

Financial Risk Analysis of the Photovoltaic Industry Based on the Z-score Model——Taking AKCOME as an Example

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Abstract. As a key development focus of China's new energy industry, the photovoltaic industry has received a series of strong policy supports. Due to the high R&D investment and high technological barriers in the industry, listed companies in this industry face relatively high financial risks. However, current studies on the financial risk analysis of enterprises in the photovoltaic industry are rather limited. This paper takes AKCOME as an example to analyze its financial data, evaluate its solvency, operating ability, and profitability, and identify and assess its financial risks through the Z-score model. The specific causes of financial risks are further explored and a series of targeted suggestions are proposed, hoping to provide references and warnings for financial risk management of relevant photovoltaic enterprises.

Keywords: Financial Risk, Z-score Model, Photovoltaic Industry, AKCOME.

1. Background analysis

In response to the global climate change, representatives of 196 countries and EU signed the Paris Agreement in 2015, which aims to control the magnitude of global warming by reducing emissions of greenhouse gases. In 2020, at the 75th session of the United Nations General Assembly, China announced that "China will strive to peak carbon dioxide emissions before 2030 and make every effort to achieve carbon neutrality before 2060." At present, to achieve the goal promptly, China is vigorously promoting the development of domestic new energy industry, thus the photovoltaic industry receiving a series of strong policy support. In 2022, the National Development and Reform Commission, the National Energy Administration and other ministries and commissions have successively issued the "Action Plan for the Innovative Development of the Intelligent Photovoltaic Industry (2021-2025)", "14th Five-Year Plan for Modern Energy System" and other policies. Relevant policies cover the entire process from the upstream raw materials to the downstream production of photovoltaic industry chain, and promote the vigorous development of China's photovoltaic industry in multiple aspects. The photovoltaic industry will become the main force to support the development of new energy in China in the future.

However, the financial risks that cannot be ignored still widely exist in the operation and management of photovoltaic enterprises, including every detail from financing to capital accumulation, utilization and distribution, which results from multiple aspects such as changes in domestic and foreign industrial policies, fluctuations in the prices of production raw materials, and exchange rate fluctuations. Therefore, this paper will take Zhejiang Akcome New Energy Technology Co.,Ltd. as an example (hereinafter referred to as "AKCOME") to analyze the causes and characteristics of various financial risks based on the Z-score model, and comprehensively sort out the relationships among all aspects of financial risks, so as to find effective methods to control, manage, prevent and avoid financial risks.

2. Related concepts and theoretical basis

2.1. Theoretical Overview of Z-score model

The Z-score model was proposed by Altman (1968), which selects an equal number of bankrupt companies and non-bankruptcy paired companies as samples, and determines X1(Working capital / Total assets ratio), X2 (Retained Earnings / Total Assets), X3 (Earnings before Interest and Taxes / Total Assets), X4 (Market Value of equity / Book Value of Total Debt) and X5 (Sales / Total Assets) as five basic discriminant variables. Among them, X1 and X4 reflect the solvency of the enterprise, X2 and X3 reflect the profitability of the enterprise, and X5 reflects the operating capacity of the enterprise. The model uses the data in the financial reports of listed companies to calculate a series of financial ratios, and reflects the financial risk of the company. Additionally, the model assigns varying weights to different indicators based on their risk efficacy. Through weighted calculations, the model derives a comprehensive risk score for a company, termed the Z-score. The Z-score is then compared against a critical value to evaluate the company's financial risk level [1].

2.2. Z-score model

The function of the Z-score model is as follows.

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5 \quad (1)$$

Table.1. lists the Z-score criteria. The Z-score is obtained through weighted calculation based on the variables X1-X5. Z-score greater or equal to 2.67 refers to low financial risk and a low possibility of bankruptcy. When the Z-value falls between 1.81 and 2.67, it is in the gray area, indicating that the financial situation is unstable. If the Z-score is less than 1.81, the enterprise is likely to go bankrupt.

Table 1. Criteria for Z-score.

Z-score	Probability of enterprise bankruptcy
$Z < 1.81$	Highly likely to bankrupt
$1.81 \leq Z < 2.67$	In the gray area, with unstable financial conditions
$2.67 \leq Z$	Relatively low financial risks and a low possibility of bankruptcy

3. Literature review

3.1. Overview of relevant domestic and foreign research

Research on the risk status of enterprises started earlier abroad, and previous research has established a comprehensive framework for evaluating enterprise risk. The earliest research on financial distress prediction was the univariate bankruptcy discriminant prediction research conducted by Fitzpatrick (1932). Its main research method was to conduct empirical analysis and comparison on a series of financial ratios of failed enterprises and normal ones [2]. Beaver (1966) was the first to propose the univariate method to study financial risks and tested the predictive ability of different financial indicators of companies 5 years before the company's bankruptcy. The results showed that among the selected indicators, the two discriminant variables with the best prediction effect were working capital / total liabilities and net profit / total assets [3]. However, the univariate model only focuses on one aspect of an enterprise's financial situation and it is difficult for it to comprehensively reflect the overall financial situation. To overcome this limitation, Altman (1968) first used the multivariate linear discriminant model to study the bankruptcy problem of companies and proposed the multivariate model Z-score model with more accurate judgment ability [1].

