International Journal of Civil Engineering and Machinery Manufacture

Volume 5, Issue 1, March, 2020

Publisher: HongKong New Century Cultural Publishing House
Address: Unit A1, 7/F, Cheuk Nang Plaza, 250 Hennessy Road, Wanchai, Hong Kong
Tel: 00852-28150191
Fax: 00852-25445670

Contents

Comprehensive Evaluation of the Competitiveness of Listed Companies in the Retail Industry

Yifan Wu
School of Finance, Anhui University of Finance and Economics, Bengbu, 233000, China

Abstract: This article takes 20 A-share listed companies in the retail industry as a research sample, selects the relevant financial data of each company for three years from 2016, 2017, and 2018, and selects a total of 10 from the four aspects of profitability, solvency, operating capacity and development potential Index, first use factor analysis to calculate the comprehensive scores of the sample companies for each year, based on this, use the weighted Topsis method to get the optimal factor program closeness, and then sort them. Finally, the competitiveness of the selected 20 listed companies is evaluated. Overview, the results show that the overall competitiveness of listed companies in the retail industry is not strong, and there is much room for improvement in the entire industry.

Keywords: Retail industry; Competitiveness; Factor analysis; Topsis method

1. Introduction

In recent years, due to the rapid development of Internet technology, more and more people use network technology to meet their various needs in life. Online shopping is a very important part of it, which has caused traditional offline retail. A certain impact, but at the same time, relying on the Internet, the use of big data, artificial intelligence and other advanced technologies to upgrade the production, distribution and sales of goods, and the online service, offline experience and modern logistics, a new model of deep integration of retail ("New Retail") came into being. The retail industry is a very important industry in a country. It involves all aspects of people's lives. It is one of the main employment channels in a country and region. It can reflect the economic situation of a country and region to a certain extent. Today's new retail model is even more an important industry combining investment with high technology. Listed companies in the retail industry are advanced representatives in the entire retail field. Their development and continuous improvement have played a very important role in China's retail industry. Therefore, research on the competitiveness of listed companies in the retail industry is very meaningful, and it can not only help many Entrepreneurs carry out specific analysis and comparison, and can also provide relevant suggestions for consumers when making many consumption choices, and can also provide relevant investors with some effective information during the evaluation process. In view of this, this article selects 20 listed companies in the retail sector of A shares, based on the financial data of each company, comprehensively evaluates the competitiveness of the sample companies by using factor analysis method and weighted Topsis method, and finally competes against listed companies in the retail industry. Suggestions for improving the power.

2. Overview of Research Literature

It is found through literature review that many scholars have conducted relevant research on listed companies in the retail industry before this. Xiao Changyuan [1] based on the 2017 annual report, selected six indicators reflecting the company's financial capabilities, established a reasonable regression model, and studied the impact of financial indicators of listed companies in the retail industry on their stock prices. Through a series of empirical analysis, it is found that the stock prices of retail companies are related to the net assets per share, current ratio and asset-liability ratio. Ding Zhouxiang [2] selected current assets, fixed assets, and operating costs as input indicators, main business income and operating profit as output indicators, and applied DEA models to 30 listed companies in the retail industry in 2010, 2014, and An empirical study of the overall efficiency of the three phases in 2017 found that the e-commerce business has outstanding operating efficiency, the department store industry accounts for a large proportion in the retail industry, and there is room for improvement in the operating efficiency of listed companies in the retail industry. Wang Chongcai [3] used the factor analysis method to comprehensively evaluate and rank the competitiveness of relevant financial indicators of 35 listed companies in the retail industry in China from the as-

pects of profitability, solvency, cost and expense ratio, and found that the overall list of listed companies in the retail industry Not competitive. Liu Xin, Ni Ming, Liu Quanbo [4] used panel data models to study the influencing factors of the capital structure of listed companies in the wholesale and retail industry, and found that profitability, company size, growth, and asset turnover showed positive correlations with capital structure. Wang Ye [5] established an evaluation system for listed companies in the retail industry in China. Using factor analysis to evaluate the financial performance of listed companies, he found that competition among companies is very fierce. [6]The new retail business development mode is conducive to improving rankings. The overall level of development is not high and there is imbalance between regions [7].

