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Article

Financial risk evaluation and control of JZ New Energy Company

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Abstract: Under the background of "double carbon", the new energy industry is developing rapidly and the economy is growing rapidly. At the same time of the rapid development of the new energy industry, the financial risks faced by it should not be ignored. In this paper, JZ New Energy Company is selected as a case study object, the financial risk of the enterprise is identified and evaluated, and control measures are proposed. The results of the study show that (1) JZ New Energy has financial risks in 2018–2022, with the highest risk in 2020 and the lowest risk in 2021. (2) JZ New Energy has certain risks of financing, investment, operation and income distribution. (3) In order to reduce the financial risk, it should expand financing channels and optimise the capital structure; regularly prepare cash budgets, reasonably retain earnings and profit distribution; improve the talent management system and actively respond to changes in the external environment. By identifying the financial risks of JZ New Energy, we can make a comprehensive evaluation of the risks of JZ New Energy, and then put forward financial risk control measures for JZ New Energy.

Keywords: JZ New Energy; financial risk assessment; risk control; entropy TOPSIS method

1. Introduction

New energy industry is one of the important directions for China' s future economic development, and it has broad market prospects and growth potential [1]. As of the end of December 2023, the country' s cumulative installed power generation capacity was about 2.92 billion kilowatts, a year-on-year increase of 13.9% [2]. New energy storage is increasingly becoming a key technology for building a new energy system and a new power system in China, and by the end of 2023, more than 30 million kilowatts of installed capacity had been put into operation [3].

The research object selected in this paper—JZ New Energy Company, the company was founded in 2010, which is very typical in the new energy industry. JZ New Energy Company has nearly 20 billion yuan of total assets and more than 3GW of new energy power station installed capacity, in the industry is a large enterprise, its operating conditions and development trend has a certain demonstration and influence on the industry. It has accumulated rich experience in the investment, construction and operation of new energy projects. For example, in the development mode of power generation projects, it adopts a variety of flexible models for different types of projects. Its successful experience can provide reference for other new energy enterprises and has positive significance for promoting the development of the industry [4]. JZ New Energy Company has become a typical enterprise in the new energy industry with its sustainable development in the field of new energy, diversified business layout, ability to adapt to market changes and scale and influence in the industry, which is of great

representative significance for the study of financial risks and development strategies of new energy enterprises.

By analysing the financial data of JZ New Energy in recent years, it is found that there is a single financing channel, unreasonable investment management, unreasonable management of accounts receivable, unreasonable distribution of retained earnings and profits, etc., and the financial situation is not optimistic, which may lead to the enterprise falling into a financial predicament if it is not taken seriously or controlled. Therefore, it is necessary to carry out an in-depth study on the financial risk of JZ New Energy to control the financial risk, in order to promote the sustainable development of JZ New Energy, and also to provide other new energy enterprises with certain references and reference significance [5].

Through reading, collating and analysing the literature related to financial risk, financial risk evaluation, financial risk control and financial risk in the new energy industry at home and abroad, it can be found that foreign scholars' research on financial risk is richer than that in China and has formed a certain theoretical foundation, and its application in enterprises is very common [6]. China's research related to financial risk started late, the research results are not rich enough, and the conclusions for a certain enterprise are difficult to use in an industry [7]. As energy security is becoming more and more important, the new energy industry is developing rapidly, and the current research on new energy enterprises is not sufficient, so it is necessary to evaluate and control the financial risk of new energy JZ new energy [8]. The financial risk of JZ new energy is managed with a view to applying the feasible suggestions of financial risk control to new energy enterprises, providing a certain reference significance for other new energy enterprises, and promoting the benign and orderly development of new energy enterprises in China [9].

This paper focuses on JZ New Energy, a new energy enterprise, as a case study. After reviewing a substantial amount of literature from the Knowledge Network, it summarizes relevant theories of financial risk and applies them to assess and identify the financial risks of JZ New Energy. By analyzing its financial data from 2018 to 2022, the paper identifies various financial risks faced by the company. It then selects appropriate financial risk evaluation indicators using the entropy weight TOPSIS method to conduct a vertical comparison of the company's financial data over these five years, as well as a horizontal comparison with data from the new energy industry in 2022. The analysis identifies the financial risks present in the enterprise and proposes scientifically grounded, targeted measures for financial risk control [10].

The remainder is organised as follows: Section 2 mainly introduces the current state of research at home and abroad and provides a literature review. Section 3 introduces the sample, research method and data sources of this paper. Section 4 carries out a comprehensive and in-depth financial risk evaluation of JZ New Energy based on the characteristics of the new energy industry and the relevant analyses of financial risk identification in the previous section. Section 5 proposes targeted control measures for the financing, investment, operation, income distribution and other risks of JZ New Energy. Section 6 draws final conclusions and looks into the future after the identification and evaluation of financial risks in the previous section.

2. Literature review

2.1. Research on financial risk

The relevant research on financial risk is mainly from the definition, identification, causes and classification of financial risk, pointing out that the operation and development of enterprises cannot be separated from financial risk. Fu pointed out that financial risk indicators include solvency indicators, profitability indicators, growth indicators and so on [11]. Li and Zhao pointed out that financial risk is very easy to induce the company's financial fraud, which directly leads to the existence of material misstatements in the financial statements, increasing the audit risk and the difficulty of the auditor's work, which leads to the increase in the probability of audit failure [12]. Zhang and Wang pointed out that the profit model of Internet enterprises is different from that of traditional enterprises, and its financial risk has greater uncertainty [13]. Yu pointed out that the financial risk of treasury payment centre includes payment system risk, budgeting risk, external system risk, internal management risk [14]. Jin and Pang pointed out that as enterprises carry out business activities, absorb social capital, and expand production scale, they will face various risks within the company, and all of them may be transformed into financial risks in the end [15]. Dang pointed out that in the process of enterprise operation, financial risk is unavoidable, and the types of financial risk are diversified, which has a long-term impact on the future development of enterprises [16]. Sheng and Wang pointed out that financial risk is dynamic and brings many uncertainties for enterprise decision-making [17]. There are also some researches originated from western developed countries, where many theoretical research results were born, which are richer than our country and gradually formed a complete theoretical system, which is worthy of our country's reference and reference. On the one hand, the financial risk under the enterprise's behaviour is manifested in the unexpected losses caused, predicted or uncontrollable factors. On the other hand, it may bring unexpected benefits. Tatiparti et al. examined and assesses several aspects of financial risk in economic performance. The main factors of financial risk covered by the study include liquidity risk, market risk, credit risk, operational risk [18]. Huang suggests that in a competitive market, financial risk usually comes from two sources. Firstly, it comes from normal external market competition behaviour. In addition, there are some risk factors within the enterprise caused by internal problems, mainly including abnormal decision-making or problems in the management process [19]. Zhang explored the nature and transmission mechanism of financial risk in fishery enterprises from the perspectives of dynamic capital flows and external environmental risks [20]. Ronyastra et al. implements an integrated framework to investigate the complexities associated with identifying financial risks in industrial areas on post-mining lands in Indonesia [21].

