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Research on the Performance Evaluation of Listed Liquor Companies based on the Entropy Weight and Closeness Degree Method

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Abstract: In this paper, based on the 2023 annual report data of 18 listed liquor enterprises, adaptation indicators are selected as research samples, performance evaluation system is constructed, entropy weight method and correlation value method are combined, and the performance evaluation of listed liquor enterprises is carried out. 12 indicators are selected and SPSSAU software is used to conduct empirical research on the performance of listed liquor enterprises. The correlation value of 18 liquor enterprises is calculated and the comprehensive performance of the enterprises is sorted to provide relevant help for investors' decision-making.

Keywords: Liquor-making Enterprise; Entropy Weight Closeness; Value Performance.

1. Introduction

As one of the traditional industries in China, the liquor industry not only carries profound cultural connotations but also plays a significant role in the national economy. With market competition and consumer demand becoming more diversified, liquor companies face both challenges and opportunities. The construction of performance evaluation and the development of effective performance evaluation methods for liquor companies are of symbolic significance for guiding and ensuring the healthy and sustainable development of the liquor industry. Traditional performance evaluation methods mainly rely on the comparative analysis of individual financial indicators, which cannot reflect the comprehensive performance of enterprises. The performance evaluation method based on the entropy weight method has been widely used, but the entropy weight method only objectively determines the weight of each indicator from the perspective of information quantity. In contrast, the closeness degree method calculates the correlation degree between indicators. The performance analysis method based on the entropy weight and closeness degree method combines the advantages of both methods, not only objectively and fairly determining the weights of indicators but also revealing the interrelationships between indicators, thereby providing a more comprehensive evaluation of enterprise performance. The current performance analysis of the liquor industry under the entropy weight method only assigns weights to the indicators of the enterprises themselves, lacking a comparison with the same industry. This paper selects the closeness degree method, combined with the entropy weight method, to overcome the limitations of the closeness degree method. The closeness degree method excludes the evaluation result errors caused by subjective factors, and its calculation results can be directly ranked to obtain direct results. This study aims to use an improved closeness degree model combined with key indicators reflecting performance, determining the weights of these indicators using information entropy. Then, by analyzing the distance from the optimal and worst points through the closeness degree method, the calculation results can be directly ranked to obtain direct results, thereby evaluating the performance of listed liquor companies in 2023. Through this study, it is expected to help listed liquor companies better understand their operating conditions, optimize strategic decisions, and provide a reference framework for other companies in the industry, promoting the sustainable development of the liquor industry.

2. Literature Review

Guo Haojie (2018) pointed out that enterprise performance evaluation uses mathematical statistics and operations research principles, following certain standards, through quantitative or qualitative comparative analysis, to objectively and fairly evaluate the operating efficiency and performance of an enterprise during a specific period. Performance evaluation plays a crucial role in any industry and field, and the liquor industry is no exception. As an indispensable part of China's long history and culture, liquor is not just a beverage but also an important component of social and celebratory activities. With the rapid development of China's economy and the improvement of residents' consumption levels, per capita liquor consumption has achieved significant growth. This growth not only reflects the important status of liquor in people's daily lives but also indicates the enormous potential for sustainable development in the liquor industry. The healthy development of the liquor industry has a profound impact on China's national economy. As a unique alcoholic beverage in China, the production and sales of liquor directly affect multiple economic sectors such as agriculture (providing raw materials like sorghum and wheat), manufacturing (production and processing of liquor), and services (sales and marketing). Additionally, liquor companies play an important role in promoting employment, increasing tax revenue, and driving local economic development. Therefore, ensuring the sustainable development of the liquor industry not only aligns with the interests of the industry itself but is also an important part of the national economic strategy. In recent years, with the diversification of investment channels, more and more investors have begun to focus on the liquor industry. As a commodity with stable consumer demand and high brand added value, liquor has become a priority investment option

for many investors. In this context, the performance evaluation of liquor companies is particularly important. Through scientific and reasonable evaluation systems and methods, the operating conditions and market competitiveness of enterprises can be comprehensively and objectively assessed, providing a basis for decision-making for investors and helping them identify truly valuable investment enterprises.