3. Construction of Evaluation System

3.1. Research thinking

Based on the existing related research, according to the division of Flush Software and Oriental Fortune.com and the relevant definition of the retail industry in China, fully consider the integrity, availability, authenticity and validity of the data, Companies with the ST and * ST logos and listed companies with incomplete financial data during the research period finally identified 20 listed companies in the retail industry as samples. [8]Select four primary indicators, which are profitability, solvency, operating capacity and development potential, while selecting ten secondary indicators, which are weighted return on net assets (X1), gross profit margin (X2), net profit margin (X3), current ratio (X4) quick ratio (X5), asset-liability ratio (X6), accounts receivable turnover ratio (X7), total asset turnover ratio (X8), operating income growth rate (X9), Non-net profit growth rate (X10). An empirical study of the competitiveness of 20 listed companies in the retail industry in China from 2016 to 2018 is shown in Table 1.

Table 1. Table of comprehensive evaluation index system

First-level indicators	Secondary indicators	Variable
Profitability	Weighted return on net assets	X1
	Gross profit margin	X2
	Net profit margin	X3
Solvency	Current ratio	X4
	Quick ratio	X5
	Asset-liability ratio	X6
Operating capacity	Accounts receivable turnover ratio	X7
	Total asset turnover ratio	X8
Development potential	Operating income growth rate	X9
	Non-net profit growth rate	X10

3.2. Data source and processing

According to research needs, this article selected 20 listed companies in the retail industry, taking the three-year research cycle of 2016, 2017, and 2018 as the data source from the annual financial report data disclosed by Oriental Fortune.com. If the original data in Oriental Fortune Network is used directly, subsequent factor analysis may deviate from the real situation. In order to ensure the effectiveness of the empirical analysis, the original data is first standardized to eliminate errors caused by different dimensions, self-variation, or large values. Use the following formula:

$$X_i^* = (X_i -) / \sqrt{\sigma_i}$$

Among them, Xi is the original financial data disclosed in Oriental Fortune, u_i is the sample mean, σ_i is the sample variance, and Xi* is the financial data after standardization. The data after standardized processing was entered into SPSS software for factor analysis.

4. Empirical Analysis

4.1. Factor analysis

The factor analysis method is a multivariate statistical analysis method based on the study of the dependence relationships in the correlation matrix of the indicators, and attributed some variables with overlapping information and intricate complex relationships to a few unrelated comprehensive factors.

4.1.1. KMO and bartlett inspection

Before performing the factor analysis, first of all, the subjects should be tested for adaptability, namely KMO and Bartlett's spherical test. If the KMO test value is greater than 0.5, it means that the data can be factor analyzed, and the Bartlett test significance level is based on 0.05. Use SPSS25.0 to perform factor analysis on the relevant data of the sample companies in 2016, 2017, and 2018, and the results are shown in Table 2.

Table 2. KMO test and bartlett spherical test

Years	KMO inspection	Bartlett test		
		Approximate chi-square	Df	Sig.

2016	0.528	146.590	2016	0.528
2017	0.569	153.672	2017	0.569
2018	0.533	148.056	2018	0.533

According to the results in Table 2, the KMO test value in 2016 was 0.528, the KMO test value in 2017 was 0.569, and the KMO test value in 2018 was 0.533, which are all greater than 0.5, and the Bartlett test values of the relevant data for three years are all 0, which is far less than the critical value of 0.05, indicating that the selected data has a certain correlation and can be studied by factor analysis.

4.1.2. Extract factor variables

Based on the above analysis, SPSS 25.0 software was used to conduct principal component analysis on the cross-section data of each year, and the characteristic values and variance contribution rates of each common factor were obtained, as shown in Table 3.