2.2. Relevant studies on financial risk evaluation

Some researchers' studies on financial risk evaluation mainly focus on constructing a financial risk evaluation system through a variety of methods to evaluate the degree of corporate financial risk. Wei et al. pointed out that an important part of the financial risk evaluation system is the selection of relevant financial

indicators, and the more in line with the actual situation of the enterprise, the more effective the construction of the evaluation index system will be, and the more accurate the results of risk evaluation will be [22]. Wang used TOPSIS analysis combined with entropy and CRITIC methods to improve the reliability of the model [23]. Tan used financial risk assessment methods such as risk sensitivity analysis and Monte Carlo simulation to quantify the financial risk of seed companies [24]. Sun and Li used entropy weighting method to determine the weights of financial risk indicators based on the linear relationship between the indicators [25]. Based on cluster analysis to obtain indicator confidence, calculate the financial risk early warning standard value. The risk early warning model is constructed through the neural network algorithm to score the financial data of public hospitals and achieve the financial risk division of the data. There are also some scholars through a variety of algorithms and the establishment of a variety of evaluation models to evaluate the financial risk, the evaluation method has its uniqueness, laying the foundation for the control of the subsequent financial risk, which is worthy of our reference. On the basis of the theoretical research related to supply chain finance and risk Xuan uses the fuzzy preference relationship, selects the main risk criteria, and constructs the risk evaluation index system [26]. Yang used Borderline-SMOTE algorithm to preprocess the sample data, adopted oversampling method to eliminate the imbalance of the data, and then introduced the long and short-term memory depth NNs algorithm to process the sample data with time series characteristics [27]. Wang used principal component analysis to preprocess financial data and constructed a lightweight CNN network to detect the hidden financial risks of enterprises [28]. Li used K-mean clustering algorithm, Gaussian hybrid clustering algorithm for risk screening [29]. Fan selected 24 football clubs that are currently listed globally as samples and constructed a financial risk evaluation model for football clubs using exploratory factor analysis (EFA) model [30]. Min analysed the financial risk formation mechanism of automobile manufacturing enterprises from the perspective of value chain, combined with the idea of system dynamics, and constructed a financial dynamic early warning simulation model using free cash flow [31]. Wang selects 65 A-share listed real estate enterprises as samples and constructs a comprehensive evaluation model of real estate enterprise financial risk based on factor analysis, expecting to evaluate and prevent the financial risk of real estate enterprises from both theoretical and practical perspectives [32].

2.3. Relevant studies on financial risk control

Enterprises in the whole process of production and operation there are certain financial risks, as far as possible to control the emergence of financial risk, is conducive to the development of enterprises. Our scholars according to the financial risks of enterprises, combined with the industry background, put forward targeted control measures. Duan puts forward that controlling the financial risk of commercial banks can make the operation and development of commercial banks more stable, and also can improve the financial risk management system of commercial banks [33]. Huang et al. establish and improve the internal control policy and approval process related to the financial risk assessment of carbon emissions, and use the “carbon

business" method to play its due effect [34]. Zou proposed to strengthen the training of financial managers and finance-related personnel, further play the role of internal audit, optimise the financial management process, and strengthen enterprise risk management [35]. Pan and Zhou researched that financial risk control helps to improve executive compensation when the business risk rises [36]. Wang et al. proposed that administrative institutions should establish the concept of big data, overcome the dilemma brought by the new technology of big data, and actively seek measures to prevent and manage financial risks [37]. Zhou points out that after financial risk control, enterprises achieve the in-depth integration of digitalisation and financial risk management to improve their ability to identify, assess and respond to financial risks [38]. Some scholars' research on financial risk control mainly focuses on identifying and evaluating financial risks according to the characteristics of enterprise financial risks, establishing a financial risk control system, and putting forward a variety of financial risk control proposals to reduce the financial risks of enterprises, which is worth learning from our scholars. Ren considers the actual business of the enterprise financial risk control information management system in the process of system analysis and the sustainable development needs of actual business sustainable development needs, strictly in accordance with the business process optimisation and principles of the enterprise financial risk control information management system, and conducts an in-depth research on the management and technology of system development [39]. Su believes that investors should fully understand the investment risks, and financial institutions should take effective risk management measures to deal with them [40]. Fu points out that the improvement of ESG performance can help to alleviate the mining company's financial risks of mining companies. From the perspective of the mechanism behind, ESG performance alleviates financing constraints, enhances risk control, and mitigates agency problems with major shareholders, thus reducing financial risks [41].

2.4. Research innovation

This paper presents two main innovations. First, it introduces the combination of the entropy weight method and the TOPSIS method for financial risk assessment of JZ New Energy, thereby contributing to the theoretical development of these methods and expanding the case studies of their application. Second, by selecting JZ New Energy as the research subject, the paper enriches the body of research on financial risk within the new energy industry, offering a novel perspective. Through the identification of financial risks at JZ New Energy, the paper conducts a comprehensive risk evaluation and proposes targeted financial risk control measures for the company.

3. Methodology

3.1. Selection of financial risk evaluation indicators for JZ New Energy

This paper mainly selects financial evaluation indexes from the following four aspects, and selects a total of 16 indexes, including: 12 positive indexes and 4 moderate indexes.

(1) Funding risk indicators. In terms of financing risk, this paper mainly selects four indicators: quick ratio, cash ratio, gearing ratio and equity ratio [42].

1) Quick ratio is the ratio of quick assets (current assets - prepaid accounts - inventory - non-current assets due within one year - other current assets) to current liabilities, which can more accurately reflect the short-term solvency of an enterprise than the current ratio.

2) The cash ratio is the ratio of money funds to current liabilities to measure the solvency of an enterprise without capital expenditure.

3) Asset-liability ratio is the ratio of total assets to total liabilities, which is an important indicator of financial risk evaluation.

4) The equity ratio is the ratio of total liabilities to total owner's equity, which is an important sign of whether the financial structure of an enterprise is sound.

(2) Investment risk indicators. In terms of investment risk, this paper mainly selects four indicators: operating profit margin, cost and expense margin, return on total assets and return on net assets.

1) Operating profit rate is the ratio of operating profit to operating income, which is an important indicator to measure the profit level of an enterprise.

2) The profit rate of cost expense is the ratio of total profit and total cost expense, reflecting the economic benefit of the enterprise.

3) The rate of return on total assets is the ratio of total profits + interest expense to the average total assets, which is the return on investment of the enterprise as a whole.

4) Return on equity is the ratio of net profit to average net assets, which is the key index concerned by enterprise investment.

(3) Business risk indicators. In terms of operational risk, this paper mainly selects four indicators: fixed asset turnover, accounts receivable turnover, current asset turnover, and total asset turnover.

1) The turnover rate of fixed assets is the ratio of operating income to the average balance of fixed assets, which is an indispensable indicator of enterprise business activities.

2) Accounts receivable turnover is the ratio of operating income to the average balance of accounts receivable, which can reflect the realization speed of accounts receivable of enterprises and the management efficiency of enterprises.

3) The turnover ratio of current assets is the ratio of operating income to the average balance of current assets, indicating the operating income supported by 1 yuan of current assets.

4) Total asset turnover is the ratio of operating income to the average balance of total assets, indicating the operating income supported by 1 yuan of total assets.

(4) Indicator of risk of income distribution. In terms of earnings distribution risk, this paper mainly selects four indicators: net profit growth rate, dividend yield, capital accumulation rate, and dividend payout ratio.

1) Net profit growth rate is the ratio of (this year's net profit to last year's net profit) to last year's net profit, which measures the annual growth rate of the company's net profit.

2) The dividend yield is the ratio between the dividend and the stock price, providing the annual rate of return that shareholders can earn through dividends on their holdings.

3) The capital accumulation ratio is the ratio of owner's equity at the end of the year to owner's equity at the beginning of the year, indicating the enterprise's ability to accumulate capital in the current year.

4) Dividend payout ratio is the ratio of pre-tax dividend per share to earnings per share in the current year, reflecting the dividend distribution policy and dividend payment ability.

The selection of financial evaluation indicators of JZ new energy is shown in **Table 1**.

Table 1. JZ New Energy financial evaluation indicator selection table.

