale in production and marketing to further promote production.

Competitiveness evaluation indicators for airlines

This article constructs an evaluation index system for the competitiveness of airlines, with primary indicators including operational capacity, enterprise scale, and service quality. The second level indicators include sales gross profit margin, return on equity, operating profit margin, total asset growth rate, operating revenue growth rate, net profit growth rate, total assets, turnover, flight schedules, customer loyalty, satisfaction, and passenger occupancy rate. As shown in Table 1:

Table 1：evaluation index system for airline competitiveness

primary indicators	secondary indicators	calculation formula (meaning)
operational capability	sales gross profit margin(x1)	(sales revenue - operating costs)/sales revenue × 100%
	return on equity(x2)	annual net profit/year-end net assets × 100%
	operating profit margin(x3)	operating profit/total business income × 100%
	total assets growth rate(x4)	asset growth this year/total assets of the previous year × 100%
	operating revenue growth rate(x5)	current year's revenue growth/total revenue of the previous year × 100%
	net profit growth rate(x6)	current net profit growth/previous period net profit × 100%
enterprise size	total assets (100 million yuan)(x7)	current assets+fixed assets+intangible assets+other assets
	turnover (100 million tons per kilometer)(x8)	transport weight × average haul distance
	flight number (thousand times)(x9)	number of flights flown within a year
service quality	customer loyalty (x10)	the trend of customers making repeated purchases of enterprise products
	satisfaction (x11)	customer satisfaction index for service

	passenger occupancy rate (x12)	actual number of carriers/available seating capacity

The definitions of each evaluation indicator are as follows:

Sales gross profit margin: It is an important indicator to measure the profitability of a listed company. The higher the indicator, the stronger the company's profitability. Because this indicator reflects the relationship between sales prices and operating costs, and does not consider the profit impact of other factors, it can intuitively reflect the company's competitiveness.

Return on equity: refers to the ratio of profit to average shareholder equity. The higher the indicator, the higher the return on investment, and it is an important indicator to measure a company's profitability.

Operating profit margin: Measures the net operating profit from a company's business revenue, indicating the company's ability to generate profits. The higher the indicator, the stronger the profitability of the enterprise.

Total asset growth rate: It is the ratio of the total asset growth of a company at the end of the year to the total asset value of the previous year. It is an important indicator for analyzing the company's capital accumulation and development capabilities for the year.

Operating revenue growth rate: It is the ratio of the current year's operating revenue growth to the total operating revenue of the previous year, reflecting the growth and changes in the company's operating revenue. It is a direct manifestation of the company's operating situation and can reflect changes in the company's operating situation more quickly.

Net profit growth rate: refers to the growth rate of a company's current net profit compared to the previous period's net profit. The larger the indicator value, the stronger the company's business ability. It reflects the expansion speed of enterprises to achieve maximum value and is an important indicator of their development ability and growth status.

Total assets: refers to the sum of all resources owned or controlled by a certain economic entity that can bring economic benefits.

Turnover: Refers to the total output of transportation and production by an airline company within a certain period of time, consisting of passenger turnover and cargo turnover. It can comprehensively reflect the total scale of air transportation and is also an important factor in the operational status of airlines.

Flight number: Refers to the total number of annual flights of an airline, which can reflect the air flight workload of the airline.

Customer loyalty: refers to the tendency of the aviation service department to generate favorable feelings and preferences for passengers throughout the entire process of serving them, leading to repeated purchases.

Satisfaction: also known as customer satisfaction index, it is an indicator used to measure the degree of customer satisfaction with the business, and it is the degree of matching between customer expectations and customer experience.

Passenger occupancy rate: refers to the ratio of the number of passengers carried by the aircraft to the number of seats provided by the aircraft. Usually, a passenger occupancy rate of 60% can be profitable, and a high passenger occupancy rate reflects that the enterprise can attract more customers and the higher customer loyalty.

Evaluation Method for Competitiveness of Airlines

Due to the complex composition factors of airline competitiveness, which have a certain degree of fuzziness and grayness, it is suitable to use grey correlation analysis method for analysis and evaluation.

The evaluation steps of grey correlation analysis method are as follows:

(1) For m evaluation schemes and n evaluation indicators, construct a comparison sequence:

C_i(j)={ $C_i(1)$， $C_i(2)$， …$C_i(n)$}

i=1, 2,..., m represents the number of schemes, j=1, 2, ..., n represents the number of indicators for each scheme.