Table 3. Eigenvalue and variance contribution rate of factor analysis

Years	Factor	Initial eigenvalue			Extract load sum of squares			Sum of squared rotation loads		
		Total	Variance contribution rate /%	Cumulative variance contribution rate /%	Total	Variance contribution rate /%	Cumulative variance contribution rate /%	Total	Variance contribution rate /%	Cumulative variance contribution rate /%
2016	1	4.334	43.337	43.337	4.334	43.337	43.447	3.260	32.603	32.603
	2	1.940	19.404	62.741	1.940	19.404	62.741	2.419	24.187	56.791
	3	1.317	13.166	75.907	1.317	13.166	75.907	1.912	19.116	75.907
2017	1	4.627	46.266	46.266	4.627	46.266	46.266	3.227	32.269	32.269
	2	2.126	21.265	67.531	2.126	21.265	67.531	2.480	24.804	57.073
	3	1.383	13.827	81.358	1.383	13.827	81.358	2.428	24.285	81.358
2018	1	4.481	44.809	44.809	4.481	44.809	44.809	2.897	28.968	28.968
	2	1.846	18.460	63.269	1.846	18.460	63.269	2.586	25.858	54.826
	3	1.174	11.739	75.008	1.174	11.739	75.008	2.018	20.182	75.008

According to the results in Table 3, after retaining factors with eigenvalues greater than 1, the cumulative variance contribution rate is larger in each year. The cumulative variance contribution rate in 2016 is 75.907%, and the cumulative variance contribution rate in 2017 is 81.358%. The cumulative variance contribution rate in 2018 is 75.008%, and the cumulative variance contribution rate over three years is more than 75%. The effect of extracting the common factor is better. The common factor of each year can explain most of the original information and can be used as a good the factor represents the selected 10 indicators, so as to achieve the purpose of factor analysis and dimensionality reduction.

4.1.3. Factor rotation

After the principal factors are extracted, a load matrix is established. SPSS 25.0 software uses the maximum variance method to perform orthogonal rotation iterations of the factor 25 times, which makes the factor load coefficient polarize to 0 or 1, which makes the common factor more representative and practical. Since the analysis process is similar in each year, only the relevant data of listed companies in the retail industry in 2017 are used as an example to explain it, as shown in Table 4.

Table 4. Common factor load matrix table after rotation

Evaluation index	Load		
	Common factor 1	Common factor 2	Common factor 3
Weighted return on net assets	0.298	Weighted return on net assets	0.298
Gross profit margin	0.445	Gross profit margin	0.445
Net profit margin	0.254	Net profit margin	0.254
Current ratio	0.955	Current ratio	0.955
Quick ratio	0.964	Quick ratio	0.964
Asset-liability ratio	-0.877	Asset-liability ratio	-0.877
Accounts receivable turnover ratio	-0.504	Accounts receivable turnover ratio	-0.504
Total asset turnover ratio	-0.072	Total asset turnover ratio	-0.072
Operating income growth rate	0.025	Operating income growth rate	0.025
Non-net profit growth rate	-0.080	Non-net profit growth rate	-0.080

Using the principal component analysis method to extract the financial indicators in 2017, three common factors can be obtained, and the variance contribution rates of the three common factors are 32.269%, 24.804%, and 24.285%. The first common factor has higher load values on the current ratio, quick ratio and asset-liability

ratio, which are 0.955, 0.964, and -0.877, respectively. It is named the solvency factor, and the second common factor is in the weighted net. There are higher load values on the return on assets, the growth rate of operating income and the growth rate of non-net profit, which are 0.816, 0.898, and 0.770 respectively. They are named development potential factors, the third common factor net interest rate and total asset turnover. There are higher load values on the rate, which are -0.776 and 0.933, respectively, and they are named as profitability factors. The cumulative contribution rate of the above three common factors reaches 81.358%, and the overall explanation level is high.

4.1.4. Calculate the factor score

Using the regression method to estimate the factor scoring coefficients, a factor scoring coefficient matrix for the corresponding year can be obtained, and the factor scores are calculated using the EXCEL tool according to the data in the table and the linear relationship see Table 5.

