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Analysis of Financial Performance of Listed Chinese Medicine Companies Based on Factor Analysis

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Abstract

The predecessors selected several indicators from four aspects of "profitability", "asset quality", "debt risk" and "business growth" to analyze the financial performance indicators of enterprises. However, most of the indicators are general indicators and lack of indicators reflecting the characteristics of the pharmaceutical industry, especially the traditional Chinese medicine industry. Therefore, this paper selects indicators from four perspectives of "profitability", "risk and asset quality", "growth capacity" and "operating capacity" to conduct an analysis in a new way. We then took the data from the companies' 2019 annual reports.The R-type factor analysis method in factor analysis is adopted, and the internal relationship is found by the algorithm from the correlation matrix.Extract information and simplify indicators to reduce dimension, and retain information to reflect the weight of an indicator to the greatest extent.Finally, the scores of Chinese medicine enterprises are obtained, and the financial performance of listed Chinese medicine enterprises is analyzed by the important influencing factors.

Keywords

Factor analysis , Financial analysis, Data analysis, Common factor extraction.

1. Introduction

With the development of my country's economy, my country's existing corporate laws and regulations have been gradually improved, and the evaluation index system for companies has also been gradually improved. Many scholars have carried out research from multiple perspectives on the analysis of corporate performance. Xu Jing[1] combined the characteristics of SMEs on the Growth Enterprise Market such as good growth but high price-earnings ratios, high investment risks and industry backgrounds, and evaluated the “profitability”, “asset quality”, “debt risk” and “debt risk” of 129 SMEs The four aspects of "business growth" select indicators for evaluation. Cai Lixin[2] constructed an index system suitable for state-owned capital investment companies from two aspects: "value creation orientation" and "value-driven orientation". Zhu Liping[3] and others used the analytic hierarchy process to analyze the performance of 30 listed pharmaceutical companies from the four aspects of "profit", "debt service", "operation" and "development".

However, so far, there are few researches on the subdivided Chinese medicine industry in the pharmaceutical industry, and the selected indicators are mostly general indicators, lacking indicators reflecting the characteristics of the pharmaceutical industry, especially the Chinese medicine industry.In this paper, indicators will be selected from four perspectives: profitability, risk and asset quality, growth ability and operating ability.

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"Profitability" reflects the ability of an enterprise to obtain profits and achieve the goal of maximizing shareholder value. The stronger this ability is, the better the corporate performance will be.Based on the existence of the pharmaceutical industry general medicine gross profit rate is low, special medicine gross profit rate is high polarization phenomenon.

"Risks and assets" reflect whether the enterprise can effectively and reasonably use operating leverage, the quality of the enterprise's receivables and the solvency of the enterprise.Sales in the pharmaceutical industry mostly rely on the establishment of offline outlets and cooperation with major hospitals, and the bargaining power of intermediaries is weak, which makes pharmaceutical companies adopt more "rebates" and loose accounts receivable policies to ensure sales, resulting in the increase of enterprise costs and the decline of income quality.

"Growth ability" reflects whether the enterprise has a future development prospect.The development of pharmaceutical industry mainly depends on the development of new drugs, which needs a lot of capital investment.Due to the limitation of raw material region and quantity, many enterprises in the traditional Chinese medicine industry will choose to build factories near the raw material origin or build their own origin, which also needs the support of asset investment and the company's profit.

"Operating capability" reflects the ability of an enterprise to sell products, control costs and make full use of assets in the course of business. The stronger the capability, the more profit the company will make.For pharmaceutical enterprises, the use of "rebate" and other forms of sales makes the sales cost has always been the main part of their expenses, combined with their inventory and assets can further analyze the management and operation ability of the enterprise.