At the same time, for liquor companies themselves, performance evaluation is also an important tool for self-diagnosis and development. By comprehensively evaluating the financial health, market performance, production efficiency, and innovation capabilities of enterprises, they can clearly recognize their strengths and weaknesses, thereby formulating more scientific and reasonable development strategies and business plans. This not only helps enterprises maintain a leading position in the fierce market competition but also provides strong support for their long-term sustainable development.

Fan Jinjuan and Guo Hui (2021) pointed out that with the gradual improvement and innovation of the financial system evaluation, the current methods for evaluating financial performance mainly include analytic hierarchy process, entropy method, data envelopment analysis, fuzzy comprehensive evaluation analysis, principal component analysis, cluster analysis, and economic value-added method. Although there are various research methods, each method has its own limitations. For example, the analytic hierarchy process is highly subjective and easily influenced by personal bias and knowledge limitations; the entropy method is an objective weighting method that reflects the utility value of indicator information entropy to obtain corresponding indicator weights, but it lacks horizontal comparison between indicators. The current performance evaluation of liquor enterprises mainly uses factor analysis, cluster analysis, balanced scorecard, data envelopment analysis, principal component analysis, entropy method, etc. Zhang Xuejun and Zhao Mengying (2017) combined the balanced scorecard with the combination weighting method for evaluating liquor enterprises, making the evaluation results more objective. Yu Ting and Yu Fawen (2021) constructed a comprehensive evaluation index system for high-quality agricultural development based on the TOPSIS entropy weight method to measure the level of high-quality agricultural development. Zhao Shaofei et al. (2020) constructed a regional industrial green technology innovation evaluation index system from the perspectives of green technology assurance capability, green technology investment capability, and green technology output capability, using the improved closeness degree method to conduct an empirical analysis of the industrial green technology innovation capability of 30 provinces in China, and evaluated the inter-provincial differences in China's regional industrial green technology innovation . Yang Shiwei et al. (2018) constructed a regional industrial enterprise innovation performance evaluation index system from four aspects: innovation environment, innovation investment, innovation activities, and innovation output, and used the closeness degree method to evaluate the innovation performance of industrial enterprises in 28 provinces in China.

The liquor industry is crucial to the development of China's economy, and performance evaluation work is a key factor affecting the development of the industry. More and more scholars are conducting research on performance evaluation methods and have achieved rich research results, promoting the maturity of performance evaluation work. Based on this, this paper conducts a performance evaluation of listed liquor companies, and the conclusions are reliable and credible, providing a theoretical basis for the long-term development of the liquor industry.

3. Construction of the Financial Performance Indicator System for Listed Liquor Companies

Referring to the "Enterprise Performance Evaluation Standard" of 2023, this paper selects twelve indicators for the financial performance evaluation system: earnings per share (EPS), return on equity (ROE), operating profit margin, return on total assets (ROA), total asset turnover ratio, current asset turnover ratio, surplus cash coverage ratio, the proportion of receivables and inventory to current assets, asset-liability ratio, cash flow to current liabilities ratio, quick ratio, R&D investment intensity, and the proportion of R&D personnel. These indicators evaluate corporate performance from four aspects: profitability, asset operation, risk control, and sustainable development. This system encompasses financial performance, operational performance, solvency, development capability, and innovation input, providing a comprehensive assessment of the performance of listed liquor companies.

(1) Profitability

To measure the profitability of liquor companies, this paper selects four indicators: earnings per share (EPS), return on equity (ROE), operating profit margin, and return on total assets (ROA). EPS, as a fundamental indicator of a company's profitability, reflects the net profit attributable to each share of stock. In the liquor industry, due to the high added value of products, competition often focuses on brand influence and market share. Thus, EPS can directly indicate the return on investment for shareholders. ROE demonstrates the efficiency with which a company utilizes its equity capital and is a core indicator of financial performance evaluation. Efficient capital operation is crucial for the long-term growth of enterprises. The operating profit margin measures a company's ability to generate profit from its main business activities and is an important indicator of operational efficiency. ROA reflects the average return on a company's total assets. Given the long production cycle and relatively slow inventory turnover in the liquor industry, ROA helps evaluate the overall efficiency of asset utilization, including both fixed and current assets.