Table 5. Factor score coefficient matrix in 2017

Secondary indicators	Scoring coefficient		
	1	2	3
Weighted return on net assets	0.004	0.324	-0.024
Gross profit margin	0.012	0.160	-0.205
Net profit margin	-0.079	0.018	-0.361
Current ratio	0.374	-0.011	0.179
Quick ratio	0.371	-0.061	0.134
Asset-liability ratio	-0.313	0.126	-0.025
Accounts receivable turnover ratio	-0.076	-0.064	0.152
Total asset turnover ratio	0.165	0.090	0.494
Operating income growth rate	-0.116	0.386	-0.070
Non-net profit growth rate	-0.019	0.355	0.218

Combining the factor scoring coefficients in Table 5, the three common factors extracted in 2017 are represented by a linear combination of the 10 selected financial indicator variables, thereby obtaining the scoring function of each factor in 2017:

$$F1 = 0.004X1 + 0.012X2 - 0.079X3 + 0.374X4$$
$$+0.371X5 - 0.313X6 - 0.076X7$$
$$+0.165X8 - 0.116X9 - 0.019X10$$
$$F2 = 0.324X1 + 0.160X2 + 0.018X3 - 0.011X4$$
$$-0.061X5 + 0.126X6 - 0.064X7$$
$$+0.090X8 + 0.386X9 + 0.355X10$$
$$F3 = -0.024X1 - 0.205X2 - 0.361X3 + 0.179X4$$
$$+0.134X5 + 0.126X6 - 0.064X7$$
$$+0.057X8 + 0.215X9 - 0.091X10$$

Based on the weight of each common factor's variance contribution rate, calculate the comprehensive score of the operating performance of the listed companies in the retail industry. Factor comprehensive scores for 2016, 2017, and 2018 are obtained, and the results are shown in Table 6.

Table 6. Factor comprehensive score and ranking

company	2016 year		2017 year		2018 year	
	Score	Ranking	Score		Score	Ranking
Red Star Macalline Group	-0.47588	16	-0.92213	20	0.163788	7
Beijing Cuiwei	-0.4821	18	-0.21951	12	-0.29593	14
Baida Group	-0.28655	13	-0.5504	18	0.368477	5
Andeli	-0.48124	17	-0.61715	19	-0.79041	20
Chongqing Department Store	-0.09017	8	0.44138	5	-0.52421	18
Zhe Jiang Dong Ri	-0.13003	9	-0.50385	16	0.306002	6
Guofang Group	-0.51223	19	-0.03761	10	-0.50919	17
Hefei Department Store	-0.35223	15	-0.53531	17	-0.43561	16
Doctorglasses Chain	1.27759	1	1.314707	1	0.951329	3
Guangzhou Grandbuy	-0.28538	12	0.132976	9	-0.22623	11
Global Top E-Commerce	1.25813	2	0.811433	2	-0.03431	8
Wangfujing Group	0.000303	6	0.263374	7	-0.24266	12
Better Life Commercial Chain Share	-0.66091	20	-0.31445	13	-0.66471	19
Shanghai Join Buy	-0.26844	11	-0.46633	14	1.260241	1
Hangzhou Jiebai Group	-0.21392	10	-0.18095	11	-0.24865	13
Shanghai Xujiahui Commercial	0.691079	4	0.469446	4	0.474154	4
Zhejiang China Commodities City Group	-0.29749	14	-0.49519	15	-0.20744	10
Beijing Capital Retailing Group	-0.00648	7	0.193108	8	-0.10567	9

Nanji E-Commerce	0.955949	3	0.787171	3	1.119426	2
Yonghui Superstores	0.36	5	0.429289	6	-0.35839	15

According to Table 6, it can be found that Xujiahui ranked fourth in three years, and is the only company in the sample company that has not changed in ranking. The three companies, Red Star Macalline Group, Baida Group, Shanghai Join Buy, have made significant progress. It went through a process from negative to positive. In contrast, Chongqing Department Store, Global Top E-Commerce, Yonghui Superstores have made significant progress, and their comprehensive factor scores have changed significantly. It shows that due to the change of time, the competitiveness of various companies is also constantly changing. It is accidental to analyze the competitiveness of listed companies only by using factor analysis. Therefore, this article selects the financial data of these sample companies for three years.