To sum up, return on equity (ROE), net profit rate on sales and earnings per share are selected to reflect "profitability" in this paper.The asset-liability ratio, current ratio and cash flow ratio were selected to reflect the "risk and asset quality" of TCM enterprises.The growth rate of assets and the proportion of R&D expenses in operating revenue (hereinafter referred to as R&D ratio) are selected to reflect "growth capacity";Select inventory turnover, total assets turnover, and sales expense ratio to reflect "operating capacity".

Based on the ranking of net profit, 20 listed companies in the Chinese medicine segment in the medical and biological field are selected for analysis. The data are all from the 2019 annual reports published by various companies.

2. Performance analysis based on factor analysis

2.1. Research ideas

Three indicators are selected from four dimensions for analysis, which makes data processing complicated.At the same time, the artificial determination of the weight of each index has great subjectivity, which can not objectively reflect the rules and analyze the objective facts.However, the factor method is based on the index and starts from the correlation matrix to find its internal relationship through the algorithm, extract the information and simplify the index to reduce the dimension, so as to retain the information to reflect the weight of an index to the greatest extent.

2.2. Research methods

In this paper, R-type factor analysis method in factor analysis method is adopted. In this method, R-factor exists objectively, but common influencing factors that cannot be directly measured. Each variable can be expressed in the following form:

$$X_i = a_{i1}F_1 + a_{i2}F_2 + \cdots a_{im}F_m + \varepsilon_i \ , i = 1,2, \dots , p$$

The F_1, F_2, F_m is a common factor, and ε_i is a special factor of X_i

The matrix form is:

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$$X = AF + \varepsilon$$

Among them

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{22} & \cdots & a_{2m} \\ \vdots & \vdots & & \vdots \\ a_{p1} & a_{p2} & \cdots & a_{pm} \end{pmatrix} = (A_1, A_2 \ldots \ldots, A_m)$$

$$X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_P \end{bmatrix}, F = \begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_m \end{bmatrix}, \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_P \end{bmatrix}$$

3. Results analysis

3.1. Model checking

SPSS software was used to analyze the feasibility of the index system. Since KMO=0.541, large and 0.5, and the significance of Bartlett sphericity test was less than 0.05, it indicated that the model data structure was good, which could be used for further analysis. As table:

Table 1: KMO and Bartlett test

KMO and Bartlett tests		
KMO sampling fitness measure		0.509
Bartlett sphericity test	Approximate chi-square	135.798
	freedom	55
	Significance	0.000

3.2. Common factor extraction

Table 2: Variance of common factor

	initial	extract
Return on equity (ROE)	1.000	.748
Sales margin	1.000	.919
Basic earnings per share	1.000	.849
Asset-liability ratio	1.000	.836
Current ratio	1.000	.903
Cash flow ratio	1.000	.814
Proportion of R&D	1.000	.845
Asset growth rate	1.000	.754
Inventory turnover	1.000	.951
Total asset turnover	1.000	.847
Sales expense ratio	1.000	.749
Extraction method:principal component analysis.		

The "extraction" column of data in the common factor analysis of variance table indicates the percentage of data information extracted for each indicator.For example, in the ROE row, the extracted column data is 0748, representing that 74.8% of the ROE data has been extracted.The

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information extraction rate of most of the overall indicators was more than 80%, which indicated that the model data structure was better.

Table 3: Total variance interpretation

ingredient	Initial eigenvalue			Load sum square extraction			Rotating load sum of squares		
	total	Variance percentage	accumulate（%）	total	Variance percentage	accumulate（%）	total	Variance percentage	accumulate（%）
1	3.081	28.005	28.005	3.081	28.005	28.005	2.391	21.737	21.737
2	2.541	23.102	51.107	2.541	23.102	51.107	2.373	21.571	43.308
3	2.093	19.026	70.133	2.093	19.026	70.133	2.248	20.433	63.741
4	1.500	13.640	83.773	1.500	13.640	83.773	2.203	20.031	83.773
5	.798	7.251	91.024						
6	.367	3.340	94.364						
7	.259	2.352	96.716						
8	.131	1.191	97.907						
9	.118	1.076	98.983						
10	.069	.626	99.609						
11	.043	.391	100.000						
Extraction method: principal component analysis method.									