(2) Asset Operation Efficiency

The total asset turnover ratio measures the efficiency with which a company generates revenue from its total assets over a certain period. For liquor companies, given the high added value of their products and the focus on brand influence and market share within the industry, this indicator is particularly relevant. The current asset turnover ratio measures the efficiency with which a company generates revenue from its current assets over a certain period. Due to the long production cycles and significant investment in brand building and market promotion, the current asset turnover ratio reflects whether these long-term investments effectively translate into operating revenue. The surplus cash coverage ratio measures whether the cash flow generated from operating activities is sufficient to cover liabilities, serving as an indicator of a company's short-term solvency. Given the high product differentiation and strong brand loyalty among

consumers in the liquor industry, this ratio helps evaluate a company's cash flow situation and financial stability.

(3) Risk Control Capability

The asset-liability ratio measures the proportion of a company's assets financed by debt, reflecting its financial leverage level and long-term solvency. The quick ratio measures whether a company's current assets, excluding inventory, are sufficient to cover current liabilities. For liquor companies, given the long production cycles and significant investment in brand building and market promotion, the quick ratio reflects a company's ability to meet short-term debts and is an important indicator of short-term solvency. The proportion of receivables and inventory to current assets indicates the percentage of current assets comprised of accounts receivable and inventory. These components are significant in manufacturing companies' assets, reflecting their impact on liquidity.

(4) Sustainable Development Capability

In selecting indicators for sustainable development capability, this paper avoids common development capability indicators and chooses innovation-related indicators instead. The proportion of R&D personnel measures the percentage of employees engaged in R&D activities, while R&D investment intensity measures the ratio of R&D expenditure to operating revenue. R&D personnel are the executors of innovation activities, and their quantity and quality directly impact a company's technological innovation and product development capabilities. Innovation capability is closely related to a company's future development. Compared to traditional development capability indicators (such as net profit growth rate), R&D investment intensity and the proportion of R&D personnel better reflect a company's commitment to long-term development investment and its ability to continuously innovate and adapt to market changes in a competitive environment.

Table 1. Corporate Performance Evaluation Indicators

Goal Level	Primary Indicators	Secondary Indicators	Calculation Formula	Indicator Type
Corporate Performance	Profitability	Return on Equity (ROE, %)	Net Profit / Average Owner's Equity	+
		Operating Profit Margin (%)	Operating Profit / Total Operating Revenue	+
		Return on Total Assets (ROA, %)	Earnings Before Interest and Taxes (EBIT) / Average Total Assets	+
		Earnings Per Share (EPS, yuan)	Net Profit / Total Number of Common Shares at Year-end	+
	Asset Operation Efficiency	Total Asset Turnover Ratio (times)	Total Operating Revenue / Average Total Assets	+
		Current Asset Turnover Ratio (times)	Total Operating Revenue / Average Current Assets	+
		Proportion of Receivables and Inventory to Current Assets (%)	(Accounts Receivable + Inventory) / Current Assets	-
	Risk Control Capability	Asset-Liability Ratio	Total Liabilities / Total Assets	-
		Cash Flow to Current Liabilities Ratio (%)	Net Cash Flow from Operating Activities / Current Liabilities at Year-end	+
		Quick Ratio (%)	Quick Assets / Current Liabilities	+
	Sustainable Development Capability	R&D Investment Intensity (%)	Total R&D Expenditure for the Year / Total Operating Revenue	+
		Proportion of R&D Personnel (%)	Total Number of R&D Personnel / Average Number of Employees for the Year	+

4. Research Design - Evaluation Model Based on Entropy Weight and Closeness Degree Method

The entropy weight and closeness degree method combine the concepts of entropy weight and closeness degree. By calculating the entropy values of various indicators, the weights of each indicator are determined. This method involves calculating the entropy value of an indicator based on its variation and its impact on the overall system to determine the weight. The closeness degree method originated from system engineering as an optimization method initially used for ranking the quality of samples. It is a multi-objective decision evaluation method that does not require weighting. By determining the "optimal value" and the "worst value" within the sample, the distances of each sample from the optimal and worst values are calculated to determine the closeness degree, thus ranking the evaluation objects.

