The Management Performance Evaluation of Chinese Listed Cultural Companies Based on Factor Cluster Analysis

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Abstract

With the liberalization of national policies related to the cultural industry and the increasing improvement of China's market economy system, the cultural, sports and entertainment industry rose rapidly and developed rapidly, making a lot of contributions to the improvement of the national economy, the prosperity of the capital market and the optimization of the supply structure.In order to study the operating performance of listed companies in the cultural industry in Shanghai and Shenzhen, 51 cultural listed companies were selected as samples, and SPSS 23 software was used to conduct factor analysis and K-means cluster analysis, focusing on the factors with great influence on the operating performance of enterprises.The research results show that the operating performance gap of listed Chinese cultural companies is large, and the overall operating performance is not very optimistic, and the suggestions are put forward based on different factors.

Keywords

Cultural industry; Business performance; Factor analysis,K-means cluster analysis.

1. Introduction

Culture is the blood of the nation and the spiritual home of the people. When China pointed out that planning the development of the 14th Five-Year Plan, it should attach great importance to the development of cultural industry. The vigorous development of cultural industry is an important basis for meeting the people's diverse cultural needs of the people, and an inevitable requirement to stimulate cultural creativity and promote the construction of a strong cultural country[1]. As a vane of the development of the industry, the listed companies in the cultural industry play a very important leading role in stimulating the innovation and entrepreneurship vitality of the cultural industry, improving the international competitiveness of the backbone cultural enterprises, cultivating new cultural business forms, and ensuring the sustainable development of the cultural industry.The study and analysis of the operating performance of listed companies in the cultural industry is not only conducive to promoting the high-quality development of the cultural industry, but also is of great significance for improving the competitiveness of listed companies in the cultural industry, improving the cultural soft power, as well as for the development of the whole national economy[2].

The enterprise is the main participant in the market economy, and the operating performance of the enterprise is the operating benefit and operator performance during a certain operating period. Among which, the operating performance is mainly reflected in the profitability, growth ability, operating ability and solvency of the enterprise.Within the listed company, the operating performance research of the company provides convenience to the shareholders. The corresponding reward and punishment system can be formulated accordingly to maximize the value of the company; the operating performance of the listed company can grasp its own

development and grasp the industry status to find gaps, learn from each other and improve the management level[3].

2. Literature Review

2.1. Research on Enterprise Business Performance Evaluation

Li ZW (2017) carried out empirical analysis of Suning Commerce Business enterprises based on the factor analysis method, obtained the ratio of operating performance, operating efficiency and capital structure of e-commerce enterprises, and put forward feasible suggestions for the use of e-commerce enterprises to improve their business performance[4]; Chen W et al (2017) used the DEA method to build the operating performance evaluation index system and model of China's high-end equipment manufacturing enterprises, found out the main reasons affecting the operating performance of enterprises, and put forward relevant countermeasures and suggestions[5]; Shu Y et al (2018) conducted performance evaluation and management suggestions based on dynamic fuzzy evaluation and BP neural network method[6]; Sun W et al (2020) based on the operating performance evaluation system of "Internet + agriculture" listed companies based on the entropy method and put forward relevant suggestions[7]; Geng ST et al (2020) to establish a comprehensive evaluation system for the performance of listed tourism companies based on factor analysis, and to introduce a diagnostic model of obstacle factors to analyze the performance obstruction factors of listed tourism companies[8]; Cho et al (2021) Use the importance-Performance Performance Analysis (IPA) and Analytic Hierarchy Process (AHP) to establish an index management performance evaluation index system[9], Put forward relevant suggestions for the quality management, financial stability and production management of the South Korean agricultural food processing company.

2.2. Research on the Business Performance Evaluation of Cultural Enterprises

Zhu EQ (2017) constructed a performance evaluation index system of listed companies in the cultural industry, used factor analysis and entropy method to analyze the solvency, operation, profitability and development power of listed companies, and obtained the performance evaluation scores and ranking of listed companies[10]; Wu H et al (2018) took the financial data of 198 Chinese CSI A-share cultural and creative listed companies as the research object, built the operating performance evaluation index system from four aspects of profitability, growth ability, operation ability and scale effect, and used the entropy method to comprehensively evaluate the operating performance of the cultural and creative listed companies [11]; He JQ et al (2020) selects 67 listed cultural and creative companies from provinces and cities along China's "Belt and Road", consider regional heterogeneity and environmental error, construct a three-stage Meta-Frontier DEA model, evaluate their business performance and give countermeasures and suggestions to improve the business performance of listed cultural and creative enterprises[12]; Li M (2021) uses the principal component analysis method to comprehensively evaluate the operating performance of listed Chinese cultural media companies, and obtain the total score of the operating performance of listed cultural media companies. On this basis, the analysis method of multiple regression is used to clarify the influencing factors of the operating performance of listed cultural media companies[13].