In contrast, research on financial risk assessment in China pays more attention to its empirical analysis and practical application in different industries. Yang Fan (2020) used the Z-value model to evaluate the financial status of 38 listed Chinese medicine enterprises from 2007 to 2018, and analyzed the impact of relevant financial ratios on the financial status through panel regression [4]. Peng Wanfang (2020) pointed out that according to the differences in the selected industries or

regions, the setting of relevant indicators and weights of the "Z-score" model should be different [5]. Sun Qingwen (2021) improved the Z-value model by setting the critical value at 0.6, which improved the accuracy of judging the financial status of listed companies in the pharmaceutical manufacturing industry [6]. Li Pengtao (2021) conducted an empirical test on the applicability of Altman's Z-value model in the early financial warning of agricultural listed companies. It was found that the predicting accuracy rate of the Z-value model one year before ST enterprises were subject to ST treatment was 100% [7]. Xu Dandan (2022) analyzed the financial status of Evergrande Group through the univariate and Z-value models and found that conglomerate diversification, shortage of cash flow, and rising financing costs were the fundamental reasons for the occurrence of the financial crisis in real estate enterprises [8]. Xu Jinfan (2023) used the Z-value model to test the enterprise risk status and found that the profitability of assets and the profitability of accumulation were the main factors leading to financial risks [9].

3.2. Literature review and comment

Throughout domestic and foreign literature, it is found that research on financial risk analysis and the establishment of the Z-score model started first abroad and was widely used in early financial risk early warning. Domestic scholars have introduced and developed the Z-score model, verified the accuracy of the model in predicting the financial status of domestic listed enterprises, and conducted specific analysis and research in different fields. Considering other influencing factors of the financial crisis and the characteristics of different industries in combination with the actual situation, they have modified and improved the Z-score model for different industries. Although significant achievements have been made in the research on evaluating financial risks with the Z-score model, researches mainly focus on industries such as medicine, real estate, and traditional manufacturing, and case studies on the financial risk analysis of emerging technology-based enterprises such as the photovoltaic industry are relatively scarce. Given the strong operability and high evaluation accuracy of the Z-score model, which can provide a good financial risk research method for enterprises, this paper employs the Z-score model to analyze and evaluate the enterprise financial risk status of AKCOME, providing specific methods for AKCOME and other photovoltaic enterprises to conduct financial risk assessment, helping enterprises to discover and respond to financial risks in a timely manner. Meanwhile, this paper enriches the theoretical research on the application of the Z-score model in the field of financial risk analysis of emerging technology-based enterprises and provides a reference for subsequent research.

4. Case selection and explanation

As the first listed company in China's photovoltaic accessories industry, AKCOME has developed into a leading domestic high-efficiency new energy comprehensive service provider after undergoing multiple strategic transformation and development. The company's main products include high-efficiency solar cells and modules, aluminum frames for solar modules, and photovoltaic support systems.

AKCOME was listed on the Shenzhen Stock Exchange in 2011. However, due to consecutive losses for three years in 2020, in 2023, it was issued a qualified opinion on its financial report and an adverse opinion on its internal control. On May 6th, AKCOME was subject to other risk warnings by the Shenzhen Stock Exchange. After that, its stock price plummeted, with 31 consecutive trading limit downs. And because it touched the situation where the par value was lower than 1 yuan for 20 consecutive trading days, it was directly delisted.

Based on the above statement, AKCOME is typical and representative in the photovoltaic industry. Conducting an in-depth analysis of its financial risks has great warning significance for the photovoltaic industry. Taking AKCOME as an example, this paper will use the Z-score model to calculate and analyze the financial risk status from three aspects, namely solvency, operating ability, and profitability.

5. Identification of financial risks in AKCOME

5.1. Analysis of solvency

An enterprise's solvency refers to its ability to repay long-term and short-term debts with its assets. In this paper, AKCOME's short-term solvency is evaluated by current ratio and quick ratio, while its long-term solvency is evaluated by asset-liability ratio, equity multiplier, and interest coverage ratio, and in-depth analysis will be conducted.

5.1.1. Short-term solvency

To evaluate AKCOME's short-term solvency, this paper selects current ratio and quick ratio as financial ratios. As shown in Figure 1., the current ratio and quick ratio both increased from 2014 to 2018, and both reached above 1 in 2018, indicating that AKCOME had a relatively strong short-term solvency at that time. However, in the next six years from 2018 to 2023, the current ratio and quick ratio continued to decline, falling from 1.16 and 1.11 to 0.69 and 0.63, indicating that its asset liquidity had weakened and it could not pay back the principal and interest of short-term debts in time, thereby weakening its short-term solvency. After analyzing, it is found that the sudden increase in AKCOME's liabilities in 2022 and 2023 is one of the important reasons for the rise of the current ratio and quick ratio, indicating that its short-term solvency has weakened and faces great short-term solvency risks.