Classification of Indicators	Financial Indicators	Indicator Number	Type of Indicator
Funding risk indicators	quick ratio	X1	Moderate indicator
	Cash ratio (%)	X2	Positive indicators
	Gearing ratio (per cent)	X3	Moderate indicator
	equity ratio	X4	Moderate indicator
Investment risk indicators	Operating margin (per cent)	X5	Positive indicators
	Cost-expense margin (%)	X6	Positive indicators
	Return on total assets (%)	X7	Positive indicators
	Return on net assets (%)	X8	Positive indicators
Business risk indicators	Fixed asset turnover (times)	X9	Positive indicators
	Accounts receivable turnover (times)	X10	Positive indicators
	Current asset turnover (times)	X11	Positive indicators
	Total asset turnover (times)	X12	Positive indicators
Income distribution risk indicators	Net profit growth rate (per cent)	X13	Positive indicators
	Dividend rate (per cent)	X14	Positive indicators
	Capital accumulation rate (per cent)	X15	Positive indicators
	Dividend Payout Ratio (%)	X16	Moderate indicator

3.2. Steps in the evaluation methodology

(1) Constructing the raw data matrix

Assuming that there are m evaluation objects and each m corresponds to n evaluation indicators, the original data matrix is built out, whicha_{ij} denotes the value of the jth indicator under the ith evaluation object;

$$A = (a_{ij})_{m\times n} \tag{1}$$

(2) Normalisation of raw matrix data

Financial indicators are generally divided into three main categories, namely, efficiency indicators, cost indicators, moderate indicators, for different indicators should be the corresponding type of data standardisation, to obtain the standardised matrix $B = (b_{ij})_{m\times n}$ which:

For positive indicators (benefit-based indicators):

$$b_{ij}=\frac{a_{ij}-a_j^{\min}}{a_j^{\max}-a_j^{\min}} \tag{2}$$

For negative indicators (cost-based indicators):

$$b_{ij}=\frac{a_j^{\max}-a_{ij}}{a_j^{\max}-a_j^{\min}} \tag{3}$$

For moderate-type indicators:

$$b_{ij}=1-\frac{\left|a_{ij}-d_{best}\right|}{\max\left|a_{ij}-d_{best}\right|} \tag{4}$$

To ensure that the values are not zero, an additional 0.1 RMS value is added to each value.

(3) Normalisation is performed under the entropy weighting method to calculate the proportion of the *i*th indicator to the *j*th object to be evaluated.

$$p_{ij}=\frac{b_{ij}}{\sum_{i=1}^{n} b_{ij}} \tag{5}$$

(4) Calculate the entropy value of the *j*th indicator under the entropy weight method.

$$e_j=-\frac{1}{ln\,n}\sum_{i=1}^{n} p_{ij}\,ln\,p_{ij} \tag{6}$$

(5) Calculation of the coefficient of variation under the entropy weight method.

$$g_j=1-e_j \tag{7}$$

(6) Determining the weights of evaluation indicators under the entropy weighting approachw_j .

$$w_j=\frac{g_j}{\sum_{j=1}^{m} g_j} \tag{8}$$

(7) The indicators in the normalised matrix are weighted to form a weighting matrix.

$$c_{ij}=b_{ij}*w_j \tag{9}$$

(8) Determine the positive ideal solutionC^+ and negative ideal solutions C^-:

$$C^+=\left[C_1^+,\ C_2^+,\ \cdots,\ C_n^+\right];)\ C^-=[C_1^-,\ C_2^-,\ \cdots,\ C_n^-]$$

Positive Ideal Solution.

$$c_j^+=\begin{cases}\max c_{ij}\,,j,\\ \min c_{ij}\,,j,\end{cases}\ j=1,2,...,n, \tag{10}$$

Negative Ideal Solution.

$$c_j^-=\begin{cases}\min c_{ij}\,,j,\\ \max c_{ij}\,,j,\end{cases}\ j=1,2,...,n, \tag{11}$$

(9) Calculate the distance from each object to be evaluated to the positive and negative ideal solutions:

Object of evaluationa_i Distance to the positive ideal solution:

$$d_i^* = \sqrt{\sum_{j=1}^{n}\left(c_{ij} - c_j^+\right)^2},\ i = 1, 2, ..., m; \tag{12}$$

Object of evaluationa_i Distance to the negative ideal solution:

$$d_i^0 = \sqrt{\sum_{j=1}^{n}\left(c_{ij} - c_j^-\right)^2},\ i = 1, 2, ..., m; \tag{13}$$

(The European distance formula is used here.)

(10) Calculate the relative closeness (evaluation reference value) of each object to be evaluated:

$$f_i = \frac{d_i^0}{d_i^0 + d_i^*},\ i = 1, ..., m \tag{14}$$

Then the f_i order from smallest to largest to get the priority order of each evaluation object.

3.3. JZ Raw data for New Energy financial indicators

The raw data of 16 financial indicators of JZ New Energy for 2018–2022 are selected as shown in **Table 2**.

Table 2. JZ New Energy raw financial indicators 2018–2022.

Indicator Name	2018	2019	2020	2021	2022
X1	1.41	1.87	1.39	1.57	0.85
X2	33.83	23.92	21.36	43.32	20.14
X3	69.88	63.59	70.04	56.38	69.77
X4	2.32	1.75	2.34	1.29	2.31
X5	25.19	26.28	19.58	53.32	29.10
X6	34.40	36.43	24.83	73.61	41.48
X7	6.51	6.73	4.63	9.94	6.56
X8	10.61	10.73	5.73	17.57	9.63
X9	0.16	0.17	0.16	0.26	0.30
X10	1.06	0.86	0.64	0.91	0.92
X11	0.70	0.65	0.50	0.60	0.58
X12	0.12	0.13	0.10	0.12	0.12
X13	63.03	8.92	-32.42	289.39	-30.48
X14	0.98	1.11	1.6	2.36	1.67
X15	6.69	42.00	8.66	58.41	5.33
X16	31.43	28.67	55.00	29.41	36.36

Data source: JZ New Energy annual report compilation and calculation.

4. JZ New Energy finance analyses and evaluation results

4.1. Process of longitudinal evaluation of financial risk of JZ New Energy

(1) JZ New Energy Financial Indicators Standardised Data

Notes on the four moderate indicators: x1 general standardised value of 1 for quick ratio; x3 general standardised value of 50% for gearing ratio; x4 general standardised value of 1.2 for equity ratio; and x16 general standardised value of 30% for dividend payout ratio. The standardised data of JZ New Energy's financial indicators for 2018–2022 are shown in **Table 3**.

Table 3. JZ New Energy's standardised data for financial indicators 2018–2022.

Indicator Name	2018	2019	2020	2021	2022
X1	0.5287	0.0000	0.5517	0.3448	0.8276
X2	0.5906	0.1631	0.0526	1.0000	0.0000
X3	0.0080	0.3219	0.0000	0.6816	0.0135
X4	0.0175	0.5175	0.0000	0.9211	0.0263
X5	0.1663	0.1986	0.0000	1.0000	0.2822
X6	0.1962	0.2378	0.0000	1.0000	0.3413
X7	0.3540	0.3955	0.0000	1.0000	0.3635
X8	0.4122	0.4223	0.0000	1.0000	0.3294
X9	0.0000	0.0714	0.0000	0.7143	1.0000
X10	1.0000	0.5238	0.0000	0.6429	0.6667
X11	1.0000	0.7500	0.0000	0.5000	0.4000
X12	0.6667	1.0000	0.0000	0.6667	0.6667
X13	0.2966	0.1285	0.0000	1.0000	0.0060
X14	0.0000	0.0942	0.4493	1.0000	0.5000
X15	0.0256	0.6908	0.0627	1.0000	0.0000
X16	0.9428	0.9468	0.0000	0.9764	0.7456

A further value of 0.1 was added to each value to obtain the panned data, as shown in **Table 4**.