1. Establishing the Indicator Matrix

Let the values of the liquor companies Aj(j=1,2,...,m) under the indicators Si(i=1,2,...,n)be represented as $A=(a_{ij})_{mxn}$.

2. Standardizing the Indicator Matrix

(1) Due to the large number of performance evaluation indicators and the different dimensions of each indicator, the indicator matrix needs to be standardized to facilitate comparison.

$$Xij = aij \Big/ \left(\sqrt{\sum_{j=1}^{n}(aij)^2}\right) \quad (1)$$

Normalization of the Matrix

$$X = (\mathrm{x}_{ij})_{n\times \mathrm{m}}$$

(2) Determine the optimal and worst points of the indicators:

When the indicator is a positive indicator

$$x_i^{+} = \max\{\mathrm{x}_{\mathrm{ij}}\}\ ,\ (\mathrm{i}=1, 2, 3\ldots, \mathrm{n})$$

$$x_i^{-} = \min\ \{\mathrm{x}_{\mathrm{ij}}\}\ ,\ (\mathrm{i}=1, 2, 3\ldots, \mathrm{n})$$

When the indicator is a negative indicator

$$x_i^{+} = \min\ \{\mathrm{x}_{\mathrm{ij}}\}\ ,\ (\mathrm{i}=1, 2, 3\ldots, \mathrm{n})$$

$$x_i^{-} = \max\{\mathrm{x}_{\mathrm{ij}}\}\ ,\ (\mathrm{i}=1, 2, 3\ldots, \mathrm{n})$$

3.Weight Determination Based on Entropy Method

The calculation process is as follows:

(1) Data Standardization: Standardize the raw data to eliminate differences in dimensions among indicators, compressing the values of each indicator within the [0-1] interval. Suppose the raw data matrix XXX consists of mmm samples and nnn indicators, represented as X=(Xij)mn

(2) Calculate Weights

$$Hi = -k\sum_{j-1}^{m} f_{ij}\ln f_{ij}(i = 1, 2, 3\ldots, n,\ \ \mathrm{j} = 1, 2, \ldots m) \quad (2)$$

$$f_{ij} = (1+x_{ij}) \Big/ \sum_{j=1}^{m}(1+x_{ij}) \quad (3)$$

$$k = 1 \Big/ \ln m \quad (4)$$

The entropy weight of the iii-th indicator:

$$Wi = (1-H_i) \Big/ (n-\sum_{i=1}^{n} Hi) \quad (5)$$

Entropy weight vector

$$w = (w_1, w_2, ..., w_n)^T$$

4.Calculate Closeness Value

Determine the ideal point and the negative ideal point of the research objects based on the indicator data. The expressions for the ideal point C+ and the negative ideal point C− are respectively:

$$C^{+} = (\mathrm{c}^{+}_{1},\ \mathrm{c}^{+}_{2}, \ldots, \mathrm{c}^{+}_{\mathrm{n}})$$

$$C^{-} = (\mathrm{c}^{-}_{1},\ \mathrm{c}^{-}_{2}, \ldots, \mathrm{c}^{-}_{\mathrm{n}})$$

Where For positive indicators

$$c^{+}_{j} = \max\{c_{ij}\}, c^{-}_{j} = \min\{\mathrm{c}_{\mathrm{ij}}\};$$

For negative indicators

$$c^{+}_{j} = \min\{c_{ij}\}, c^{-}_{j} = \max\{\mathrm{c}_{\mathrm{ij}}\}$$

Using Euclidean distance for distance measurement, the expressions for the distance between each sample data and the ideal point and the negative ideal point are respectively:

$$d_i^{+} = \sqrt{\sum_{i=1}^{n} w_j(c_{ij} - c_i^{+})^2} \quad (6)$$

Calculate the closeness value cic_ici for each sample using the formula:

$$C_{\mathrm{j}} = d_j^{+} \Big/ d^{+} - d_j^{-} \Big/ d^{-} \quad (7)$$

Where:

$$d_j^{+} = \sqrt{\left[\sum_{i=1}^{n} w_i(x_{ij} - x_i^{+})^2\right]} \quad (8)$$