4.2. Comprehensive evaluation of topsis method

The Topsis method is a sorting method that approximates the ideal solution. It is a systematic evaluation method suitable for multi-index and multi-plan decision analysis. By constructing the "positive ideal solution" and "negative ideal solution", multiple decision-making schemes are ranked. The Topsis method calculates the closeness of a scheme to the positive ideal solution by calculating the weighted Euclidean distance between the scheme and the positive ideal solution and the negative ideal solution. In this article, the factor analysis method is used first, but because the rankings of most companies are changing, it is difficult to reach a comprehensive conclusion with this method alone. On this basis, the Topsis method is used to make a final evaluation of the comprehensive scores of the three companies for three years. The specific steps are as follows:

Use the factor scores of the 20 listed companies as an evaluation index for the company to form a brand new index system.

In order to eliminate the impact of the different dimensions of the indicators on the results, vector normalization processing is needed for the new indicators, and a standardized matrix $S = (S_{ti})_{m*n}$ is constructed.

Among them, $S_{ti} = y_{ti} / \sqrt{\sum_{i=1}^{n} y_{ti}^2}$, y_{ti} is the company's comprehensive score for each year.

According to the practical significance, it can be known that the higher the comprehensive score obtained by the above factor analysis method, the better the company's operating performance and the stronger its competitiveness. Therefore, this type of scoring index is larger and better. Based on the new S_{ti} matrix, the best and worst vectors can be determined.

The optimal vector is written as $S^{+} = (S_{\max,1}, S_{\max,2}, \ldots, S_{\max,n})$;

The worst vector is written as $S^{-} = (S_{\min,1}, S_{\min,2}, \ldots, S_{\min,n})$;

The Euclidean distance is used to calculate the distance between the i evaluation object and the best and worst solutions:

$A^{+} = \sqrt{\sum_{i=1}^{n} (S_{\max,j} - S_{ji})^2}$; $A^{-} = \sqrt{\sum_{i=1}^{n} (S_{\min,j} - S_{ji})^2}$;

The relative closeness of each scheme to the positive ideal solution is expressed as:

$C_i = A_i^{-} / (A_i^{-} + A_i^{+})$, $0 \le Ci \le 1$, The larger C_i, the better the closeness to the positive ideal solution, the better the business performance, and the stronger the competitiveness.

On the basis of the factor analysis method described above, the Topsis method is used to sort, and the results are shown in Table 7.

Table 7. Comprehensive evaluation results and rankings

Company	Ci	Ranking	Company	Ci	Ranking
Doctorglasses chain	0.9172	1	Guangzhou grandbuy	0.3388	11
Nanji e-commerce	0.8269	2	Baida group	0.3302	12
Global top e-commerce	0.6583	3	Hangzhou jiebai group	0.2827	13
Shanghai xujiahui commercial	0.6410	4	Guofang group	0.2486	14
Shanghai join buy	0.4766	5	Red star macalline group	0.2425	15
Yonghui superstores	0.4586	6	Beijing cuiwei	0.2392	16
Beijing capital retailing group	0.4017	7	Zhejiang China commodities city group	0.2236	17
Wangfujing group	0.3962	8	Hefei department store	0.1692	18
Chongqing department store	0.3845	9	Better life commercial chain share	0.1640	19
Zhe jiang dong ri	0.3413	10	Andeli	0.0964	20

