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Research on Financial Performance Evaluation of Company W Based on Factor Analysis Method

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Abstract: As a core industry supporting global technological transformation, the semiconductor industry not only profoundly reshapes the technical pathways of traditional fields such as energy management, transportation, and medical diagnosis but also serves as a strategic cornerstone for ensuring the stable operation of the modern electronic information industry and driving innovation breakthroughs in artificial intelligence and the Internet of Things. Against the policy background of China vigorously promoting the autonomy of the semiconductor industry and encouraging breakthroughs in core technologies, domestic semiconductor enterprises are facing a critical period of opportunity for large-scale development. However, inherent characteristics of the industry, such as high R&D cost pressures, barriers posed by core technology patents, short product life cycles, and intensifying global market competition, also expose enterprises to operational risks like insufficient profit stability and pressure on capital chains. This paper takes Company W, a leader in the field of semiconductor image sensors, as the research object. Eight financial indicators are selected from four dimensions: profitability, solvency, operation, and growth. Factor analysis is conducted using SPSS to calculate performance scores and analyze its financial performance. Based on the analysis, optimization suggestions such as cost control and capital allocation are proposed, providing references for the sustainable development of Company W and other enterprises in the same industry.

Keywords: Financial Performance; Factor Analysis Method; Company W

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1.Introduction

The semiconductor industry is the core support of the information technology field, and its development is directly related to a nation's technological competitiveness. In recent years, China's semiconductor industry has steadily improved in both scale and structure, becoming an important force in scientific and technological development. The "14th Five-Year Plan" explicitly lists the integrated circuit industry as a strategic emerging industry, proposing the development goal of "breaking through key core technologies and enhancing the resilience and security level of the industrial and supply chains." Simultaneously, with the continuous advancement of the "New Infrastructure" strategy, the construction scale of 5G base stations, data centers, AI infrastructure, etc., continues to expand, further releasing the market demand for semiconductors. The characteristics of the semiconductor industry—high investment, high risk, and high technological barriers—are prominent. Coupled with the impact of global competition and technological controls, some enterprises face profit pressures, making scientific financial performance evaluation crucial for their stable development. This paper takes Company W as the research object, selects

indicators from four dimensions: profitability, solvency, operation, and growth, uses the factor analysis method to construct a financial performance evaluation system, analyzes its financial problems, and provides references for the high-quality development of Company W and other enterprises in the same industry.

2.Research Method

The research method employed in this paper is factor analysis. This method is an important tool in multivariate statistical analysis for dimensionality reduction and data simplification. It refines multiple highly correlated original variables into a few uncorrelated common factors, enabling simplified analysis of complex problems. Considering that the financial performance evaluation of Company W involves multiple financial indicators across four major dimensions—profitability, solvency, operational capability, and growth capability—where information overlap among indicators may exist, factor analysis can effectively eliminate redundant information and accurately identify the core drivers affecting financial performance. Meanwhile, by calculating factor scores and comprehensive performance scores, it provides a scientific basis for the quantitative evaluation of Company W's financial performance. This paper first selects 8 core financial indicators of Company W from the four dimensions based on the principles of scientificity, systematicness, and operability, collecting their annual financial data from the past 10 years to form an original data matrix. Then, the Z-score method is used to standardize the data to eliminate dimensional influences, and the KMO test and Bartlett's test of sphericity are used to verify data suitability. Subsequently, principal component analysis is used to extract common factors, and the Varimax orthogonal rotation method is applied to clarify the financial meaning of each common factor. Finally, based on the factor score coefficient matrix, the annual scores of the common factors are calculated, and the variance contribution rates of the common factors are used as weights to calculate the comprehensive financial performance score through a formula, in order to judge the level and change trend of Company W's financial performance.