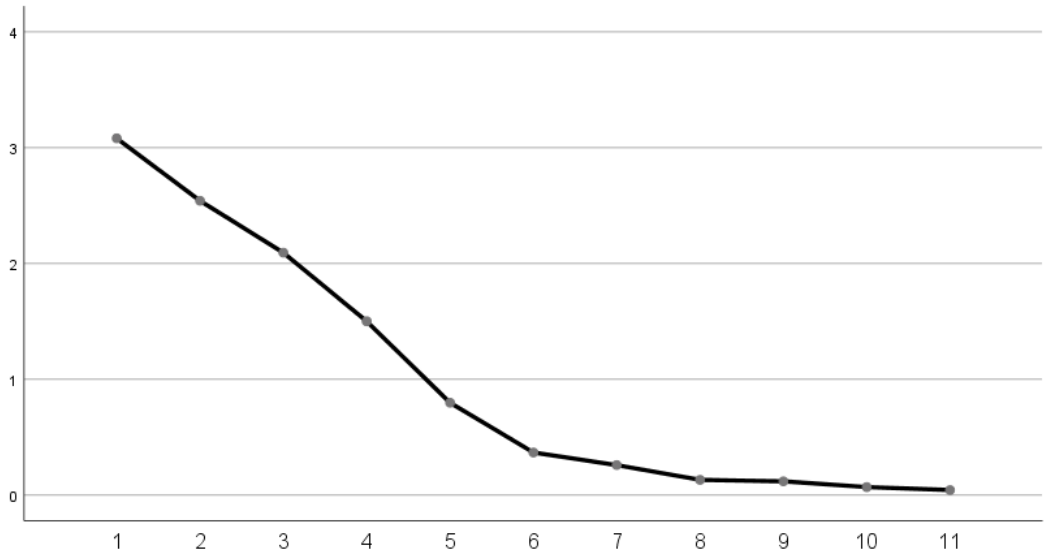

Figure 1 : Gravel map

In the total variance interpretation table, the total column is the eigenvalues of the principal factors (components). In this paper, 4 principal factors with eigenvalues greater than 1 are selected.The accumulated information extracted by the four main factors was more than 80%, and the data information was preserved perfectly.

3.3. Common factor nomenclature

Table 4 : The composition matrix after rotation

	composition			
	1	2	3	4
Proportion of R&D	.893	-.074	.198	-.051
Total asset turnover	-.889	-.060	.219	.075

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Sales margin	.842	.016	-.104	.447
Inventory turnover	.036	.937	-.212	.165
Selling expense ratio	.029	-.825	-.119	.234
Cash flow ratio	-.017	.744	-.502	.084
Current ratio	.092	-.168	.916	-.162
Asset-liability ratio	-.235	-.129	.859	.161
Basic earnings per share	.124	-.169	.029	.897
Return on equity（roe）	.025	.289	.029	.814
Asset growth rate	-.112	-.309	-.509	.622
Extraction method: principal component analysis. Rotation method: Caesar normalized maximum variance method.				
a. The rotations converged after 6 iterations.				

It can be seen from the composition matrix after rotation that the R&D proportion, net profit rate of sales and turnover of total assets have a higher absolute load on the first factor, which indicates that there is a strong relationship between R&D investment, profit and assets of TCM enterprises.These indicators reflect the future growth ability and profitability of the enterprise, so the first factor is named as "profitability and growth ability factor".Cash flow ratio, inventory turnover ratio and sales expense ratio have higher absolute load on the second factor. These indicators reflect the ability of TCM enterprises to sell products and manage, so the second factor is named as "management and sales ability factor".Asset-liability ratio and current ratio have a higher absolute load on the third factor, which reflects the debt paying risk of TCM enterprises, so the third factor is named as "debt paying ability factor".The fourth factor, return on equity, basic earnings per share and growth rate of assets, has a higher absolute load. These indicators reflect the size of the income that pharmaceutical enterprises bring to shareholders, and this factor is named as "shareholder income factor".