For comparison, this paper analyzes the current ratio and quick ratio of AKCOME's industry peer, Sungrow Power Supply Co.,Ltd.(hereinafter referred to as "Sungrow"). Figure 1. shows that Sunny Power's current ratio and quick ratio, except for 2022, were above 1 and were higher than those of AKCOME, indicating that it has a very strong short-term solvency and is much stronger than AKCOME. AKCOME performs relatively poorly in comparison with its industry peer in terms of short-term solvency.

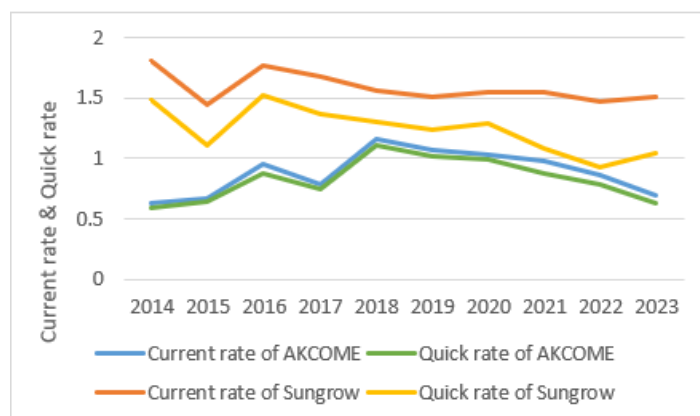


Figure 1. Comparison of current ratio and quick ratio of AKCOME and Sungrow from 2014 to 2023.

5.1.2. Long-term solvency

To evaluate the long-term solvency of AKCOME, this paper selects the asset-liability ratio (referred to as "ALR" in Table.2.), equity multiplier (referred to as "EM" in Table.2.) and interest coverage ratio (referred to as "ICR" in Table.2.) as important indicators. Table.2. shows the asset-liability ratio, equity multiplier and interest coverage ratio of AKCOME from 2014 to 2023. From the perspective of the asset-liability ratio, the average level of the asset-liability ratio in the photovoltaic industry ranges from 60% to 70%, which can reflect relatively good long-term solvency of enterprises. During the eight years from 2014 to 2021, although the asset-liability ratio of AKCOME had always been relatively high and even approached 80% in 2015, it showed a downward trend, indicating that its debt proportion was decreasing and the debt repayment situation was relatively stable. However, in 2022 and 2023, the asset-liability ratio of AKCOME increased significantly, reaching above 70%, suggesting that a huge crisis emerged in the long-term solvency

of AKCOME after 2022. Combined with the fact that the debt scale expanded significantly in 2022 as mentioned before, the financial crisis of AKCOME had been very serious since 2022 and its long-term solvency had been greatly weakened.

In terms of the equity multiplier, although the equity multiplier was relatively high in the initial stage from 2014 to 2021, it had been declining constantly, indicating that the long-term solvency of AKCOME was gradually strengthening and basically getting out of the danger of serious insufficiency in solvency that occurred in the early stage of listing. However, in 2022 and 2023, the equity multiplier of AKCOME returned to the initial value. At this time, the total liabilities of AKCOME increased significantly, resulting in weakened short-term and long-term solvency.

Viewed from the interest coverage ratio, the interest coverage ratio of AKCOME was above 1 and within a reasonable range from 2014 to 2018, demonstrating relatively strong solvency. However, in 2019, the interest coverage ratio dropped directly below 0. And since 2019, due to the impact of the epidemic, it had been below 1, showing AKCOME's weak long-term solvency.

Table 2. Long-term solvency indicators of AKCOME from 2014 to 2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ALR (%)	71.71	79.49	65.01	66.12	57.72	64.70	57.29	58.67	72.26	77.81
EM	3.53	4.88	2.86	2.95	2.37	2.83	2.34	2.42	3.60	4.51
ICR (%)	1.66	1.46	1.67	1.29	1.31	-2.83	0.90	-1.01	-3.24	-2.51

As a comparison, this paper analyzes the asset-liability ratio of Sungrow. As shown in Figure 2., Sungrow's asset-liability ratio has always been maintained within the range of 50% to 70% and is quite stable, indicating that it has a very strong long-term solvency. However, AKCOME's asset-liability ratio is generally higher than that of Sungrow, and its long-term solvency is also inferior to that of Sungrow.