Table 4. JZ New Energy financial indicators 2018–2022 after panning data.

Indicator Name	2018	2019	2020	2021	2022
X1	0.6287	0.1000	0.6517	0.4448	0.9276
X2	0.6906	0.2631	0.1526	1.1000	0.1000
X3	0.1080	0.4219	0.1000	0.7816	0.1135
X4	0.1175	0.6175	0.1000	1.0211	0.1263
X5	0.2663	0.2986	0.1000	1.1000	0.3822
X6	0.2962	0.3378	0.1000	1.1000	0.4413
X7	0.4540	0.4955	0.1000	1.1000	0.4635
X8	0.5122	0.5223	0.1000	1.1000	0.4294
X9	0.1000	0.1714	0.1000	0.8143	1.1000
X10	1.1000	0.6238	0.1000	0.7429	0.7667
X11	1.1000	0.8500	0.1000	0.6000	0.5000

Table 4. (*Continued*).

Indicator Name	2018	2019	2020	2021	2022
X12	0.7667	1.1000	0.1000	0.7667	0.7667
X13	0.3966	0.2285	0.1000	1.1000	0.1060
X14	0.1000	0.1942	0.5493	1.1000	0.6000
X15	0.1256	0.7908	0.1627	1.1000	0.1000
X16	1.0428	1.0468	0.1000	1.0764	0.8456

(2) Normalise the process and calculatep_{ij} .

JZ New Energy's data after normalisation for 2018–2022 is shown in **Table 5**.

Table 5. JZ New Energy's financial indicators after normalisation, 2018–2022.

Indicator Name	2018	2019	2020	2021	2022
X1	0.2284	0.0363	0.2367	0.1616	0.3370
X2	0.2994	0.1141	0.0662	0.4770	0.0434
X3	0.0708	0.2766	0.0656	0.5126	0.0744
X4	0.0593	0.3115	0.0504	0.5150	0.0637
X5	0.1240	0.1391	0.0466	0.5123	0.1780
X6	0.1302	0.1485	0.0439	0.4834	0.1940
X7	0.1738	0.1896	0.0383	0.4210	0.1774
X8	0.1923	0.1961	0.0375	0.4129	0.1612
X9	0.0438	0.0750	0.0438	0.3563	0.4813
X10	0.3300	0.1871	0.0300	0.2229	0.2300
X11	0.3492	0.2698	0.0317	0.1905	0.1587
X12	0.2190	0.3143	0.0286	0.2190	0.2190
X13	0.2054	0.1183	0.0518	0.5696	0.0549
X14	0.0393	0.0764	0.2160	0.4325	0.2359
X15	0.0551	0.3470	0.0714	0.4826	0.0439
X16	0.2536	0.2546	0.0243	0.2618	0.2057

(3) Calculate the entropy value of the indicatore_j .

(4) Calculate the coefficient of variationg_j .

(5) Determine the weights of the evaluation indicatorsw_j .

As shown in **Table 6**, the weights were calculated to rank them from smallest to largest, in the order of operational risk, investment risk, income distribution risk, and funding risk.

Table 6. Entropy, coefficient of variation, weights of financial indicators of JZ New Energy 2018–2022.

Indicator Name	e_j	g_j	w_j	Total weights
X1	0.9071	0.0929	0.0351	0.2921
X2	0.7938	0.2062	0.0779	
X3	0.7814	0.2186	0.0826	
X4	0.7448	0.2552	0.0964	
X5	0.8238	0.1762	0.0666	0.2165
X6	0.8422	0.1578	0.0596	
X7	0.8793	0.1207	0.0456	
X8	0.8817	0.1183	0.0447	
X9	0.7380	0.2620	0.0990	0.2092
X10	0.9055	0.0945	0.0357	
X11	0.8937	0.1063	0.0402	
X12	0.9091	0.0909	0.0343	
X13	0.7523	0.2477	0.0936	0.2822
X14	0.8437	0.1563	0.0591	
X15	0.7482	0.2518	0.0951	
X16	0.9089	0.0911	0.0344	

(6) Weighting process to form a weighting matrix.

JZ New Energy's weighted processing data for 2018–2022 is shown in **Table 7**.

Table 7. JZ New Energy financial indicators weighting matrix 2018–2022.

Indicator Name	2018	2019	2020	2021	2022
X1	0.0221	0.0035	0.0229	0.0156	0.0326
X2	0.0538	0.0205	0.0119	0.0857	0.0078
X3	0.0089	0.0349	0.0083	0.0646	0.0094
X4	0.0113	0.0596	0.0096	0.0985	0.0122
X5	0.0177	0.0199	0.0067	0.0732	0.0254
X6	0.0177	0.0201	0.0060	0.0656	0.0263
X7	0.0207	0.0226	0.0046	0.0502	0.0211
X8	0.0229	0.0233	0.0045	0.0492	0.0192
X9	0.0099	0.0170	0.0099	0.0806	0.1089
X10	0.0393	0.0223	0.0036	0.0265	0.0274
X11	0.0442	0.0341	0.0040	0.0241	0.0201
X12	0.0263	0.0378	0.0034	0.0263	0.0263
X13	0.0371	0.0214	0.0094	0.1029	0.0099
X14	0.0059	0.0115	0.0324	0.0650	0.0354
X15	0.0120	0.0752	0.0155	0.1046	0.0095
X16	0.0359	0.0360	0.0034	0.0371	0.0291

(7) Determine the positive ideal solution C^+ and negative ideal solution C^- .

JZ New Energy Positive Ideal Solution C^+ and negative ideal solution C^- are shown in **Table 8**.

Table 8. JZ New Energy's positive and negative ideal solutions for financial indicators, 2018–2022.

Indicator Name	C^+	C^-
X1	0.0326	0.0035
X2	0.0857	0.0078
X3	0.0646	0.0083
X4	0.0985	0.0096
X5	0.0732	0.0067
X6	0.0656	0.0060
X7	0.0502	0.0046
X8	0.0492	0.0045
X9	0.1089	0.0099
X10	0.0393	0.0036
X11	0.0442	0.0040
X12	0.0378	0.0034
X13	0.1029	0.0094
X14	0.0650	0.0059
X15	0.1046	0.0095
X16	0.0371	0.0034

(8) Calculate the positive ideal solution Euclidean distance d_i^* and the negative ideal solution Euclidean distance d_i^0 s.

(9) Calculate the relative closeness f_i .

As shown in **Table 9**, the financial risks of JZ New Energy for 2018–2022 are ranked, where 1 indicates the smallest financial risk and 5 indicates the largest financial risk.

Table 9. JZ New Energy financial indicators positive and negative ideal solution Euclidean distance, relative adjacency, 2018–2022.

In the End	2018	2019	2020	2021	2022
d_i^*	0.2124	0.1818	0.2479	0.0422	0.2040
d_i^0	0.0926	0.1116	0.0336	0.2413	0.1216
f_i	0.3036	0.3804	0.1195	0.8510	0.3735
arrange in order	4	2	5	1	3

4.2. Results of the longitudinal evaluation of JZ New Energy's financial risk

4.2.1. Funding risks

The financial risk of JZ New Energy for 2018–2022 is ranked by calculating the relative closeness to the size of the financial risk. The highest relative proximity is

2021, indicating that its financial risk is the smallest. The lowest relative proximity is in 2020, indicating that its financial risk is the largest. 2018–2022 financial risk is ranked from smallest to largest as 2021, 2019, 2022, 2018, 2020. In order to analyse the financial risk of JZ New Energy more intuitively, a line graph is drawn based on the relative closeness value, as shown in **Figure 1**.