In general, the index system and evaluation method of listed company business performance evaluation is more mature, the existing literature using factor analysis, DEA, hierarchical analysis, entropy method, from different perspectives, built the financial and non-financial indicators, the in-depth research of the business performance, made rich results, but the performance evaluation of cultural listed companies is less.

3. Research Design

3.1. Selection of Indicators

According to the industry classification of China Securities Regulatory Commission (2012 edition), eight listed companies: ST and ST * and missing data were excluded from cultural listed companies, and finally 51 cultural listed companies in China were selected as samples.This paper evaluates the financial performance of enterprises from four aspects: profitability, growth ability, operation ability and solvency. A total of 10 indicators are selected to build a factor analysis and evaluation system. The specific evaluation index system is shown in Table 1.

Table 1. Evaluation index system of the listed cultural companies

Level 1 indicators	Secondary indicators	variable symbol
profitability	Return on equity (%)	X1
	Return on Total Assets (%)	X2
	Earnings per share (Yuan)	X3
Growth ability	Net asset growth rate of (%)	X4
	Total assets growth rate of (%)	X5
operation capacity	Current asset turnover rate	X6
	Total assets turnover rate	X7
debt paying ability	current ratio	X8
	quick ratio	X9
	equity ratio	X10

3.2. Data Source

This paper will select relevant data for two years to compare the stability of the business performance of cultural listed companies. However, because the overall national economy was affected by the COVID-19 epidemic in 2020, the data from 2018 and 2019 were selected as the observation value, and the index data in 2018 and 2019 through RESSET database, and 398 groups of data were selected in two years.To ensure the stability and credibility of the study, the data will be assimilated and normalized in this paper.Of the 10 metrics selected, X1to X9 all belong to the positive indicators, the property rights ratio is the reverse index, the smaller the index, the enterprise financial performance is good.In order to ensure the unified evaluation standards, the property right ratio is assimilated[14]. Meanwhile, this paper standardized z-score for various data through SPSS 23 software.

4. Factor Analysis

4.1. Applicability Test

Before factor analysis, each index data needs suitability tested and the results are shown in Table 2.

Table 2. KMO and Bartlett tests

		2018 year	2019 year
Bartlett's spherical degree test	KMO	0.677	0.621
	Approximate chi-square	2077.00	2562.920
	free degree	45	45
	significance	0.000	0.000

The KMO values in 2018 and 2019 were 0.679 and 0.621 respectively, all greater than 0.6. Generally, the KMO value greater than 0.5 is suitable for factor analysis, and the significance of the Bartlett spherical degree test in these two years was 0, indicating that there is some correlation between the original index data of the 51 listed cultural companies, and factor analysis can be conducted.

4.2. Factor Extraction and Naming

In this paper, the factor analysis of the index data of cultural listed companies in 2018 and 2019, first with the sample of cultural listed companies in 2018.

The factor load matrix was obtained by principal component analysis, and then the number of extracted factors is determined based on the size of the characteristic value. The specific results are shown in Table 3, and it can be seen that the four factors with the characteristic value greater than 1 contribute 91.213% to the total variance, indicating that the four factors retain about 91.213% of the original 10 indicators and can better represent the 10 indicators as public factors, so as to achieve the purpose of dimensionality reduction.