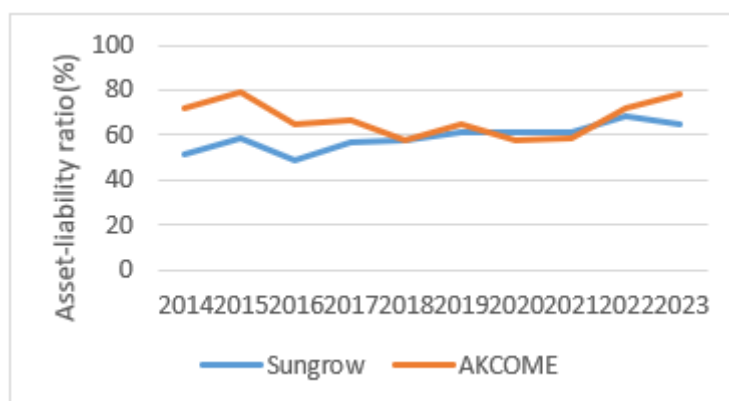


Figure 2. Comparison of asset-liability ratio of AKCOME and Sungrow from 2014 to 2023.

5.2. Operational ability analysis

The enterprise's operating ability, which refers to the enterprise's capacity of using various assets, mainly focuses on the efficiency with which a company generates sales revenue. The analysis of operating ability provides decision-making support for improving operating efficiency. In this paper inventory turnover rate, accounts receivable turnover rate and total asset turnover rate are selected to measure the operating capacity of AKCOME and an in-depth analysis is conducted.

5.2.1. Inventory turnover rate

Inventory turnover rate (referred to as "ITR" in Table.5.) is one of the key financial indicators to measure the efficiency and liquidity of inventory management. It reflects the turnover rate of enterprise inventory in a certain period.

Table.3. shows the inventory turnover rate of AKCOME from 2014 to 2023. According to the public information in the industry, a rate around 3% is the reasonable level. The data in Table.3. shows that the inventory turnover rate of AKCOME is above 8, which shows a high inventory

turnover efficiency. However, from 2019 to 2021, the index declined from 16.89 to 8.24. Although it rebounded in 2022, it has still experienced a sharp descent to 8.50 in 2023, indicating a gradually weakened operating capacity of AKCOME. According to the analysis, decreasing demand in global market led by the economic downturn caused by COVID-19 epidemic is one possible reason, the other lies in the development speed of the photovoltaic industry greatly affected by the global photovoltaic industry policy. Especially in the international market, some countries or regions (such as the United States, India, Europe, etc.) have established the policy portfolio including trade barriers and local industries' development support to defend China's photovoltaic products, resulting in a lower share of overseas sales. In addition, the operating cost of AKCOME witnesses a significant increase in 2022. According to the annual report of the enterprise, the main reason is that AKCOME greatly expanded the production of solar mounting brackets and solar modules in 2022, resulting in a stagnant sale of the inventory, which shows that its inventory management efficiency becomes low and its operating capacity is problematic.

Table 3. Inventory turnover rate of AKCOME from 2014 to 2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ITR (%)	14.66	14.66	10.58	12.00	14.87	16.89	12.44	8.24	13.01	8.50

Figure 3. is the comparison of inventory turnover rate between AKCOME and its competitors in the same industry. According to Figure 3., the inventory turnover rate of AKCOME is higher than that of Sungrow, showing a good inventory management and better operating capacity.

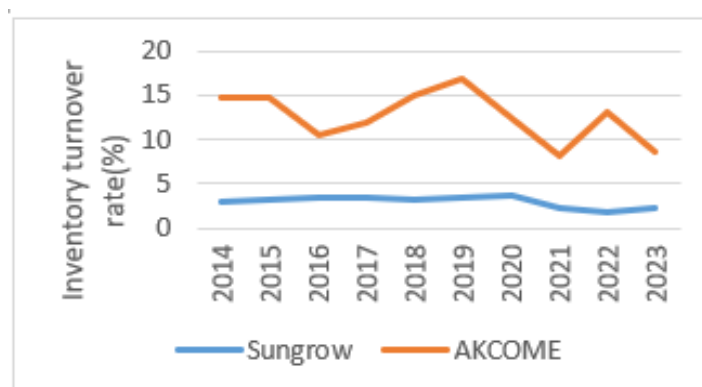


Figure 3. Comparison of the inventory turnover rate AKCOME and Sungrow from 2014 to 2023

5.2.2. Accounts receivable turnover rate

The accounts receivable turnover rate (referred to as "APT" in Table.4.) measures the efficiency of a company's recovery of accounts receivable from its sales, which reflects the enterprise's cash flow management capabilities and the effectiveness of its credit policies. In the photovoltaic industry, which falls under the manufacturing sector, credit sales are prevalent. Therefore, a stable accounts receivable turnover rate enhances capital efficiency and accelerates corporate fund flow.

Table.4. shows the accounts receivable turnover rate of AKCOME from 2014 to 2023. According to the data of Table.4., the accounts receivable turnover rate of AKCOME from 2014 to 2020 is stable between the rate 2-4%. However, the annual report of AKCOME pointed out that impacted by the integration of the photovoltaic industry, the enterprise's customers have a relatively high degree pressure in operation, causing a series of uncertainties to the company's capital return, which have increased the pressure on the enterprise's accounts receivable recovery in some extent, and will lead to fluctuations in the turnover rate of AKCOME's accounts receivable. In summary, AKCOME's accounts receivable turnover rate indicates a relatively reasonable level of its operating capacity.