3.4. Factor score

references at a time may be put in one set of brackets [3, 4]. The references are to be numbered in the order in which they are cited in the text and are to be listed at the end of the contribution under a heading References, see Table 1.

Table 5: Component score coefficient matrix

	composition			
	1	2	3	4
Return on equity (ROE)	-.031	.168	.132	.404
Sales margin	.333	.010	.011	.162
Basic earnings per share	.008	-.038	.082	.420
Asset-liability ratio	-.090	.060	.423	.168
Current ratio	.067	.036	.422	.000
Cash flow ratio	-.024	.277	-.146	.022
Proportion of R&D	.387	-.012	.103	-.054
Asset growth rate	-.089	-.182	-.237	.243
Inventory turnover	.000	.406	.033	.094

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Total asset turnover	-.377	.006	.090	.100
Sales expense ratio	.000	-.382	-.144	.066
Extraction method: principal component analysis. Rotation method: Caesar normalized maximum variance method.				

Note: (Z1: return on equity, Z2: net profit rate on sales, Z3: basic earnings per share, Z4: asset-liability ratio, Z5: current ratio, Z6: cash flow ratio, Z7: R&D ratio, Z8: growth rate of assets, Z9: inventory turnover, Z10: turnover rate of total assets, Z11: sales expense ratio)

According to the component scoring coefficient matrix, we can get:

F_1=-0.31 Z_1+0.333 Z_2+0.008 Z_3-0.090 Z_4+0.067 Z_5-0.024 Z_6+0.387 Z_7-0.089Z_8+0.000 Z_9-0.377 Z_{10}-0.000 Z_{11}

F_2=0.168Z_1-0.010 Z_2-0.038 Z_3+0.060 Z_4+0.036 Z_5+0.277Z_6-0.012 Z_7-0.182Z_8+0.406 Z_9+0.006Z_{10}-0.0382Z_{11}

F_3=0.132 Z_1+0.011 Z_2+0.082Z_3+0.423 Z_4+0.422 Z_5-0.146 Z_6+0.103 Z_7- 0.237Z_8+0.033 Z_9+0.090 Z_{10}-0.144 Z_{11}

F_4=0.404 Z_1+0.162 Z_2+0.420 Z_3+0.168 Z_4+0.000 Z_5+0.022 Z_6-0.054 Z_7 +0.243Z_8+0.094 Z_9+0.100 Z_{10}+0.066 Z_{11}

The comprehensive performance scoring formula is as follows:

F=0.259 F_1+0.257 F_2+0.244 F_3+0.239 F_4

4. Conclusion

The scores of each Chinese medicine company are shown in the table below:

Table 6 : The scores of each Chinese medicine

	F1	F2	F3	F4	F
Qizheng Tibetan Medicine	-0.868	-1.771	-1.286	1.757	-0.574
Tibet pharmaceutical industry	3.674	-1.033	0.559	0.527	1.235
Jichuan Pharmaceutical	-0.100	-1.503	-0.320	1.441	-0.189
Ma Yinglong	-0.312	-0.942	0.027	-0.429	-0.411
Baiyun Mountain	0.022	0.799	1.139	0.353	0.524
Jiangzhong Pharmaceutical	0.347	1.465	-0.964	0.200	0.295
Renhe Pharmaceutical	-0.206	0.459	1.288	0.947	0.512
Yunnan Baiyao	-0.254	-0.660	0.736	-0.695	-0.216
Zhongheng Group	0.770	-0.406	0.033	-1.179	-0.056
Pien Tze Huang	-0.149	1.934	1.033	1.659	0.968
China Resources Sanjiu	0.168	-0.233	-0.436	-1.258	-0.340
Buchang Pharmaceutical	-0.259	-0.040	0.429	-2.291	-0.447
Hongri Pharmaceutical	0.112	0.160	-0.786	-0.055	-0.110
Sunflower Pharmaceutical	-0.365	0.133	1.021	0.309	0.196
Yiling Pharmaceutical	-0.819	-0.275	-1.338	-0.366	-0.717
Zhongxin Pharmaceutical	-0.701	-0.454	0.649	-0.159	-0.234
Tongrentang	0.327	0.842	0.003	-0.745	0.171
Kunyao Group	-1.322	-0.057	1.242	-0.120	-0.211