Table 3. Interpretation of the total variance

ingredient	Initial characteristic value			Extract the sum of square of the load			Sum of square of the rotating load		
	amount to	variance percentage	accumulate%	amount to	variance percentage	accumulate%	amount to	variance percentage	accumulate%
1	3.700	37.004	37.004	3.700	37.004	37.004	2.816	28.162	28.162
2	2.614	26.137	63.141	2.614	26.137	63.141	2.718	27.184	55.346
3	1.619	16.190	79.331	1.619	16.190	79.331	1.805	18.049	73.395
4	1.188	11.883	91.213	1.188	11.883	91.213	1.782	17.819	91.213
5	.340	3.401	94.614						
6	.188	1.875	96.490						
7	.153	1.535	98.024						
8	.118	1.176	99.200						
9	.067	.669	99.869						
10	.013	.131	100.000						

The factors were extracted and named, the factor model was rotation transformed by the maximum variance method, and they were named and interpreted according to the rotating component matrix.The details are presented in Table 4, the first public factor F1 with the return on equity X1(0.941), Return on Total Assets X2(0.957), earnings per share X3(0.943) three indicators are more correlated, because these several indicators are related to enterprise profitability, so the public factor F1 were named the profit factor; the second public factor F2 with current ratio X8(0.955), quick ratio X9(0.976) and equity ratio X10(0.894) three metrics are highly correlated and therefore F2 will be named the debt repayment factor; the third public factor F3 with the net asset growth rate X4(0.908), Total assets growth rate X5(0.946) two metrics are highly correlated and therefore F3 will be named the growth factor; the fourth public factor F4 with the Current asset turnover rate X6(0.920), Total assets turnover rate X7(0.922) two metrics are highly correlated and therefore F4 will be named the operating factor.

Table 4. Composition matrix after rotation[a]

	ingredient			
	1	2	3	4
Return on equity	0.941	-0.002	0.162	0.080
Return on Total Assets	0.957	-0.052	0.117	0.084
earnings per share	0.943	-0.037	0.169	0.178
net asset growth rate	0.277	-0.039	0.908	0.019
Total assets growth rate	0.103	-0.095	0.946	0.005
current asset turnover rate	0.112	-0.180	-0.038	0.920
Total asset turnover rate	0.152	-0.085	0.061	0.922
current ratio	-0.011	0.955	-0.026	-0.152
quick ratio	-0.026	0.976	-0.042	-0.121
equity ratio	-0.047	0.894	-0.089	-0.047

4.3. Each Factor Score and The Comprehensive Score Were Calculated

Based on the component score coefficient matrix obtained from the factor analysis, as detailed in Table 5, and finally we list the scoring formula for the three common factors[15].

$$F_1 = 0.367X_1 + 0.382X_2 + 0.353X_3 - 0.047X_4 - 0.126X_5$$
$$-0.065X_6 - 0.067X_7 + 0.009X_8 + 0.001X_9 - 0.008X_{10} \tag{1}$$

$$F_2 = 0.008X_1 - 0.014X_2 + 0.007X_3 + 0.038X_4 + 0.018X_5$$
$$+0.04X_6 + 0.084X_7 + 0.361X_8 + 0.373X_9 + 0.346X_{10} \tag{2}$$

$$F_3 = -0.064X_1 - 0.099X_2 - 0.058X_3 + 0.529X_4 + 0.581X_5$$
$$-0.020X_6 + 0.042X_7 + 0.036X_8 + 0.032X_9 + 0.003X_{10} \tag{3}$$

$$F_4 = -0.068X_1 - 0.075X_2 - 0.009X_3 + 0.005X_4 + 0.014X_5$$
$$+0.551X_6 + 0.563X_7 + 0.023X_8 + 0.047X_9 + 0.085X_{10} \tag{4}$$

Table 5. Component score coefficient matrix

	ingredient			
	1	2	3	4
Return on equity	0.367	0.008	-0.064	-0.068
Return on Total Assets	0.382	-0.014	-0.099	-0.075
earnings per share	0.353	0.007	-0.058	-0.009
net asset growth rate	-0.047	0.038	0.529	0.005
Total assets growth rate	-0.126	0.018	0.581	0.014
current asset turnover rate	-0.065	0.040	-0.020	0.551
Total asset turnover rate	-0.067	0.084	0.042	0.563
current ratio	0.009	0.361	0.036	0.023
quick ratio	0.001	0.372	0.032	0.047
equity ratio	-0.008	0.346	0.003	0.085

In order to comprehensively evaluate the operating performance of various cultural listed companies, a comprehensive score model should be constructed.In this paper, the weighted average gives the comprehensive score formula:

$$F=0.37004F_1+0.26137F_2+0.16190F_3+0.11883F_4 \qquad (5)$$

Of these, F indicates the composite score, F_i represents each public factor.