Table 4. Accounts receivable turnover rate of AKCOME from 2014 to 2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
APT (%)	3.04	2.47	2.64	2.77	2.63	2.91	2.55	4.32	9.14	4.21

Figure 4. is the comparison result of the accounts receivable turnover rate index of AKCOME and the same industry competitor Sungrow. In comparison with Sungrow, AKCOME's accounts receivable turnover rate is higher, indicating that judging from accounts receivable turnover rate, AKCOME's operating ability is better.

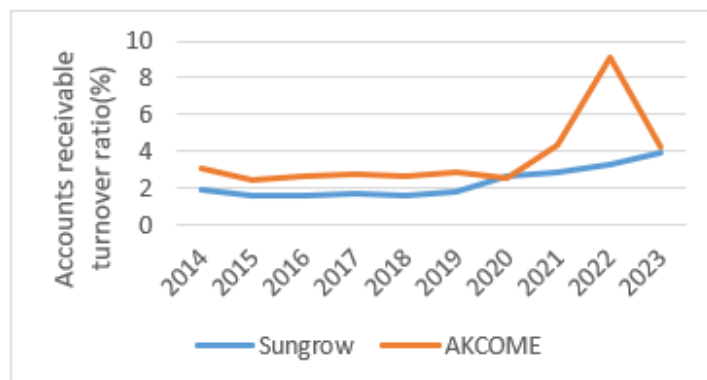


Figure 4. Comparison of accounts receivable turnover ratio of AKCOME and Sungrow from 2014 to 2023.

5.2.3. Total asset turnover rate

The total asset turnover rate (referred to as "TAT" in Table.5.) is an important financial indicator to measure the efficiency of enterprise asset operation. It reflects the ability of enterprises using all their assets to generate sales revenue, and the utilization efficiency and management quality of enterprises in terms of assets.

Table.5. shows the total asset turnover rate of AKCOME from 2014 to 2023. According to the data in Table.5., AKCOME's total asset turnover rate is relatively mediocre and its operating capacity is not outstanding judging by this indicator. The reason founded after the analysis is that the relatively slow growth rate of the company's operating income compared with the speed of the company's expansion scale. From 2019 to 2021, the total assets of AKCOME significantly shrank, and the total asset turnover rate fell again, indicating that the operating capacity of AKCOME was weak during the period. According to the analysis, one reason is that the sales situation has deteriorated due to the impact of the COVID-19 epidemic and global industrial policies, On the other hand, the poor ability of AKCOME in planning and allocating asset elements leads to AKCOME's poor operating ability.

Table 5. Total asset turnover rate of AKCOME from 2014 to 2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TAT (%)	0.47	0.31	0.27	0.29	0.31	0.40	0.28	0.27	0.64	0.42

Figure 5. is the comparison of total asset turnover rate of AKCOME and SUNGROW. According to Figure 5., the total asset turnover rate of AKCOME is generally low, indicating that its operating capacity in total assets utilization remains a relatively poor level.

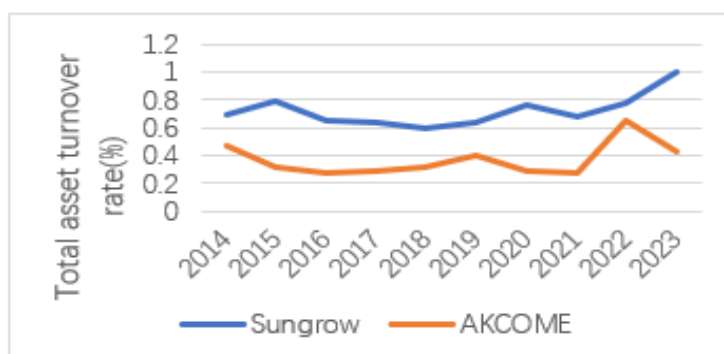


Figure 5. Comparison of total asset turnover rate between AKCOME and Sungrow from 2014 to 2023.

5.3. Analysis of profitability

Profitability is of great significance for an enterprise as it reflects the enterprise's operating status and directly embodies its ability to generate profits. It determines whether the enterprise can continue to grow and its future development. In this paper, the net profit margin, return on equity (ROE), and revenue growth rate, are selected to analyze the profitability of AKCOME.