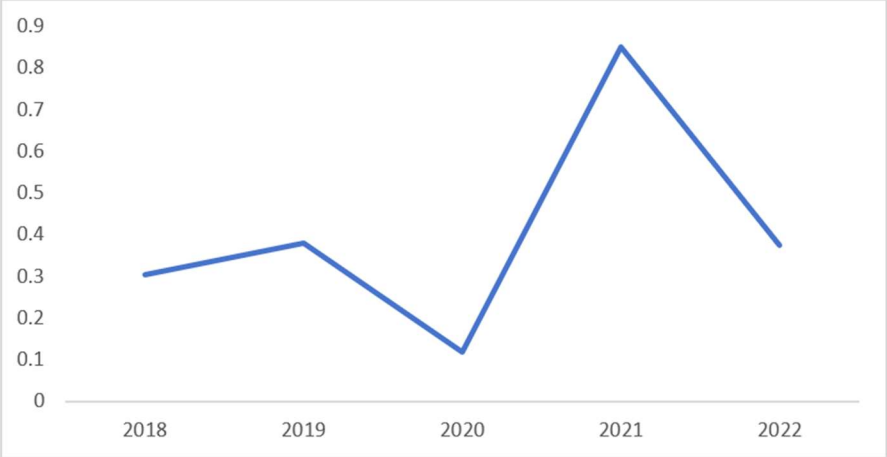

Figure 1. JZ New Energy financial risk trend 2018–2022.

In order to classify the financial risk, this paper adopts the rank sum ratio method to classify the relative closeness interval. The rank sum ratio method, abbreviated as RSR method, was proposed by Professor Fengtiao Tian in 1988. In this paper, the financial risk level is divided into five grades: high risk, medium-high risk, medium risk, medium-low risk, and low risk. The classification of financial risk class is shown in **Table 10**.

Table 10. Financial risk rating scale.

Risk Level	High Risk	Medium to high risk	Medium Risk	Medium-to- low Risk	High Risk
Relative Closeness Interval	[0, 0.108)	[0.108, 0.276)	[0.276, 0.444)	[0.444, 0.612)	[0.612, 1]

As shown in **Table 11**, JZ New Energy always has financial risk from 2018–2022. 2018, 2019 and 2022 have medium financial risk, 2020 has the highest financial risk and medium-high risk, and 2021 has the lowest financial risk and low risk.

Table 11. JZ New Energy financial risk relative proximity and risk rating 2018–2022.

In the End	2018	2019	2020	2021	2022
f_i	0.3036	0.3804	0.1195	0.8510	0.3735
Arrange in Order	4	2	5	1	3
Risk Level	Medium Risk	Medium Risk	Medium to High Risk	High Risk	Medium Risk

4.2.2. Analysis of the results of JZ New Energy's financing risk evaluation

By calculating the weighted total, JZ New Energy 2018–2022 has the largest share of financing risk and the highest risk, in which the cash ratio, gearing ratio, and

equity ratio have a high impact on the financing risk. As shown in **Table 12**, the financing risk of JZ New Energy 2018–2022 is analysed by calculating the relative closeness to the size of the financing risk. The highest relative closeness is 2021, which indicates that its financing risk is the smallest, and the financial risk is low risk. The lowest relative proximity is 2020, indicating that its financing risk is the largest, and the financial risk is medium-high risk. JZ New Energy's financing risk from 2018–2022 is ranked from smallest to largest in the order of 2021, 2019, 2018, 2022 and 2020.

Table 12. JZ New Energy funding risk relative proximity and risk rating 2018–2022.

In the End	2018	2019	2020	2021	2022
f_i	0.3135	0.4010	0.1332	0.8858	0.1849
Arrange in order	3	2	5	1	4
Risk Level	Medium Risk	Medium Risk	Medium to High Risk	High Risk	Medium Risk

4.2.3. Analysis of JZ New Energy investment risk evaluation results

By calculating the weighted total, the weight accounted for by JZ New Energy's investment risk in 2018–2022 is 0.2165, and there is little difference in the impact of the indicators on investment risk. As shown in **Table 13**, the investment risk of JZ New Energy 2018–2022 is analysed by calculating the relative closeness to the investment risk. The highest relative closeness is 2021, indicating that its investment risk is minimal and the financial risk is low. The lowest relative proximity is 2020, indicating that the investment risk is the largest, and the financial risk is high. JZ New Energy's 2018–2022 investment risks are ranked from smallest to largest in 2021, 2022, 2019, 2018 and 2020.

Table 13. JZ New Energy investment risk relative proximity and risk rating 2018–2022.

In the End	2018	2019	2020	2021	2022
f_i	0.2603	0.2900	0.0000	1.0000	0.3222
Arrange in Order	4	3	5	1	2
Risk Level	Medium to High Risk	Medium Risk	High Risk	High Risk	Medium Risk

4.2.4. Analysis of the results of JZ New Energy's business risk evaluation

By calculating the weighted total, JZ New Energy 2018–2022 has the smallest proportion of operating risk and the lowest risk, in which the higher impact on operating risk is the fixed asset turnover ratio. As shown in **Table 14**, the magnitude of operational risk is analysed by calculating the relative closeness to JZ New Energy's operational risk for 2018–2022. The highest relative closeness is 2022, which indicates that its operating risk is minimal and financial risk is low. The lowest relative proximity is 2020, which indicates that the operation risk is the largest, and the financial risk is high. JZ New Energy's operation risk from 2018–2022 is ranked from smallest to largest in the order of 2022, 2021, 2018, 2019 and 2020.

Table 14. JZ New Energy's relative proximity to operational risk and risk rating 2018–2022.

In the End	2018	2019	2020	2021	2022
f_i	0.3695	0.3465	0.0000	0.6750	0.7833
Arrange in Order	3	4	5	2	1
Risk Level	Medium Risk	Medium Risk	High Risk	High Risk	High Risk

4.2.5. Analysis of the evaluation results of the risk of JZ New Energy's revenue distribution

By calculating the weighted total, JZ New Energy's 2018–2022 income distribution risk is high and the risk is high, with net profit growth rate and capital accumulation rate having a high impact on income distribution risk. As shown in **Table 15**, the size of income distribution risk of JZ New Energy 2018–2022 is analysed by calculating the relative closeness. The highest relative closeness is 2021, which indicates that its income distribution risk is the smallest, and the financial risk is low risk. The lowest relative closeness is 2020, which indicates that its income distribution risk is the largest, and the financial risk is medium-high risk. JZ New Energy's income distribution risk for 2018–2022 is ranked from smallest to largest as 2021, 2019, 2018, 2022 and 2020.

Table 15. JZ New Energy's relative proximity to income distribution risk and risk rating, 2018–2022.

In the End	2018	2019	2020	2021	2022
f_i	0.2503	0.4225	0.1652	1.0000	0.2228
Arrange in Order	3	2	5	1	4
Risk Level	Medium to High Risk	Medium Risk	Medium to High Risk	High Risk	Medium to High Risk

4.3. Process of horizontal evaluation of financial risks of JZ New Energy

This paper selects the data of 10 listed companies in the new energy industry in 2022 to evaluate the financial risk of JZ New Energy. 10 listed companies are JZ New Energy, Chuantou Energy (600674) , Longyuan Power (001289), Jiangsu Xinneng (603693), Xintian Green Energy (600956), LONGi Green Energy (601012), Energy Saving Wind Power (601016), Mingyang Intelligent (601615), Trina Solar (688599), and JAO Technology (002459). The raw data is shown in **Table 16**. The purpose of comparative analysis with other companies is to clarify JZ new Energy's position in the industry, understand its competitive advantages and disadvantages compared with peers, and to judge JZ New Energy's position in the industry competition pattern by comparing various financial indicators, so as to provide a basis for enterprises to formulate differentiated competitive strategies.