$$d_j^{-} = \sqrt{\left[\sum_{i=1}^{n} w_i(x_{ij} - x_i^{-})^2\right]} \quad (9)$$

$$d^{+} = \min\{d_j^{+}\}\ ,\ \ d^{-} = \max\{d_j^{-}\}$$

5.Evaluation Results

The size of Ci reflects the degree to which the company's performance deviates from the optimal point. When Ci>0, Aj deviates from the optimal point, and the larger the value, the farther the deviation; when Ci=0, Aj is closest to the optimal point. Using the size of Ci as the criterion, the plan with the smallest Ci is the company with the best performance.

Financial Performance Evaluation of Listed Liquor Companies Based on Entropy Weight and Closeness Value Method.

In this study, we evaluate the performance of 18 listed liquor companies, including Kweichow Moutai, Shanxi Fenjiu, Luzhou Laojiao, Wuliangye, Shuijingfang, Yanghe Co., Gujinggong Liquor, Yingjia Gongjiu, Jinshiyuan, Shede Liquor, Kouzi Cellar, Jinhuan Liquor, Tsingtao Brewery, Jiugui Liquor, Yili Special, Laobaigan Liquor, Shunxin Agriculture, and Jinzhongzi Liquor, using 12 performance evaluation indicators. The comprehensive evaluation of the performance of these 18 listed liquor companies is conducted through the entropy weight and closeness value method.

5. Conclusion

According to the principle that a lower closeness coefficient indicates better performance, the ranking results of this case study show that Kweichow Moutai, with its outstanding performance, ranks first. It is followed by Wuliangye and Luzhou Laojiao in second and third place, respectively. The rest of the companies rank as follows: Shanxi Fenjiu, Yanghe Co., Yingjia Gongjiu, Shede Liquor, Gujinggong Liquor, Shuijingfang, Jinhui Liquor, Jinshiyuan, Jiugui Liquor, Kouzi Cellar, Tsingtao Brewery, Yilite, Jinzhongzi Liquor, Laobaigan Liquor, and Shunxin Agriculture.

From the comprehensive evaluation results, Kweichow Moutai, Wuliangye, and Luzhou Laojiao are the top-ranked companies, indicating strong overall growth potential. Overall, through the comprehensive performance evaluation of 18 listed liquor companies, we can gain a more complete understanding of each company's performance and position within the industry. This evaluation provides opportunities for companies to self-reflect and improve, and offers valuable information to investors and market analysts to make more

informed decisions.