4.4. Interpretation of Result

Another factor analysis of the indicators in 2019 to calculate each factor score and comprehensive score is shown in Table 6. Next, the operating performance of each company is ranked according to the comprehensive score (top 10), and the specific results are shown in Table 7.

Table 6. Weight of various factors for the comprehensive scores of cultural listed companies

Factor name	2018	2019
Profit factor	37.004%	31.230%
Debt repayment factor	26.137%	35.149%
Growth factor	16.190%	11.918%
Operation factor	11.883%	15.983%

Table 7. Operating performance ranking table

ranking	corporate name	2019 year					corporate name	2018 year				
		F1	F2	F3	F4	F		F1	F2	F3	F4	F
1	THINKINGDOM	0.66	0.29	3.83	0.39	1.65	THINKINGDOM	0.97	2.85	0.75	0.15	1.24
2	Beijing Hualubaina Film & Tv	-0.26	-0.41	3.06	-0.97	0.82	Beijing Enlight Media	1.53	0.88	0.13	-1.01	0.70
3	Zhejiang Guangsha Songcheng	2.19	-1.43	0.89	-0.06	0.76	Mango Excellent Media	-0.21	-0.12	4.16	0.98	0.68
4	Performance Development	0.77	-0.04	0.68	0.40	0.52	Tvzone Media	0.10	1.89	0.05	0.44	0.59
5	Mango Excellent Media	0.14	0.81	-0.42	3.95	0.49	Hengdian Entertainment	0.62	-0.17	0.27	2.18	0.49
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47	Beijing Jetsen Technology	-0.53	-0.58	-0.67	-0.19	-0.51	Zhejiang Guangsha	0.01	-1.14	0.09	-1.26	-0.43
48	Zhejiang Huace Film & Tv	-0.55	-0.85	-0.63	-0.20	-0.55	Col Digital Publishing Group	-1.95	0.85	0.22	0.28	-0.43
49	Beijing Jingxi Culture & Tourism	-1.68	-0.86	-0.13	0.14	-0.69	Huayi Brothers	-0.12	-1.02	-0.41	-0.72	-0.47
50	Huayi Brothers	-1.24	-0.76	-0.87	-0.60	-0.88	Huawen Midea	-1.28	-0.52	-0.25	-0.39	-0.70
51	Zhejiang Talent Television And Film	-0.92	-1.11	-1.11	-1.72	-1.06	Zhejiang Talent Television And Film	-1.27	-1.14	-0.28	-0.81	-0.91

Profitability factors reflect the profitability of enterprises, the higher the profit factor score, the better the financial performance, Table 7 shows that, The profit level of cultural listed companies in China is relatively low, We can conclude from Table 6, The profit factor weight in the proportion of the comprehensive score is higher, So the companies want to improve their business performance, Emphasis can be placed on improving business performance by improving profitability; The better the debt repayment factor score, The better the solvency of the enterprise, And the debt repayment factor weight is also large, For example, the THINKINGDOM, even if the profitability level is not the best, But as it far outperformed other

companies, it topped its operating performance for two consecutive years, Debt is an important guarantee for sustainable operation of enterprises; Growth factors indicate the growth ability of enterprises, From Table 7, we can see that the growth ability of cultural listed companies is low, Growth ability weight is also higher, It shows that it also has an impact on business performance, for example, Mango Excellent Media, While it has little advantage in its other metrics, but it is among the top with its high growth ability; Operation factors reflect the turnover efficiency of the enterprise production and operation, The higher the operating factor score, Explain that the enterprise asset structure allocation is reasonable, The higher the production and operation efficiency, The operating level of cultural listed companies in China is uneven, Comprehensive ranking, no matter at which level, all have companies with good operating ability performance, there are also poorly performing companies, improving turnover efficiency is also one of the ways to improve business performance.

5. K-Means Clustering Analysis

5.1. Cluster Analysis

Cluster analysis can classify samples with similar characteristics.In order to comprehensively evaluate the operating performance of each company, the K-mean clustering analysis was further conducted.Clustering analysis was performed using the SPSS 23 software using two-year factor mean and comprehensive score mean as variables[16]. As a result, China's cultural listed companies can be divided into stable development type, capital management type, inefficient type and high-speed development type.The details are shown in Figure 8.