Table 16. Raw 2022 financial indicators for 10 companies in the New Energy sector.

Indicator Name	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
X1	0.85	0.55	0.70	0.83	0.78	1.18	1.66	0.97	0.77	0.75
X2	20.14	10.61	27.33	31.24	38.14	89.82	49.88	39.35	34.83	34.75
X3	69.77	35.67	64.07	55.84	67.47	55.39	62.12	58.86	68.00	58.32
X4	2.31	0.59	2.24	1.46	2.69	1.25	1.75	1.44	2.32	1.53
X5	29.10	253.00	19.28	35.22	17.70	12.91	37.70	12.57	4.79	8.86
X6	41.48	223.00	20.15	41.17	18.58	13.00	52.97	12.98	4.65	8.60
X7	6.56	8.03	5.21	6.35	6.06	14.23	6.94	6.24	6.03	10.45
X8	9.63	10.80	7.17	8.11	11.97	26.95	13.55	14.57	16.16	24.19
X9	0.30	0.23	0.30	0.19	0.56	5.16	0.20	2.97	6.64	8.09
X10	0.92	2.88	159.00	0.99	3.51	15.24	1.07	3.70	7.96	10.44
X11	0.58	0.33	0.85	0.55	0.26	1.72	0.55	0.84	1.65	2.09
X12	0.12	0.03	0.19	0.12	1.19	1.09	0.13	0.47	1.11	1.13
X13	−30.48	13.86	−31.14	54.19	−0.04	63.02	39.19	9.40	104.00	171.40
X14	1.67	2.69	0.60	1.09	2.18	1.35	2.43	1.80	1.11	0.45
X15	5.33	7.32	2.13	5.80	4.18	22.66	35.34	29.19	26.43	67.54
X16	36.36	50.27	20.05	28.30	36.42	20.51	28.53	19.13	27.79	10.00

Data source: Annual reports of 10 companies in the new energy industry collated and calculated.

The entropy value, coefficient of variation, weight, and weight total of the 10 new energy industries are calculated by the formula, as shown in **Table 17**.

Table 17. Entropy, coefficient of variation, weights, and total weights of financial indicators for 17 companies in the New Energy sector for 2022.

Indicator Name	e_j	g_j	w_j	Total weights
X1	0.9627	0.0373	0.0216	0.1301
X2	0.9346	0.0654	0.0378	
X3	0.9348	0.0652	0.0377	
X4	0.9431	0.0569	0.0329	
X5	0.8294	0.1706	0.0987	0.3045
X6	0.8493	0.1507	0.0872	
X7	0.8909	0.1091	0.0631	
X8	0.9040	0.0960	0.0555	
X9	0.8171	0.1829	0.1058	0.3655
X10	0.7815	0.2185	0.1264	
X11	0.8959	0.1041	0.0602	
X12	0.8736	0.1264	0.0731	
X13	0.9091	0.0909	0.0526	0.1999
X14	0.9284	0.0716	0.0414	
X15	0.8821	0.1179	0.0682	
X16	0.9349	0.0651	0.0376	

The Euclidean distance and relative closeness of the positive and negative ideal solutions to the 2022 financial indicators of the 10 companies in the new energy sector are calculated by the formulae as shown in **Table 18**.

Table 18. Euclidean distance, relative closeness of positive and negative ideal solutions to financial indicators for 10 companies in the new energy sector, 2022.

In the End	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
d_i^*	0.2493	0.2196	0.2229	0.2443	0.2417	0.1869	0.2313	0.2213	0.2040	0.1880
d_i^0	0.0463	0.1423	0.1316	0.0647	0.0883	0.1536	0.0789	0.0817	0.1358	0.1794
f_i	0.1568	0.3933	0.3713	0.2094	0.2676	0.4512	0.2544	0.2696	0.3997	0.4883
Arrange in Order	10	4	5	9	7	2	8	6	3	1

4.4. Results of the horizontal evaluation of financial risk of JZ New Energy

4.4.1. Analysis of JZ New Energy's financial risk evaluation results

By calculating the total weights, the weights are, in descending order, financing risk, income distribution risk, investment risk, and operational risk. Among them, the fixed asset turnover rate and accounts receivable turnover rate have a higher impact on the operation risk; the operating profit margin and cost and expense profit margin have a higher impact on the investment risk; the capital accumulation rate has a higher impact on the income distribution risk; and the indicators of financing risk have a similar degree of impact on it.

The financial risk of 10 companies in the new energy industry in 2022 is ranked by calculating the relative closeness to the size of the financial risk. The highest relative proximity is JA Technology, which indicates that its financial risk is the smallest; the lowest relative proximity is JZ New Energy, which indicates that its financial risk is the largest. In order to analyse the financial risk of 10 companies in the new energy industry more intuitively, a line graph is drawn according to their relative closeness values, as shown in **Figure 2**. The financial risk is ranked from small to large as JA Technology, LONGi Green Energy, Trina Solar, ChuanTou Energy, Longyuan Power, Ming Yang Intelligence, Xintian Green Energy, Energy Saving Wind Power, Jiangsu Xinneng Energy, and JZ New Energy. JZ New Energy ranks 10th among the 10 companies in the new energy industry, and has a high financial risk.

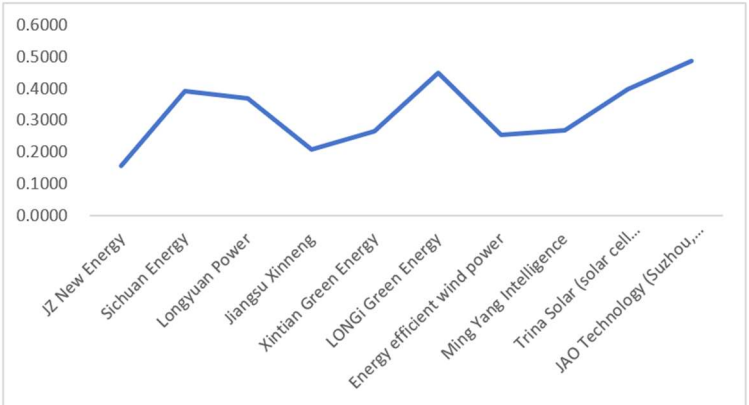

Figure 2. Financial risk trends for 10 companies in the New Energy SEctor, 2022.

Ranking the financial risk of 10 companies in the new energy industry in 2022, the financial risk of the new energy industry in general is medium-high risk. As shown in **Table 19**, the financial risk of JAO Technology is the smallest, and the risk is medium-low risk; JZ New Energy financial risk is the largest, and the risk is medium-high risk, and the financial risk is the highest among 10 companies in the new energy industry.

Table 19. Relative financial risk proximity and risk rating of 10 companies in the new energy sector in 2022.