3.Literature Review

In recent years, the application of factor analysis in the field of corporate financial performance evaluation has become increasingly widespread. Many scholars have conducted in-depth empirical research on various industries such as pharmaceuticals, manufacturing, new energy vehicles, semiconductors, and logistics using this method, systematically revealing the financial performance characteristics and core issues of different industries. Liu Jingxuan (2025) further used factor analysis to evaluate the financial performance of Kang'enbei and 66 other A-share listed traditional Chinese medicine companies. The research showed that driven by policy support, growing market demand, and technological progress, the traditional Chinese medicine industry maintained an average annual growth rate of 7%-9%, with certain progress made in modernization, standardization, and internationalization. However, it still faced deep-seated challenges such as lagging basic theoretical research, insufficient innovation in production processes, relatively limited R&D investment, and the gradual dilution of local traditional technological advantages by foreign companies[1]. Fu Honglei (2025) conducted a longitudinal study on the financial performance of Company L from 2014 to 2023 using factor analysis. It was found that although the comprehensive financial performance of the enterprise showed a steady upward trend, and its operational capability significantly enhanced since 2019, with solvency generally improving, it still faced prominent problems such as net profit turning from profit to loss, a sharp decline in total operating revenue, and a sharp reduction in net cash inflow from operating activities. In 2022, its profitability factor value even fell to a low point, mainly affected by multiple factors including intensified industry competition, increased uncertainty in the international trade environment, fluctuations in raw material costs, and continuous increase in technological innovation investment[2]. An Hongxia (2025) conducted a comprehensive evaluation of the financial performance of Shanxi Fenjiu and 20 other liquor companies in the same industry based on factor analysis. It was found that in the 2024 industry evaluation, Shanxi Fenjiu ranked first, demonstrating its comprehensive advantages in profitability, operational efficiency, and development potential. However, its solvency ranked sixth among the sample companies, becoming a key constraint for further improvement of its financial performance[3].Hu Furui (2024) conducted a financial performance evaluation study on China Resources Vanguard based on factor analysis. The study found that the overall financial performance of the enterprise ranked high among retail peers, and the performance of various

capability factors was relatively balanced. However, the solvency factor ranking was relatively low, reflecting room for optimization in the control of the asset-liability ratio and the use of financial leverage. If liabilities continue to rise, it may trigger financial risks[4].Chen Kun (2025) focused on the semiconductor IDM company Silan Microelectronics, using factor analysis to deeply investigate the evolution of its financial performance from 2003 to 2022. The research pointed out that China's semiconductor industry has achieved rapid development driven by both industrial policy and downstream application demand. Silan Microelectronics achieved good performance in 2021 benefiting from market and policy dividends. However, the inherent characteristics of the industry, such as high risk, high investment, long R&D cycles, and high technological barriers, led to significant overall fluctuations in the company's financial performance. Affected by factors such as global economic slowdown, industry growth rate decline, and its own declining solvency in 2022, its performance significantly declined compared to 2021[5].

In summary, factor analysis can effectively extract multi-dimensional financial information, systematically reveal the key factors driving performance and potential risks within different industries and enterprises, providing a powerful analytical tool for academic research and corporate decision-making.

4.Sample Selection and Indicator Selection

4.1 Sample Selection

This paper evaluates the financial performance of Company W using factor analysis. The data comes from the annual reports of Company W, selecting financial data disclosed in the annual statements from 2015 to 2024 as samples, and uses IBM SPSS Statistics 27.0 software for analysis.

4.2 Establishment of the Financial Performance Evaluation Indicator System for Company W

The construction follows four principles: scientificity, systematicness, operability, and pertinence. Indicators must conform to financial theory and the requirements of factor analysis, cover core dimensions, and data must be obtainable from financial reports. Eight indicators are selected from four dimensions: solvency, profitability, operation, and growth, as follows:Profitability dimension: Return on Equity (X1), Net Profit Margin on Total Assets (X2), reflecting the level and quality of profitability.Solvency dimension: Current Ratio (X3), Equity Multiplier (X4).Operational capability dimension: Total Asset Turnover (X5), Fixed Asset Turnover (X6).Growth capability dimension: Operating Revenue Growth Rate (X7), Net Asset Growth Rate (X8), verifying growth sustainability.

4.3 Factor Analysis of Financial Performance Indicators of Company W

4.3.1 Model Suitability Test

Factor analysis requires first eliminating the dimensional differences of indicators before conducting suitability tests. Dimensional differences in financial indicators can affect the analysis results. Z-score standardization is first performed using SPSS 27. Then, the KMO test and Bartlett's test of sphericity are used to judge the suitability of the initially selected 8 financial indicators, to verify whether these variable indicators are suitable for factor analysis. The test results are shown in Table 1.