5.3.1. Net profit margin

The net profit margin (referred to as "NPM" in Table.6.) refers to the ratio between the net profit achieved by a company and its sales revenue. This indicator can measure an enterprise's ability to obtain earnings through the sales of products and services. The data in Table.6. shows that from 2014 to 2018, AKCOME's sales revenue gradually increased, and the net profit margin was relatively stable. However, during the period from 2019 to 2023, the enterprise's operating conditions were poor. In 2019, the net profit margin turned negative with a relatively large value, indicating that the enterprise suffered huge losses. Spurred by the losses in 2019, the enterprise made efforts to improve its operating conditions in 2020 and reversed the losses to achieve positive earnings. Nevertheless, it failed to maintain the growth momentum of earnings after 2020, and the losses of the enterprise increased year by year in the three years before delisting. Additionally, as can be seen from the data in the table, due to factors such as the pandemic in 2020 and 2021, the sales revenue decreased significantly. In 2021, it shrank to 50% of that in 2019, suggesting that the profitability of AKCOME was gradually weakening. Through the analysis of the enterprise's financial statements, it was found that in the non-pandemic period when there was no significant decline in sales revenue, the main reasons for AKCOME's losses came from its relatively high operating costs and various expenses. The decline in AKCOME's net profit margin indicates that the enterprise's ability to obtain earnings through daily business activities has weakened, which will lead to an increase in financial risks. Therefore, during the daily operation process, the enterprise needs to pay attention to controlling operating costs and reducing unnecessary expenses to improve the net profit margin.

Table 6. Profitability Indicators of AKCOME from 2014 to 2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NPM (%)	3.3	3.7	4.0	2.3	2.9	-32.6	1.0	-16.6	-12.4	-19.2
ROE (%)	5.3	4.9	3.7	1.9	2.3	-33.2	0.7	-10.7	-23.7	-32.4
RGR (%)	55.5	7.1	21.4	24.3	-0.3	5.9	-41.2	-16.1	164.3	-30.3

As can be seen from Figure 6., which is the comparison of the net profit margin between AKCOME and Sungrow, the net profit margin of AKCOME was consistently lower than that of Sungrow during the period from 2014 to 2023. Specifically, from 2014 to 2018, the net profit margin of AKCOME was approximately 3%. However, after 2018, this indicator turned negative, making it difficult for the enterprise to generate profits. In contrast, within the past ten years, the net profit margin of Sungrow has remained steadily around 10%, demonstrating that the enterprise enjoys good profitability. By comparing with competitors in the same industry, it can be intuitively observed that the profitability of AKCOME is relatively weak.

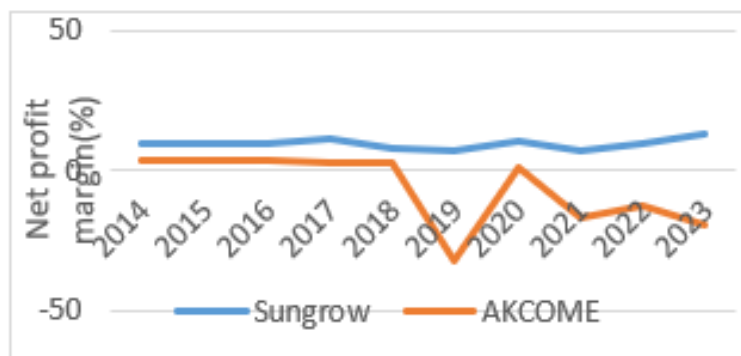


Figure 6. Comparison of net profit margin between AKCOME and Sungrow from 2014 to 2023.

5.3.2. Return on equity

Return on equity (ROE) is the ratio of net profit to average shareholders' equity. It indicates how effectively a company utilizes its own capital and the level of return generated by investment. Generally, a higher ROE signifies a higher return on investment.

The data of AKCOME's ROE has shown a downward trend since 2014 and dropped to the minimum value of -33.2% in 2019, indicating that the company's operating conditions were extremely poor, the efficiency of using its own capital was low, and the enterprise was faced with insolvency. Similar to the analysis result of the net profit margin on sales mentioned before, except for the reversal of the significant loss in 2020, the losses have been expanding since 2021, and the company's own capital has been shrinking yearly. The ROE dropped to -32.4% in 2023, suggesting that the profitability of AKCOME has been gradually weakening. The main reason lies in the relatively high operating costs and related expenses of AKCOME, which makes it difficult for the enterprise to obtain net profits. The continuous decline of AKCOME's ROE indicates its weak profitability and warns that the enterprise's financial risk situation is intensifying. Therefore, attention should be paid to reducing operating costs and related expenses and improving the enterprise's ability to convert its own capital into profits.

It can be seen from Figure 7. that during 2014 to 2023, the ROE of AKCOME was lower than that of Sungrow. The ROE of AKCOME had been showing a downward trend from 2014 to 2023. After 2018, AKCOME's ROE was negative, indicating that there were problems in the AKCOME's operation and management and that it was difficult to convert its own capital into profits. However, the ROE of Sungrow within ten years has always been steadily exceeding 10%, and since 2021, its ROE has been growing rapidly, indicating that the enterprise's profitability is getting stronger and the efficiency of using its own capital is high. By comparing with competitors in the same industry, it is found that AKCOME has a low efficiency in using its own capital and weak profitability.