In the End	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
f_i	0.1568	0.3933	0.3713	0.2094	0.2676	0.4512	0.2544	0.2696	0.3997	0.4883
Arrange in Order	10	4	5	9	7	2	8	6	3	1
Risk Level	Medium to High Risk	Medium Risk	Medium Risk	Medium to High Risk	Medium to High Risk	Medium-to-Low Risk	Medium to High Risk	Medium to High Risk	Medium Risk	Medium-to-Low Risk

4.4.2. Analysis of the results of JZ New Energy's financing risk evaluation

As shown in **Table 20**, the funding risk of 10 companies in the new energy industry in 2022 is analysed by calculating the relative closeness to the size of the funding risk. The highest relative closeness is LONGi Green Energy, which indicates that its financing risk is the smallest, and the financial risk is low. The lowest relative closeness is JZ New Energy, with a relative closeness of 0.2807, indicating that its financing risk is the largest, and its financial risk is medium risk. The fundraising risk of the 10 companies in the new energy industry is ranked from small to large as LONGi Green Energy, Mingyang Intelligence, Jiangsu Xinneng, JA Solar, Energy Saving Wind Power, ChuanTou Energy, Longyuan Power, Trina Solar, Xintian Green Energy and JZ New Energy.

Table 20. Relative closeness of funding risk and risk rating of 10 companies in the new energy sector in 2022.

In the End	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
f_i	0.2807	0.3369	0.3304	0.5960	0.2991	0.9229	0.4905	0.6265	0.3188	0.5715
Arrange in Order	10	6	7	3	9	1	5	2	8	4
Risk Level	Medium Risk	Medium Risk	Medium Risk	Medium-to-Low Risk	Medium Risk	High Risk	mMedium-to-Low Risk	High Risk	Medium Risk	Medium-to-Low Risk

4.4.3. Analysis of JZ New Energy investment risk evaluation results

As shown in **Table 21**, the investment risk of 10 companies in the new energy industry in 2022 is analysed by calculating the relative closeness to the investment risk. The highest relative closeness is ChuanTou Energy, indicating that its investment risk is the smallest, and the financial risk is low. The lowest relative closeness is Longyuan Power, indicating that its investment risk is the largest, and the financial risk is high. JZ New Energy's relative closeness is 0.1347, and its investment risk is medium-high risk. The investment risks of the 10 companies in the new energy industry are in descending order from small to large, including ChuanTou Energy, LONGi Green

Energy, JA Solar, Energy Saving Wind Power, Trina Solar, Ming Yang Intelligence, JZ New Energy, Jiangsu Xin Energy, Xintian Green Energy and Longyuan Power.

Table 21. Relative closeness to investment risk and risk rating of 10 companies in the new energy sector in 2022.

In the End	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
f_i	0.1347	0.6803	0.0536	0.1319	0.1038	0.3986	0.2011	0.1355	0.1499	0.3129
Arrange in Order	7	1	10	8	9	2	4	6	5	3
Risk Level	Medium to High Risk	Low Risk -	High Risk	Medium to High Risk	High Risk	Medium Risk	Medium to High Risk	Medium to High Risk	Medium to High Risk	Medium Risk

4.4.4. Analysis of JZ New Energy's business risk evaluation results

As shown in **Table 22**, the magnitude of business risk is analysed by calculating the relative closeness to the business risk of 10 companies in the new energy industry in 2022. The highest relative closeness is JA Technology, which indicates that its operating risk is the smallest, and its financial risk is medium-low risk. The lowest relative closeness is ChuanTou Energy, which indicates that its operation risk is the largest, and the financial risk is high. JZ New Energy's relative closeness is 0.0615, which indicates that its operation risk is high. The 10 companies in the new energy industry are JA Technology, Longyuan Power, Trina Solar, LONGi Green Energy, Xintian Green Energy, Ming Yang Intelligence, JZ New Energy, Energy Saving Wind Power, Jiangsu Xinneng, and ChuanTou Energy in descending order of operational risk.

Table 22. Relative closeness of business risk and risk rating of 10 companies in the new energy sector in 2022.

in the end	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
f_i	0.0615	0.0149	0.4995	0.0566	0.3000	0.4655	0.0583	0.2454	0.4917	0.5414
Arrange in Order	7	10	2	9	5	4	8	6	3	1
Risk Level	High Risk	High Risk	Medium-to-Low Risk	High Risk	Medium Risk	Medium-to-Low Risk	High Risk	Medium to High Risk	Medium-to-Low Risk	Medium-to-Low Risk

4.4.5. Analysis of the risk evaluation results of JZ New Energy's revenue distribution

As shown in **Table 23**, the risk of income distribution of 10 companies in the new energy industry in 2022 is analysed by calculating the relative closeness to the size of the risk of income distribution. The highest relative closeness is JA Technology, which indicates that its income distribution risk is minimal and financial risk is low. The lowest relative closeness is Longyuan Power, which indicates that its income distribution risk is the largest, and its financial risk is medium-high risk. JZ New Energy's relative closeness is 0.2860, and its income distribution risk is medium risk. The 10 companies in the new energy industry are JA Technology, Energy Saving Wind Power, Trina Solar, Ming Yang Intelligence, LONGi Green Energy, Jiangsu Xinneng, ChuanTou Energy, Xintian Green Energy, JZ New Energy and Longyuan Power in descending order of income distribution risk.

Table 23. Relative closeness of risk and risk rating of 2022 income distribution for 10 companies in the new energy sector.

In the End	JZ New Energy	600674	001289	603693	600956	601012	601016	601615	688599	002459
f_i	0.2860	0.3440	0.1683	0.3571	0.3415	0.4026	0.5699	0.4054	0.5060	0.6154
Arrange in Order	9	7	10	6	8	5	2	4	3	1
Risk Level	Medium Risk	Medium Risk	Medium to High Risk	Medium Risk	Medium Risk	Medium Risk	Medium-to-Low Risk	Medium Risk	Medium-to-Low Risk	High Risk

This chapter is mainly based on the characteristics of the new energy industry and the basis of risk identification of the case company, selects 16 indicators suitable for the new energy industry, applies the data from 2018–2022, chooses the method combining entropy weight method and TOPSIS method to construct the financial risk evaluation model, and carries out the longitudinal evaluation of the case company; and selects 10 companies in the new energy industry and carries out the horizontal evaluation of the case company, and finally The rank and ratio method is introduced to classify its financial risk.

5. Discussion

By analysing the financial risks of JZ New Energy, JZ New Energy has financing risk, investment risk, operation risk and income distribution risk. Ranking the financial risks from 2018–2022, it is concluded that JZ New Energy faces the highest financial risks in 2020. Sorting the financial risk of 10 companies in the new energy industry in 2022, it is concluded that JZ New Energy's financial risk is ranked 10th, and there is a high financial risk. China's new energy industry has entered a period of rapid growth, JZ New Energy faces a variety of financial risks, and the development of the enterprise faces challenges and opportunities. In view of the financial risks of JZ New Energy, corresponding control measures are proposed to ensure the healthy development of the enterprise.

Strengthen JZ new energy financing risk control. In 2024, the General Administration of Financial Supervision revised and released the "Consumer Finance Company Management Measures", which "appropriately broaden financing channels and enhance the liquidity support capacity of shareholders. "It shows that the development of enterprises cannot be separated from the support of funds, and it is necessary to broaden the financing channels of enterprises. JZ New Energy, as a new energy enterprise, has five business segments, in order to better develop its business and enhance the competitiveness of the industry, it is necessary to broaden the financing channels. JZ New Energy can be financed through retained earnings, loans, bond issuance, the introduction of investors and other ways to provide financial support for the future development of the enterprise. JZ New Energy's gearing ratio has always been at a high level, and the company has a lot of debt, which is prone to capital chain breakage and affects the future development of the company. A suitable capital structure is conducive to the long-term development of JZ New Energy, in the intensely competitive market situation, JZ New Energy should continue to optimise the capital structure, pay attention to the liabilities, as a way to enhance the ability to

participate in the market competition, to resist the market risk. JZ New Energy should reduce the gearing ratio, and control the total liabilities within a reasonable range. At the same time, JZ New Energy should reduce the proportion of current liabilities to reduce the pressure of short-term repayment; control the proportion of long-term borrowing to reduce corporate liabilities and promote the healthy development of JZ New Energy. It is expected that multi-channel financing can increase the sources of funds, optimize the capital structure can enhance the long-term solvency, reduce the risk of capital chain break, improve the financial stability of enterprises, provide sufficient financial support for business development, and enhance market competitiveness.