Table1 KMO and Bartlett's Test

KMO Measure of Sampling Adequacy.		**0.627**
Bartlett's Test of Sphericity	Approx. Chi-Square	63.026
	df	28
	Sig.	0.000

From the test results, the KMO value is 0.627, indicating a certain degree of information overlap among the 8 financial indicators, and the correlation level between variables meets the basic requirements of factor analysis for data. Meanwhile, the significance probability (Sig.) of Bartlett's test of sphericity is 0.000, which is less than the significance level of 0.05, indicating significant linear correlations among the 8 indicators, and no situation of information independence exists.

Combining the results of the two tests, it shows that the selected data of the 8 financial indicators of Company W have good suitability and can be used for factor analysis of Company W's financial performance.

4.3.2 Common Factor Extraction

The total variance of the extracted factors is analyzed using Principal Component Analysis in SPSS to extract common factors. As can be seen from Table 2, among the eigenvalues of the 8 indicators, the eigenvalues of the first 3 common factors are 3.777, 2.421, and 1.256 respectively, all greater than the critical value of 1; the eigenvalues of the fourth and subsequent factors are all less than 1, indicating that the first 3 factors can sufficiently summarize the core information of the original indicators. Therefore, it is determined to extract 3 common factors, denoted as F1, F2, F3. From the variance contribution rate and cumulative variance contribution rate in the Total Variance Explained table, the variance contribution rate of the first common factor F1 is 47.206%, the second common factor F2 is 30.262%, and the third common factor F3 is 15.700%; the cumulative variance contribution rate of the three reaches 93.168%, far exceeding the standard threshold of 70%. This indicates that the extracted 3 common factors can explain 93.168% of the information of the 8 financial indicators of Company W, with a high degree of information retention, and can effectively replace the original indicators for financial performance evaluation without needing to add additional common factors.

Table 2 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.777	47.206	47.206	3.777	47.206	47.206	3.609	45.112	45.112
2	2.421	30.262	77.468	2.421	30.262	77.468	2.238	27.970	73.081
3	1.256	15.700	93.168	1.256	15.700	93.168	1.607	20.087	93.168
4	.316	3.949	97.118						
5	.123	1.541	98.659						
6	.069	.864	99.523						
7	.024	.298	99.821						
8	.014	.179	100.000						

Extraction Method: Principal Component Analysis.

4.3.3 Factor Rotation and Naming

By rotating the factor loading matrix, the variables can be interpreted more intuitively. Based on the magnitude of the absolute value of the loading weights, each common factor is named. From the Rotated Component Matrix in Table 3, it can be seen that the Current Ratio and Equity Multiplier from the solvency dimension, and the Total Asset Turnover and Fixed Asset Turnover from the operational capability dimension have large loading coefficients on F1. This indicates that F1 mainly reflects Company W's solvency and operational capability, hence it is named the Solvency and Operational Capability Factor. The Return on Equity and Net Profit Margin on Total Assets from the profitability dimension have large loading coefficients on F2. This indicates that F2 mainly reflects Company W's profitability, hence it is named the Profitability Factor. The Operating Revenue Growth Rate and Net Asset Growth Rate from the growth capability dimension have large loading coefficients on F3. This indicates that F3 mainly reflects Company W's growth capability, hence it is named the Growth Capability Factor.

Table 3 Rotated Component Matrix

	Component		
	1	**2**	**3**
X1 Return on Equity		0.968	
X2 Net Profit Margin on Total Assets		0.975	
X3 Current Ratio	-0.925	0.300	
X4 Equity Multiplier	0.851		0.353
X5 Total Asset Turnover	0.876	0.357	
X6 Fixed Asset Turnover	0.967		
X7 Operating Revenue Growth Rate	0.556		0.694
X8 Net Asset Growth Rate			0.959
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations.			

4.3.4 Factor Score Model

Table 4 Component Score Coefficient Matrix

	Component		
	1	**2**	**3**
X1 Return on Equity	0.025	0.440	-0.036
X2 Net Profit Margin on Total Assets	-0.022	0.440	-0.023
X3 Current Ratio	-0.261	0.125	0.035
X4 Equity Multiplier	0.205	-0.140	0.183
X5 Total Asset Turnover	0.288	0.215	-0.269
X6 Fixed Asset Turnover	0.279	0.053	-0.064
X7 Operating Revenue Growth Rate	0.090	0.016	0.395
X8 Net Asset Growth Rate	-0.127	-0.058	0.659
Extraction Method: Principal Component Analysis.			