Table 8. Cluster members

class	corporate name	number
The first kind	Songcheng Performance Development, Hengdian Entertainment, Beijing Enlight Media, China Television Media, Time Publishing And Media, Anhui Xinhua Media, Shandong Publishing & Media, Changjiang Publishing &Media, China Film, Qingdao City media, China Science Publishing & Media, Southern Publishing And Media, Guangzhou Jinyi Media, Shanghai Lisheng Racing, Chinese Universe Publishing And Media Group, Astro-Century Education & Technology, Xinhua Winshare Publishing & Media, Shanghai Fengyuzhu Culture Technology, North Ernunited Publishing & Media, Jiang Su Phoenix Publishing and Media Group, Omnijoi Media, Wanda Film Holding, Zhejiang Huamei Holding	23
The second kind	THINKINGDOM, Beijing Hualubaina Film & Tv, Chengdu B-Ray Media, Duzhe Publish & Media, Tvzone Media, Zhejiang Sunriver Culture, Col Digital Publishing Group	7
The third class	Zhejiang Guangsha, China South Publishing & Media Group, Shanghai Film, Wasu Media Holding, Meisheng Cultural & Creative, China Publishing & Media Holdings, Wuhan Ddmc Culture&Sports, Ciwen Media, H&R Century, Shanghai Xinhua Media, Hubei Radio & Television Information Network, Cultural Investment Holdings, Huawen Midea, Hunan Huakai Cultural And Creative, Shanghai New Culture Media Group, Beijing Jetsen Technology, Zhejiang Huace Film & Tv, Beijing Jingxi Culture & Tourism, Huayi Brothers, Zhejiang Talent Television And Film	20
The fourth class	Mango Excellent Media	1

5.2. Interpretation of Result

The first category includes Songcheng Performance Development and Hengdian Entertainment and other 23 enterprises. These earnings maintained earnings remained earnings, all keep the positive numbers, and these companies rely on stable profitability, ranked relatively stable in

the industry. The second category includes the THINKINGDOM, Beijing Hualubaina Film & Tv and other 7 enterprises. These companies score with higher debt repayment factors, it shows that their capital management ability is strong and make up for the other deficiencies. In the industry is basically in the middle and upstream of the whole, especially with the THINKINGDOM, its debt repayment factor scored far ahead, making it number one for two consecutive years. The third category includes Zhejiang Guangsha, China South Publishing & Media Group and other 20 enterprises, their main feature is the generally low operating factor scores, it can be concluded that their assets are inefficient. Therefore, they are inefficient enterprises. The fourth category is only a Mango Excellent Media, it has very high growth factor scores, far more than the peer enterprises. So it is a rapidly developing enterprise.

6. Conclusion and Suggestions

Through the factor analysis and clustering analysis of 51 cultural listed companies in China, the results show that, China's listed companies between cultural companies operating performance gap is large and the overall is not very optimistic, By using the average of the combined score, The THINKINGDOM score of 1.44, The second-place Mango Excellent Media only scored 0.58, The last place in Zhejiang Talent Television And Film is-0.98. Among the factors affecting the company's operating performance, Profit factors and debt repayment factors have a relatively large weight, but most companies are weak in profitability and solvency. Growth ability is also one of the ways to improve business performance, but in addition to the Mango Excellent Media, the growth capacity of other enterprises needs to be strengthened.

Since cultural services are the tertiary industry in China, it also plays an important role in promoting the growth of the national economy. According to the above analysis and conclusions, in order to give full play to the role of cultural listed companies and improve the operating performance of the listed cultural companies, the following suggestions are made: In terms of profitability, Listed cultural companies should improve their product quality, optimize the production and product structure, So as to enhance the competitive advantage and profit level of enterprises; In terms of the solvency, Enterprises should combine their own characteristics and the advantages of national policy support, expand the access channels for enterprise funds, it will comprehensively optimize the capital structure, Strengthen fund management; In terms of growing capacity, Companies can constantly innovate, increase the depth and breadth of cultural services and make cultural services to maintain vitality forever, inject vitality into the growth of enterprises; In terms of operating capacity, Chinese cultural listed companies should strengthen the management of current assets such as inventories and accounts receivable and the management of total assets.

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