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Tasly	-0.554	-0.202	-0.785	-0.054	-0.425
Conbay	0.488	1.784	-2.243	0.158	0.125

It can be seen from the table that the comprehensive score of only 8 enterprises is greater than 0, indicating that the score of these 8 enterprises is higher than the average score of the Chinese medicine industry. The three enterprises with the highest scores are Xizang Pharmaceutical Company, Pien Tze Huang and Baiyunshan, while the three enterprises with the lowest scores are Yiling Pharmaceutical Company, Qizheng Tibetan Pharmaceutical Company and Buchang Pharmaceutical Company. The difference between Xizang Pharmaceutical Company and Yiling Pharmaceutical Company is 1.952, a small difference. Xizang Pharmaceutical has the highest score because of the high score of F1 "profitability and growth ability factor". The high score of Pien Tze Huang is due to the high score of F2 "Management and Sales Capacity Factor", F3 "Debt Capacity Factor" and F4 "Shareholder Income Factor", and Baiyunshan ranks the third due to the high score of F3 "Debt Debt Capacity Factor".Yiling Pharmaceutical ranked the last because of its low score in F1 and F3, Qizheng Tibetan Pharmaceutical ranked the second last because of its low score in F2 and F3, and Buchang Pharmaceutical ranked the third last because of its low score in F4.

Among the F1 scores of various enterprises, Xizang Pharmaceutical Group got the highest score, while Kunming Pharmaceutical Group got the lowest score, with a big difference of 4.996 points between them. Only 8 enterprises have positive scores, and most of them are within the range of 0.800~0.020. However, the scores of the remaining enterprises are mostly within the range of 0.000~-0.080, with generally low scores. However, F1 has a high weight in the three indicators of R & D ratio, net profit rate of sales and turnover rate of total assets, indicating that most TCM enterprises are weak in these three aspects, indicating that the overall R & D ratio of TCM industry is low and it is difficult to achieve high net profit rate of sales.

F2 is "management and sales ability factor", scoring in each enterprise of F2, seed Huang highest score, lowest score no medicine, both are 3.705 points, at the same time there are three companies score is greater than 1, the three companies score less than 1, the gap between larger, that traditional Chinese medicine (TCM) industry enterprise management ability and the sales ability gap between larger.. In addition, only 8 enterprises scored more than 0, indicating that the management and sales ability of most enterprises in the traditional Chinese medicine industry is poor and it is difficult to expand sales channels.

F3 is the "solvency factor". Among the F3 scores of various enterprises, Renhe Pharmaceutical Company has the highest score, while Connbe Company has the lowest score, with a large difference of 3.531 between them.F3 score of 12 enterprises is positive, indicating that the solvency of most TCM enterprises is higher than the average level and the default risk is small.

F4 is the "shareholder's return factor", with a high weight on ROE and earnings per share. The score of Qizheng Tibetan medicine was the highest, and the score of step length pharmaceutical was the lowest, with a big difference of 4.048.There are 9 enterprises with F4 scores greater than 0, 3 enterprises with F4 scores greater than 1, and 3 enterprises with F4 scores less than -1, which indicates that the ability of TCM enterprises to bring returns to shareholders is mixed in good and bad, and there is a large gap among enterprises.

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