Based on the component score coefficient matrix, the following equations can be derived:

F1=0.025*X1-0.022*X2-0.261*X3+0.205*X4+0.288*X5+0.279*X6+0.090*X7-0.127*X8

F2=0.440*X1+0.440*X2+0.125*X3-0.140*X4+0.215*X5+0.053*X6+0.016*X7-0.058*X8

F3=-0.036*X1-0.023*X2+0.035*X3+0.183*X4-0.269*X5-0.064*X6+0.395*X7+0.659*X8

After calculating the three common factors, the comprehensive factor F score is obtained by weighted summation using the weights of each common factor's variance contribution rate (after rotation) relative to the cumulative contribution rate, as obtained earlier:

F=（45.112%*F1+27.970%*F2+20.087%*F3）

The scores and rankings of each common factor and the comprehensive factor are calculated according to the above formulas, and the results are shown in Table 5.

Table 5 Scores and Rankings of Each Common Factor and the Comprehensive Factor

Year	F1	F2	F3	F	F Score
2024	-1.417	0.199	0.121	-0.600	8
2023	-1.187	-1.281	0.099	-0.938	10
2022	-0.749	-1.085	-1.006	-0.905	9
2021	-0.605	1.648	0.559	0.322	4
2020	-0.380	1.147	0.909	0.356	3
2019	0.630	-0.308	-0.061	0.200	5
2018	1.374	-1.073	1.475	0.661	2
2017	0.294	-0.418	0.028	0.023	7
2016	0.842	0.646	-2.155	0.137	6
2015	1.197	0.525	0.030	0.744	1

4.3.5 Comprehensive Analysis

(1) F1 Solvency and Operational Capability Factor

As the core factor reflecting solvency and operational capability, the F1 score decreased from 1.197 in 2015 to -1.417 in 2024, showing an overall trend of first stabilizing and then declining. The F1 scores from 2015 to 2018 were all positive, indicating that during this stage, Company W had sufficient fund liquidity, indicators such as the current ratio and equity multiplier were adapted to the needs of the semiconductor industry, and the total asset turnover and fixed asset turnover were efficient, indicating a good level of asset operation efficiency. However, after 2019, the F1 score turned volatile and declined, dropping to -0.605 in 2021 and further falling to -1.417 in 2023-2024, reflecting the weakening of the company's solvency and operational capability in recent years. From the perspective of actual business operations, this change is closely related to the business expansion of Company W. Although the company is not directly engaged in wafer manufacturing, after 2020, it increased its packaging and testing capacity reserves to capture the automotive sensor market, leading to increased fixed asset investment. However, capacity utilization did not match this increase in a timely manner, dragging down the fixed asset turnover. Meanwhile, global supply chain fluctuations led to extended payment cycles from downstream consumer electronics customers, reducing the current ratio. Although the asset-liability ratio remained at 37.89% in 2024, short-term debt pressure still increased significantly.

(2) F2 Profitability Factor

The F2 score shows cyclical fluctuations without forming a sustained growth trend. The F2 scores in 2015-2016 were 0.525 and 0.646 respectively, indicating stable profitability. It dropped to negative values in 2017-2018, affected by smartphone market saturation and intensified competition in semiconductor image sensors, leading to declining product prices and subsequent decreases in return on equity and net profit margin on total assets. After a brief rebound in 2019, it peaked in 2020-2021, benefiting from the mobile phone replacement cycle and the explosion in demand for smart car sensors, which simultaneously increased product sales and gross profit margins. However, it fell again to -1.281 in 2023, and although it slightly recovered to 0.199 in 2024, it remained at a relatively low level. This trend is highly related to the business structure of Company W. The company's traditional business mainly focuses on consumer electronics sensors. The weakness in consumer electronics demand in 2022 directly impacted profitability, while the automotive business had not yet formed sufficient scale to provide support, leading to insufficient stability in profits.