Table 2. Evaluation Indicators and Basic Data

Company indix	EPS	ROE	Profit Margin on Sales	ROA	Total Asset Turnover	Current Asset Turnover	Proportion of Cash and Receivables	Debt-to-Asset Ratio	Cash Flow to Current Liabilities	Quick Ratio	R&D Investment Intensity	R&D Staff Ratio
Luzhou Laojiao	3.12	35.07%	59.01%	23.10%	53.00%	77.00%	25.66%	34.38%	80.13%	3.35	0.88%	12.55%
Jinhui Liquor	0.65	10.20%	15.57%	7.74%	24%	37%	59.40%	24.52%	43.76%	1.09	2.01%	6.72%
Wuliangye	7.78	25.06%	50.44%	18.99%	52%	58%	11.84%	20.00%	127.72%	3.97	0.39%	10.26%
Shanxi Fenjiu	8.56	43.06%	44.55%	25.84%	79.00%	100.00%	33.44%	35.88%	47.70%	1.52	0.28%	3.46%
Kweichow Moutai	19.16	34.19%	70.22%	28.35%	56%	67%	20.65%	17.98%	136.75%	3.67	0.42%	2.40%
Shede Liquor	5.35	25.80%	32.54%	16.94%	68%	89%	57.92%	31.98%	21.04%	1.08	1.53%	4.18%
Gujinggong Liquor	3.91	22.92%	31.02%	14.07%	62%	85%	29.75%	36.72	36.23%	1.45	1.81%	8.84%
Yanghe Co.	6.65	20.34%	39.98%	14.54%	23%	30%	36.09%	25.42%	35.69%	1.96	0.88%	3.08%
Shunxin Agriculture	-0.4	-4.27%	0.71%	-1.66%	59.00%	84%	22.09%	55.74%	-10.12%	1.08	0.29%	4.15%
Yingjia Gongjiu	2.86	29.97%	44.85%	21.04%	62%	80%	49.77%	28.33%	69.85%	1.45	1.15%	6.89%
Jinzhongzi Liquor	-0.03	-0.87%	-0.34%	-0.64%	43%	68%	73.78%	27.18%	11.40%	0.92	1.72%	5.83%
Laobaigan Liquor	0.73	14.40%	16.82%	7.23%	57%	94%	57.56%	49.37%	17.57%	0.56	0.25%	1.91%
Jinshiyuan	2.52	25.92%	41.38%	15.75%	51%	82.00%	39.06%	38.57%	34.39%	0.97	0.43%	3.59%
Shuijingfang	2.61	32.36%	34.28%	16.40%	64%	106%	50.05%	47.84%	43.34%	0.61	1.08%	4.51%
Yilite	0.72	9.04%	20.36%	7.07%	46%	84%	70.65%	20.90%	36.44%	0.98	0.85%	7.30%
Kouzi Cellar	2.87	18.63%	39.01%	14.32%	50%	83%	66.93%	22.21%	35.18%	0.97	0.56%	2.17%
Jiugui Liquor	1.69	12.99%	25.67%	9.52%	9%	12%	36.55%	24.53%	3.79%	2.00	0.58%	7.10%
Tsingtao Brewery	0.19	3.21%	12.63%	2.75%	37%	65%	71.32%	15.77%	21.55%	1.19	2.46%	5.12%

Table 3. Raw Data After Normalization

Company indix	EPS	ROE	Profit Margin on Sales	ROA	Total Asset Turnover	Current Asset Turnover	Proportion of Cash and Receivables	Debt-to-Asset Ratio	Cash Flow to Current Liabilities	Quick Ratio	R&D Investment Intensity	R&D Staff Ratio
Luzhou Laojiao	0.1240	0.3500	0.3752	0.3447	0.2379	0.2383	0.1237	0.0094	0.3266	0.1767	0.4740	0.4184
Jinhui Liquor	0.0258	0.1018	0.0990	0.1155	0.1077	0.1145	0.2863	0.0067	0.1784	0.4035	0.2538	0.1361
Wuliangye	0.3093	0.2501	0.3207	0.2834	0.2334	0.1795	0.0571	0.0054	0.5206	0.0783	0.3875	0.4958
Shanxi Fenjiu	0.3403	0.4297	0.2832	0.3856	0.3545	0.3095	0.1612	0.0098	0.1944	0.0562	0.1307	0.1898
Kweichow Moutai	0.7616	0.3412	0.4464	0.4231	0.2513	0.2074	0.0995	0.0049	0.5575	0.0843	0.0907	0.4583
Shede Liquor	0.2127	0.2575	0.2069	0.2528	0.3052	0.2755	0.2791	0.0087	0.0858	0.3071	0.1579	0.1349
Gujinggong Liquor	0.1554	0.2287	0.1972	0.2100	0.2783	0.2631	0.1434	0.9993	0.1477	0.3633	0.3339	0.1811
Yanghe Co.	0.2643	0.2030	0.2542	0.2170	0.1032	0.0929	0.1739	0.0069	0.1455	0.1767	0.1163	0.2448
Shunxin Agriculture	-0.0159	-0.0426	0.0045	-0.0248	0.2648	0.2600	0.1065	0.0152	-0.0413	0.0582	0.1567	0.1349
Yingjia Gongjiu	0.1137	0.2991	0.2851	0.3140	0.2783	0.2476	0.2398	0.0077	0.2847	0.2309	0.2602	0.1811
Jinzhongzi Liquor	-0.0012	-0.0087	-0.0022	-0.0096	0.1930	0.2105	0.3556	0.0074	0.0465	0.3453	0.2202	0.1149
Laobaigan Liquor	0.0290	0.1437	0.1069	0.1079	0.2558	0.2909	0.2774	0.0134	0.0716	0.0502	0.0721	0.0699
Jinshiyuan	0.1002	0.2587	0.2631	0.2350	0.2289	0.2538	0.1882	0.0105	0.1402	0.0863	0.1356	0.1211
Shuijingfang	0.1037	0.3229	0.2179	0.2447	0.2872	0.3281	0.2412	0.0130	0.1767	0.2168	0.1703	0.0762
Yilite	0.0286	0.0902	0.1294	0.1055	0.2064	0.2600	0.3405	0.0057	0.1485	0.1706	0.2757	0.1224
Kouzi Cellar	0.1141	0.1859	0.2480	0.2137	0.2244	0.2569	0.3225	0.0060	0.1434	0.1124	0.0820	0.1211
Jiugui Liquor	0.0672	0.1296	0.1632	0.1421	0.0404	0.0371	0.1761	0.0067	0.0154	0.1164	0.2682	0.2498
Tsingtao Brewery	0.0076	0.0320	0.0803	0.0410	0.1661	0.2012	0.3437	0.0043	0.0878	0.4938	0.1934	0.1486