Select the various indicators of the evaluated enterprise as the comparison sequence. Use the optimal values of each evaluation enterprise indicator as a reference sequence.

The reference sequence is C_0(j)={ $C_0(1)$， $C_0(2)$， …$C_0(n)$}

(2) Data preprocessing

Due to the different formats and meanings between indicators, in order to ensure the accuracy and convenience of system analysis, the collected raw data is subjected to dimensionless processing to eliminate dimensionality and reduce interference.

C_j=$\frac{C_i(\mathrm{j})}{C_0(\mathrm{j})}$

(3) Determine indicator weights

This article uses the entropy method to determine weights, and the weight sequence is represented as:

$$W = [w_1, w_2, \ldots\ldots, w_n]$$

(4) Calculate difference sequence$|C_k^* - C_k^i|$, two-stage minimum difference sequence minmin$|C_k^* - C_k^i|$, two-level maximum search sequence maxmax $|C_k^* - C_k^i|$.

(5) Calculate correlation degree

Calculate the correlation coefficient between each parameter in each comparison sequence and the corresponding parameter in the reference sequence $\xi_i(k)$:

$$\frac{\text{minmin}\left|C_k^* - C_k^i\right| + \rho\text{maxmax}|C_k^* - C_k^i|}{\left|C_k^* - C_k^i\right| + \rho\text{maxmax}|C_k^* - C_k^i|}$$

Among them: ρ ($0 \le \rho \le 1$) is the resolution coefficient, which controls the degree of differentiation. In general, take ρ= 0.5.

By correlation coefficient $\xi_i(k)$, construct correlation coefficient matrix:

$$\begin{bmatrix} \xi_1(1) & \xi_1(2) & \cdots & \xi_1(m) \\ \xi_2(1) & \xi_2(2) & \cdots & \xi_2(m) \\ \vdots & \vdots & \ddots & \vdots \\ \xi_n(1) & \xi_n(2) & \cdots & \xi_n(m) \end{bmatrix}$$

According to formula $r_i = \sum_{k=1}^{n} w_i\, \xi_{ik}$, calculate the evaluation results and sort them. The larger r_i, the better the scheme.

IV. EMPIRICAL STUDY ON THE COMPETITIVENESS OF SOUTHERN AIRLINES

In order to objectively reflect the actual operational situation of Southern Airlines, this article selected various data from the three major airlines in 2021 as the basic data, as shown in Table 2:

Table 2：various airline indicators in 2021

indicator	China Southern Airlines	China Eastern Airlines	Air China
X1	-2.54	-19.22	-15.17
X2	-17.90	-23.78	-27
X3	-2.54	-18.2	-22.33
X4	-0.97	1.47	5.05
X5	9.87	14.48	7.23
X6	11.63	3.2	15.50
X7	3229.48	2865.48	2984.15
X8	212.11	201.94	177.13
X9	563.32	592.61	371.82
X10	83.3	79.0	85.4
X11	85.4	83.9	85.9
X12	71.25	67.71	68.63

Based on the evaluation index data of the three major airlines, the optimal value of the evaluation index was determined and a reference sequence for the optimal value was constructed, as shown in Table 3:

Table 3：optimal reference sequence

X1	X2	X3	X4	X5	X6
-2.54	-17.90	-2.54	-0.97	7.23	3.2
X7	X8	X9	X10	X11	X12
2865.48	177.13	371.82	79.0	83.9	67.71

Based on the correlation coefficient obtained by the grey correlation analysis method, a correlation coefficient matrix is constructed, as shown in Table 4:

Table 4： correlation coefficient matrix

indicator	China Southern Airlines	China Eastern Airlines	Air China
X1	1	0.333333	0.397711
X2	1	0.436242	0.333333
X3	1	0.387204	0.333333
X4	0.333333	0.456753	1
X5	0.43701	1	0.333333
X6	0.613772	0.333333	1
X7	1	0.333333	0.4259
X8	1	0.632321	0.333333
X9	0.790314	1	0.333333
X10	0.603774	0.333333	1
X11	0.666667	0.333333	1
X12	1	0.333333	0.403189

From Table 4, it can be seen that in 2021, China Southern Airlines led other airlines in terms of sales gross profit margin, return on equity, operating profit margin, total assets, turnover, and passenger occupancy rate. However, China Southern Airlines' total asset growth rate was not as high as other airlines, while operating revenue growth rate, net profit growth rate, flight number, customer loyalty, and satisfaction were in the middle. Using the entropy method, objective indicator weights were obtained, as shown in Table 5:

Table 5： weight of competitiveness evaluation indicators

indicators	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12
weight	0.10	0.09	0.11	0.08	0.09	0.07	0.09	0.07	0.07	0.07	0.07	0.10

According to formula $r_i = \sum_{k=1}^{m} w_i \, \xi_{ik}$, obtain the competitiveness level of each airline and rank them, as shown in Table 6:

Table 6： comprehensive competitiveness of the three major airlines in 2021

airline	result (correlation degree r_i)	sort
China Southern Airlines	0.803176	1
China Eastern Airlines	0.482643	3
Air China	0.550642	2

From the evaluation results, it can be seen that among the three major airlines, China Southern Airlines is the most comprehensively competitive airline.

V. SUGGESTIONS FOR THE DEVELOPMENT OF CHINA SOUTHERN AIRLINES

Adjusting the debt structure of enterprises

From the previous analysis, it can be seen that low profitability is one of the reasons restricting the competitiveness of China Southern Airlines, and to improve profitability, improving debt repayment ability is essential. Southern Airlines needs to strictly control the scale of its current liabilities, adjust its debt structure, convert some short-term debts into long-term debts, sort out its assets, and optimize assets with low utilization or poor asset quality. At the same time, China Southern Airlines should also develop a reasonable debt repayment plan, reduce unnecessary expenses, improve sustainable development capabilities, and integrate its own resources, improve operational efficiency, and enhance its profitability.

Develop appropriate marketing strategies

From the customer satisfaction of China Southern Airlines, it can be seen that there are shortcomings in customer maintenance. Therefore, China Southern Airlines should establish a customer-centric business philosophy, explore and analyze the composition, flow direction, and preferences of frequent travelers, and develop corresponding reward measures based on the consumption trends, ticketing methods, and habits of frequent travelers to improve customer loyalty and enhance market competitiveness. In addition, China Southern Airlines should also clarify its marketing focus, leverage the business benchmark role of its route network, focus on service quality, provide comprehensive brand services, and create brand advantages that differentiate it from other airlines.

Enhancing core operational capabilities

In the air transportation industry with extremely high homogenization of services and products, in order to seize the opportunity in competition, it is necessary to have an advantage in resource allocation and integration. For internal resources, China Southern Airlines needs to enhance its hub operation capacity, focusing on the operation of hub international airports such as Beijing Capital Airport, Shanghai Hongqiao (Pudong) Airport, and Guangzhou Baiyun Airport, cultivating the sustainable development capacity of hub airports, and making plans and predictions to select the most suitable aircraft type for different routes to reduce operating costs. For external resources, with the internationalization of the air transportation industry, China Southern Airlines should actively establish strategic alliances, share resources with foreign airlines, fully utilize the advantages of alliance members to expand profits, and learn from the advantages and advanced experience of foreign airlines, in order to enhance its core competitiveness.

VI. CONCLUSION

With the gradual recovery of the global economy, China's air transportation industry is steadily growing, the market is gradually expanding, and it has enormous potential. The competitiveness level of China Southern Airlines is higher than that of China Eastern Airlines and Air China International. However, in the future, Southern Airlines still needs to further adjust its corporate debt structure, develop appropriate marketing strategies, enhance its core operational capabilities, and further enhance its competitiveness.

REFERENCES

[1]. Dai Shu Analysis Of China's Air Freight Competitiveness Level Based On BP Neural Network - From The Perspective Of Airlines Journal Of Yueyang Vocational And Technical College, 2019, 34 (1): 103-108

[2]. Zhang Xiaonan Research On The Dynamic Relationship Between Enterprise Capability And Enterprise Competitiveness Scientific Progress And Countermeasures, 2011, 28 (17): 72-75

[3]. Yinan, Huo Guoqing Research On The Core Competitiveness Of Chinese Airlines Modernization Of Management. 2007 (6): 21-23

[4]. Joyce M.W. Low, Byung Kwon Lee Effects Of Internal Resources On Airline Competitiveness Journal Of Air Transport Management 2014 (36): 23-32

[5]. David Gillen, William Morrison Bunding, Integration And The Delivered Price Of Air Travel: Are Low Cost Carriers Full Service Competitors Journal Of Air Transport Management, 2003 (9): 15-23