(3) F3 Growth Capability Factor

The F3 score shows the largest fluctuation amplitude, dropping to -2.155 in 2016, soaring to 1.475 in 2018, falling again to -1.006 in 2022, and slightly recovering to 0.121 in 2023-2024. The high score in 2018 stemmed from the company's

launch of a 48-megapixel high-definition image sensor, which met the demand for smartphone camera upgrades, driving rapid growth in operating revenue and net assets. The low scores in 2016 and 2022 were due to lagging technology iteration, leading to stagnant revenue growth. The lack of a long-term upward trend in the F3 score reflects that Company W's growth capability relies on short-term product cycles. Furthermore, in the context of global semiconductor market growth in 2024 being mainly driven by the memory storage and logic chip sectors, the company faces technological pressure from leading enterprises like Sony and Samsung. The shortcomings in the market competitiveness of its core products have become more prominent, posing severe challenges to the company's long-term sustainable growth momentum.

(4) Comprehensive F Score Analysis

The comprehensive performance score ranked first in 2015. Although it fluctuated between 2019 and 2021, it remained in the positive range. However, from 2022 to 2024, it turned negative for three consecutive years, showing an overall trend of initial stability, mid-term volatility, and recent decline. In terms of driving factors, the decline in comprehensive performance after 2022 mainly stems from two core issues: first, the continuous deterioration of solvency and operational capability, which is the primary factor dragging down the comprehensive score; second, profitability falling into a trough again, coupled with weak recovery of growth capability. These three factors jointly put pressure on the company's overall financial performance. This result also confirms the high-risk and strong cyclical characteristics of the semiconductor industry, further highlighting the operational vulnerability brought by Company W's dual dependence on external supply chains and downstream demand.

5.Suggestions and Countermeasures

5.1 Persist in High-Intensity R&D Investment to Break Through High-End Technological Barriers

Company W must continue to make high-intensity and forward-looking R&D investments to break through high-end technological barriers and build long-term core competitiveness. Meanwhile, it should actively conduct global patent layout, building an intellectual property moat around core technologies and processes to resist competition pressure from international giants and explore potential technology licensing businesses. While consolidating its advantages in CMOS image sensors, it should also pay appropriate attention to emerging technological paths such as 3D stacking and event-driven vision to address future technological change risks and cultivate diversified growth points, thereby reducing reliance on single product cycles.

5.2 Optimize Financial Strategy to Enhance Financial Robustness and Anti-Cyclical Capability

In response to emerging solvency pressures and significant profit fluctuations, Company W needs to focus on optimizing its financial strategy to enhance robustness. The company should prudently control the scale of interest-bearing debt, optimize its capital structure, avoid over-reliance on debt financing during expansion periods, and explore diversified channels such as equity financing to reduce financial risks. Simultaneously, it must strengthen cash flow management, establish strict budgeting and monitoring mechanisms, focus on strengthening accounts receivable collection to shorten the payment cycle, and maintain sufficient cash reserves to cope with industry fluctuations. During periods of high investment demand or profit volatility, consider implementing more flexible dividend policies, retaining more profits within the company for reinvestment or enhancing risk resistance, thereby improving overall financial flexibility.

5.3 Implement Operational Management to Comprehensively Improve Asset Operation Efficiency

To reverse the decline in operational efficiency, Company W's primary task is to improve the utilization efficiency of existing assets, especially by conducting benefit evaluations of the newly invested automotive sensor packaging and testing capacity. Enhance capacity utilization and fixed asset turnover through production and process optimization and intelligent transformation. Secondly, strengthen supply chain collaboration and inventory management, establish closer collaborative relationships with upstream and downstream partners, and implement precise inventory strategies to reduce capital occupancy and accelerate inventory turnover. Company W also needs to implement refined cost control, strictly control R&D, sales, and administrative expenses through comprehensive budget management, ensuring that various expenses efficiently support strategic objectives, and fundamentally improve operational capability.

5.4 Establish a Dynamic Monitoring System for Timely Strategic Adjustment

Facing the rapid changes in the semiconductor industry, Company W should establish an integrated dynamic monitoring

and strategic adjustment system. The core of this system is to build a dynamic early warning mechanism based on key financial indicators, regularly evaluate performance, and respond promptly to unfavorable trends. Meanwhile, it is necessary to strengthen market and competitive intelligence analysis, continuously track technology trends, competitor movements, and changes in downstream demand, and combine external insights with internal assessments. On this basis, the company should cultivate strategic agility within the organization, establish regular review mechanisms, and be able to adjust business priorities and resource allocation appropriately based on internal and external monitoring results, thereby maintaining strategic initiative and adaptability in a complex and changing market environment.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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