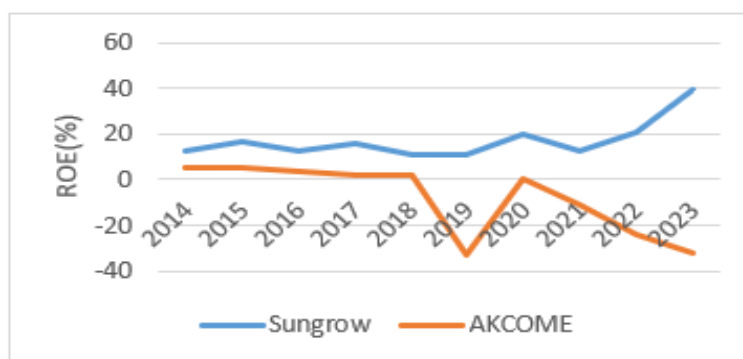


Figure 7. Comparison of ROE between AKCOME and Sungrow from 2014 to 2023.

5.3.3. Revenue growth rate

The revenue growth rate (referred to as "RGR" in Table.6.) refers to the growth level of an enterprise's operating revenue in a current year compared to that of the previous year. Through the analysis of the changes in the value of this indicator, the changes in the enterprise's operating revenue and its future trends can be observed. Before the pandemic in 2020, the operating revenue of AKCOME fluctuated but was generally still in a growth stage. During the pandemic, normal production and research and development were suspended, and the revenues of technology enterprises dropped significantly. The high growth of operating revenue in 2022 was mainly due to the rebound after the pandemic. In 2023, AKCOME failed to maintain the growth of its operating revenue, with a 30.3% decrease in operating revenue. The enterprise's revenue shrank substantially, and its operating conditions were not good. Judging from the indicator of the revenue growth rate, the profitability of AKCOME is relatively weak.

6. Analysis and evaluation based on the Z-score model

Table 7. presents variables X1-X5 and the Z-score results of AKCOME from 2019 to 2023. Combined with the critical point analysis of the Z-score model, the Z-score was consistently less than the critical value of 1.81 during the period from 2014 to 2023. AKCOME was in a state of bankruptcy for a long time, with a high level of financial risk and poor financial conditions.

Further analysis reveals that the Z-score generally showed a trend of first rising and then falling. From 2014 to 2018, the enterprise's financial conditions demonstrated an overall improving trend. There was a turning point in 2019. In 2019, the Z-score of AKCOME was 0.32, which was the minimum value during the period from 2014 to 2023. At this time, the enterprise was facing huge financial risks. In 2020, the Z-score was 0.73, indicating that the enterprise was making efforts to improve its financial conditions, but failed to stop the downward trend. From 2021 to 2023, the Z-score further decreased, and the enterprise's financial conditions continued to deteriorate, eventually leading to bankruptcy.

Based on the data results of the Z-score model along with specific analyses of various variables, it can be found that the overall changing trends of the variables are the same as that of the Z-score, indicating that it can better reflect the problems emerging in enterprise operations and the degree of financial risks. The decrease in the Z-score in 2019 was mainly due to the occurrence of a relatively large negative value in variable X3. The calculation formula of X3 is earnings before interest and tax / total assets, which indicates that the enterprise failed to obtain profits. According to the financial statements, it could be found that the main reason for this phenomenon was the increase in liabilities. After taking on debts, the enterprise failed to obtain more profits, and the utilization efficiency of capital was poor, resulting in an increase in financial risks. Variable X1 had negative values on multiple occasions, indicating that the asset liquidity and the short-term solvency of AKCOME was weak, and it was faced with insolvency. The change in variable X2 reflects that the enterprise had a certain ability to accumulate profits in the first five years, but negative values appeared in the latter five years, with losses in enterprise operations and a reduction in retained earnings. Variable X4 experienced a large decline in 2022, reflecting that the enterprise's financing structure lacked stability and Creditor invested capital was less protected by shareholder capital. Variable X5 was relatively stable, indicating that the enterprise's operations were relatively stable and the asset utilization rate and the ability of assets to create sales were acceptable.

Based on the above analyses, the Z-score of AKCOME changes under the combined impact of five indicators [10]. The reason for the financial crisis lies in the fact that, the enterprise failed to obtain sufficient profits through the sales of products and services while taking on a large amount of debts, due to excessive sales costs and various expenses. It is very important to monitor the changes in various financial data for the timely discovery of problems existing in enterprises. In order to effectively control the enterprise's financial conditions and maintain them in good condition, it is necessary to strengthen financial risk management at all levels.