4.3. Analysis of results

According to the factor analysis method combined with the weighted Topsis method, and carefully comparing the relevant data in Tables 6 and 7, we can find that the comprehensive factor scores of each year are relatively good and the rankings are stable, or the companies whose scores show an upward trend and their rankings

have improved. The closeness ranking of the best factor scheme is relatively high. For example, two listed companies, Doctorglasses Chain and Yonghui Superstores, are ranked among the best in terms of comprehensive factor scores in each year, and their scores have been stable for three years. Therefore, they rank among the top two factors in the proximity of the optimal factor scheme. But it is undeniable that the company's factorglass score has dropped slightly and its ranking has also fallen back. The company must find its own problems in time and compare it with better listed companies to achieve greater progress. The Shanghai Join Buy company's progress is very obvious. Especially in 2018, the factor comprehensive score ranked first. The factor comprehensive scores of the previous two years were negative. In 2017, it also regressed on the basis of 2016. However, in the third year, the comprehensive factor score increased rapidly, from negative to positive. In contrast, those companies that do not have a high comprehensive factor score in each year or a large fluctuation in the scores in each year are not very good in the ranking of the optimal factor scheme closeness. For example, Chongqing Department Store, a company that regressed very quickly in 2018. Although it scored well in the first two years, it has come to the midstream in the closeness ranking of the best factor schemes due to the significant regression in the third year. The two companies, Andeli and Better Life Commercial Chain Share, have been ranked lower in the comprehensive factor scores, and both are negative, so they are ranked in the bottom of the ranking of the best factor schemes.

As a whole, of the selected sample companies, only one listed company had an optimal factor solution closeness greater than 0.9, and only 10% of the listed companies had an optimal factor solution closeness greater than 0.8. The proportion of companies in the range of 0.4 to 0.8 is also relatively small, only 25%, while 60% of companies have an optimal factor program closeness in the range of 0.1 to 0.4. This shows that the overall strength of the retail industry is not very strong, the development within the industry is uneven, and there is a lot of room for improvement.

5. Conclusions and Recommendations

5.1. Conclusion

First, there is a large gap in the competitiveness of different companies in the industry. The closeness of the best factor program of the top company is 0.9172, while the closeness of the best factor program of the last company is only 0.0964.

Second, competition within the industry is clear. Most companies have their rankings changed every year, and many companies have large changes in their overall factor scores each year.

Third, the overall development of the retail industry is not very good. Among the sample companies selected, the most close to the optimal factor solution is in the range of 0.1 to 0.4, indicating that most companies are not competitive and need to be further improved.

5.2. Recommendations

The retail industry has a long history in China, and it also plays a vital role in people's daily lives. Under the "Internet +" background, traditional retail forms have been affected to a certain extent, and new retail models have developed rapidly. The retail industry is facing huge challenges, and the industry is facing gradual changes and transformations, which require joint efforts from multiple sides. First, the entire industry needs to use Internet technology to effectively combine online and offline retail methods, and the two channels promote each other. Secondly, the government should increase relevant investment, actively introduce outstanding talents, and contribute to the improvement of the competitiveness of the retail industry. In the end, companies should strengthen their core competitiveness, learn from better companies in the same industry, constantly improve themselves, and occupy a place in the market.

References

[1] Xiao C.Y. Financial indicators of listed companies in the retail industry and their investment optimization strategies. Journal of Huanggang Vocational and Technical College. 2019, 21(04), 122-125.

[2] Ding Z.X. Research on the operating efficiency of China's retail listed companies. Xi'an University of Science and Technology. 2019.

[3] Wang C.C. Analysis of competitiveness factors of listed companies in china's retail industry. Industrial Technology & Economy. 2010, 29(01), 133-137, 154.

[4] Liu X., Ni M., Liu Q.B. An empirical analysis of the factors affecting the capital structure of listed companies in china's wholesale and retail industry. Modernization of Shopping Malls. 2009, (08), 101-102.

[5] Wang W. Research on financial performance evaluation and influencing factors of listed companies in china's retail industry. Xi'an University of Technology. 2017.

[6] Liu M.M. Research on financial performance evaluation of wangfujing based on factor analysis. Taiyuan University of Technology. 2019.

[7] Qiu C. Research on the operational efficiency of listed retail enterprises under the background of "internet +". Nanjing University of Science and Technology. 2018.

[8] Yang S. Research on the relationship between M & A types and performance of listed companies in retail industry. Xihua University. 2017.