Table 4. Determination of Optimal and Worst Points

Indicator	Optimal	Worst
Earnings per Share (EPS)	0.7616	-0.0159
Return on Equity (ROE)	0.4297	-0.0426
Profit Margin on Sales	0.4464	-0.0022
Return on Assets (ROA)	0.4231	-0.0248
Total Asset Turnover	0.3545	0.0404
Current Asset Turnover	0.0371	0.3281
Proportion of Cash and Receivables	0.0571	0.3556
Debt-to-Asset Ratio	0.0043	0.9993
Cash Flow to Current Liabilities	0.5575	-0.0413
Quick Ratio	0.4938	0.0502
R&D Investment Intensity	0.4740	0.0721
R&D Staff Ratio	0.4958	0.0699

Table 5. Indicator Weights

Indicator	Weight
Earnings per Share (EPS)	15.14%
Return on Equity (ROE)	6.00%
Profit Margin on Sales	6.85%
Return on Assets (ROA)	6.62%
Total Asset Turnover	4.04%
Current Asset Turnover	3.86%
Proportion of Cash and Receivables	9.01%
Debt-to-Asset Ratio	1.96%
Cash Flow to Current Liabilities	7.86%
Quick Ratio	13.77%
R&D Investment Intensity	14.22%
R&D Staff Ratio	10.66%

Table 6. Distances of Each Company from Optimal and Worst Points

Company	Distance from Optimal	Distance from Worst
Luzhou Laojiao	0.2907	0.3222
Jinhui Liquor	0.3818	0.2255
Wuliangye	0.2492	0.3533
Shanxi Fenjiu	0.3093	0.2875
Kweichow Moutai	0.2047	0.4519
Shede Liquor	0.3332	0.2369
Gujinggong Liquor	0.3449	0.2179
Yanghe Co.	0.3158	0.2406
Shunxin Agriculture	0.4667	0.1678
Yingjia Gongjiu	0.3260	0.2535
Jinzhongzi Liquor	0.4319	0.1910
Laobaigan Liquor	0.4434	0.1640
Jinshiyuan	0.3814	0.2090
Shuijingfang	0.3671	0.2230
Yilite	0.4040	0.1845
Kouzi Cellar	0.3891	0.1958
Jiugui Liquor	0.3881	0.2036
Tsingtao Brewery	0.4082	0.2314

Table 7. Closeness Coefficient Results for Each Company

Company	Closeness Coefficient
Kweichow Moutai	0.000
Wuliangye	0.436
Luzhou Laojiao	0.708
Shanxi Fenjiu	0.875
Yanghe Co.	1.011
Yingjia Gongjiu	1.032
Shede Liquor	1.104
Gujinggong Liquor	1.203
Shuijingfang	1.300
Jinhui Liquor	1.367
Jinshiyuan	1.401
Jiugui Liquor	1.446
Kouzi Cellar	1.468
Tsingtao Brewery	1.482
Yilite	1.566
Jinzhongzi Liquor	1.688
Laobaigan Liquor	1.804
Shunxin Agriculture	1.909

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