Table 7. X1-X5 variables and Z-score results of AKCOME from 2019 to 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
X1	-0.21	-0.17	-0.01	-0.10	0.06	0.03	0.02	-0.01	-0.09	-0.22
X2	0.02	0.02	0.020	0.03	0.04	-0.01	-0.12	-0.17	-0.21	-0.31
X3	0.03	0.04	0.04	0.04	0.05	-0.10	0.04	-0.03	-0.06	-0.07
X4	0.40	0.26	0.54	0.51	0.73	0.55	0.75	0.70	0.38	0.29
X5	0.36	0.26	0.24	0.28	0.35	0.44	0.31	0.28	0.58	0.45
Z-score	0.48	0.36	0.69	0.62	1.07	0.32	0.73	0.36	0.21	-0.29

The Z-score results of AKCOME and Sungrow are compared in Figure 8., which shows that the Z-score of Sungrow from 2014 to 2023 is basically higher than the critical value of 1.81, located in the gray area. This indicates that Sungrow has relatively higher financial stability and is at a relatively lower risk level. In contrast, the Z-score result of AKCOME is obviously lower than the critical value

of 1.81, indicating that the company has a high financial risk level and faces the risk of bankruptcy. AKCOME must pay close attention to its financial situation, deeply analyze the reasons for its high financial risk level, and take effective measures to improve it, such as optimizing asset structure, improving profitability, and strengthening cash management, to improve the company's sustainable development ability.

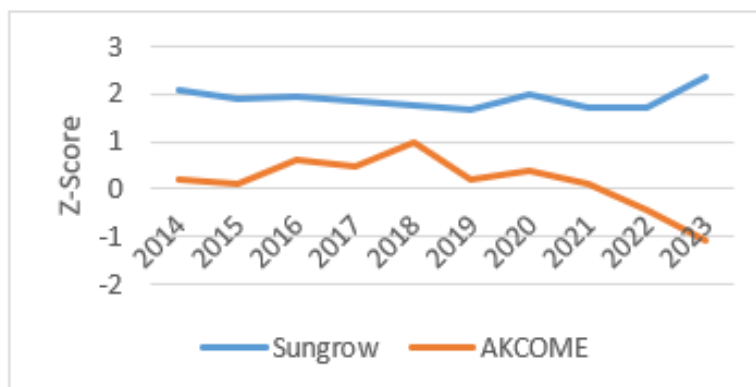


Figure 8. Comparison of Z-score of AKCOME and Sungrow from 2014 to 2023

7. Conclusion

AKCOME, once the first domestic listed company in the photovoltaic industry and the leading comprehensive service provider of high-efficiency new energy in China, its financial risks extensively exist in every detail of its operating and management process, leading to AKCOME's consecutive losses and finally delisting. Based on the analysis and research above, the following conclusions are drawn.

In terms of solvency, through the analysis of current ratio, quick ratio and asset-liability ratio, it can be concluded that AKCOME's asset liquidity is seriously insufficient, leading to a continuous weakening of both short-term and long-term debt repayment ability, and finally unable to repay debts and interests. Concerning the operational ability, through the analysis of inventory turnover rate, accounts receivable turnover rate and total assets turnover rate, it can be concluded that AKCOME, under the influence of the downward trend of the world economy and the anti-market policies of international markets, still blindly expanded production, resulting in unsold inventory, and the inventory turnover rate continued to decline to 8.50%, indicating that its inventory management efficiency has decreased and operational ability has weakened. In terms of profitability, through the analysis of net profit margin, ROE and revenue growth rate, it can be concluded that due to AKCOME's high operating costs and related expenses, it is difficult to obtain net profits through daily business activities, and its profitability has continued to weaken. The three indicators collectively reflect that AKCOME is facing a very serious financial crisis. Moreover, the Z-score model analysis and evaluation also shows that AKCOME's Z-score result is less than the critical value of 1.81, which fully demonstrates its high financial risk level and its risk of bankruptcy.

8. Feasible Suggestions

8.1 Reducing current liabilities and increasing current assets

Enterprises should reduce current liabilities and increase current assets to improve the current ratio and quick ratio, thereby enhancing their short-term solvency. The asset liquidity of AKCOME is seriously low, and the debt repayment plan is formulated unreasonably, which has led to its ultimate inability to repay huge debts. Instead, enterprises should increase current assets such as cash, accounts receivable and inventories, repay short-term debts in advance, or negotiate debt restructuring with creditors to reduce current liabilities and strengthen solvency.

8.2 Strengthening production management and improving sales channels

Enterprises should adopt the concept of lean production, strengthen production management, and improve sales channels to enhance operating capacity. Despite being hit hard by both the COVID-19 pandemic and trade barriers, AKCOME still blindly expanded production and failed to allocate its available assets efficiently, resulting in stagnant sales of its products. In the photovoltaic industry, enterprises should optimize the production process, control the quantity of work in progress, expand sales channels, and implement effective promotional strategies, so as to increase the inventory turnover rate and enhance operating ability.

8.3 Optimizing costs and increasing profits

Enterprises should analyze their cash inflows and outflows in detail and review their production and operation processes to seek cost reduction and profit enhancement opportunities, thereby improving their net profit margin and enhance profitability. After the pandemic, AKCOME still had no awareness of cost control when facing the period of economic weakness, but continued to expand production with a large amount of costs, resulting in consecutive years of losses for the enterprise and an increase in financial risks. In the photovoltaic industry, enterprises should improve budget control and cost monitoring, increase the added value of products and expand the market to improve their net profit margin and enhance the profitability of the enterprise.

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