Strengthen JZ new energy investment risk control. When JZ New Energy invests in a project, it has to investigate and study the project from a variety of aspects, such as economic, technical, social environment and legal aspects, to analyse whether the project is feasible and whether it can achieve the expected results. All investment projects must strictly fulfil the demonstration and approval procedures and carry out project feasibility studies to ensure the scientific and correctness of investment projects. The project approval of the investment projects that have been included in the scope of the annual investment plan is the responsibility of the General Manager's Office, and the decision-making power is managed in a hierarchical manner with limits. Investment projects should be carried out in a standardised and orderly manner, and the procedures that must be fulfilled for investment projects include six stages, such as application, prequalification, project establishment, demonstration, deliberation, approval, etc., and none of them is indispensable. JZ New Energy is committed to new energy investment, and in the whole process of investment, investment risks should be prevented in a practical manner, and investment rights and interests should be safeguarded. Before investing, we should have a comprehensive understanding of the investee company, do not make high-risk investments, and do not invest in enterprises with poor creditworthiness and high liabilities. After the investment, foreign investment should implement budget management, and the budget should be constantly adjusted according to the changes of the actual situation of the invested enterprise. Supervision and management of the projects already invested, timely understanding of the relevant information of the investee company, found that the problem should be reported to the management in a timely manner, and take appropriate measures, as a way to prevent the risk of JZ New Energy's investment. It is expected that the scientific investment decision-making process can reduce the probability of investment failure, ensure that the investment project conforms to the enterprise strategic planning and market demand, and improve the return on investment. Budget management helps to monitor the progress of investment projects in real time, discover and solve problems in time, and protect investment rights and interests.

Strengthen JZ new energy business risk control. JZ New Energy's accounts receivable are growing in general, and the control of accounts receivable should be strengthened in order to maintain financial soundness. To control accounts receivable, it is necessary to investigate the credit of customers, avoid credit for poor credit enterprises as much as possible, and keep an eye on the status of customers to prevent bad debts. When signing a sales contract, it should be agreed clearly so as not to get

into disputes and have an impact on the enterprise. Accounts receivable is the responsibility of a special person, if necessary, related to personal interests, if there is a change of the responsible person, the responsibility and interests should be continued to the next responsible person, and the responsible person shall not be broken. JZ New Energy has low utilisation of fixed assets such as plant, machinery and equipment, and should strengthen the management of fixed assets. In the process of fixed asset management, the relevant rules and regulations on asset management should be strictly implemented, and the management process should be refined to ensure that the accounts are in line with the actual situation, the accounts are in line with the accounts and the accounts are in line with the cards, so as to ensure that the asset information is comprehensive, accurate and complete. JZ New Energy should strengthen the integrated management and improve the efficiency of asset use on the basis of clearing the bottom line, strengthening the whole life cycle management of assets, and enhancing the scientific and rational use of assets. It is expected that the optimization of accounts receivable management can reduce bad debt losses, accelerate the withdrawal of funds and stabilize cash flow. Strengthening the management of fixed assets can improve the utilization rate of assets, reduce the production cost, increase the profitability of enterprises, and enhance the financial soundness.

Strengthen JZ new energy income distribution risk control. Cash budget is the most effective control tool for cash flow management. To implement control of cash inflow and ensure that JZ New Energy's cash balance is always at a reasonable level, it is necessary to prepare cash budgets on a regular basis. JZ New Energy has to analyse the prepared cash budgets before and after the fact to provide certain support for the next preparation of cash budgets. Regular preparation of cash budget is conducive to JZ New Energy to play the role of cash management, to achieve a reasonable distribution of funds, so as to maximise corporate profits and reduce the risk of corporate income distribution. JZ New Energy in the distribution of income in the way there are certain problems, retained earnings and profit distribution is not reasonable. In order to meet the needs of JZ New Energy's development, a reasonable policy has been formulated to ensure the reasonableness of retained earnings and profit distribution, with a view to achieving the purpose of reducing the risk of income distribution. The proportion allocated by the policy will enable investors to obtain high returns, so that more investors will come to invest in JZ New Energy to alleviate the economic pressure and develop the new energy business. It is also important to ensure that retained earnings and profit distribution are reasonable, neither high earnings and low distribution nor low income and high distribution. It is expected that the cash budget will help to rationally arrange funds, ensure the reasonable cash balance, realize the optimal allocation of funds, improve the efficiency of the use of funds, and reduce the risk of income distribution. Reasonable allocation policies can attract investors, enhance the financing capacity of enterprises, and ensure that enterprises have enough funds for business development.

6. Conclusions and future perspectives

6.1. Conclusions of the study

This paper selects JZ New Energy as the research object, identifies its financing risk, investment risk, operation risk, income distribution risk and other risks, and uses entropy weight TOPSIS method to evaluate the financial risk of JZ New Energy, and finally puts forward the control measures, and this paper draws the following conclusions:

(1) JZ New Energy has financial risks in 2018–2022, of which the financial risk in 2021 is the smallest and the financial risk in 2020 is the largest. JZ New Energy has certain financing risk, investment risk, operation risk and income distribution risk, of which the financing risk is the highest; the operation risk is the lowest. From the perspective of financing, the source of funds obtained from financing is less, the long-term solvency and short-term solvency are weaker, and there is a certain financing risk. From the perspective of investment, the operating profit margin, cost and expense margin, return on total assets and return on net assets are all unstable and at a low level, with a certain investment risk. From the perspective of operation, the accounts receivable turnover ratio and fixed asset turnover ratio are lower than the industry average and lower than other new energy enterprises, there is a certain degree of operational risk. From the perspective of income distribution, the dividend rate is low, and the ratio of income and distribution is unreasonable, there is a certain risk of income distribution.

(2) All 10 companies in the new energy industry have certain financing risk, investment risk, operation risk and income distribution risk in 2022, of which financing risk is the lowest; operation risk is the highest. JZ new energy is ranked 10th among the 10 companies in the new energy industry, and has high financial risk.

(3) Identify the financial risk of JZ New Energy in terms of two non-financial factors: external factors and internal factors. It is found that the external factors affecting the financial risk of JZ New Energy are national policy, government approval process, and industry competition; the internal factors affecting the financial risk of JZ New Energy are talent management and mechanical equipment.

(4) In order to control the financial risks of JZ New Energy, the following countermeasures are proposed: strengthening the control of financing risks of JZ New Energy, including expanding financing channels and optimising the capital structure; strengthening the control of investment risks of JZ New Energy, including rational investment projects and preventing investment risks; strengthening the control of operating risks of JZ New Energy, including strengthening the control of accounts receivable and strengthening the management of fixed assets; strengthening the control of income distribution of JZ New Energy risk control, including the regular preparation of cash budgets and reasonable retention of earnings and profit distribution; and strengthening the control of other risks of JZ New Energy, including the improvement of the talent management system and actively responding to changes in the external environment.

6.2. Implications

6.2.1. Theoretical implications

In the high-speed period of the country's economic development, people's quality of life has gradually improved, traditional energy enterprises continue to transform, and new energy enterprises have entered a new historical stage. Because the new energy industry is an emerging industry, selecting a representative new energy enterprise JZ new energy to conduct research, so that the new energy industry financial risk theory research is more abundant. Therefore, the new energy enterprise JZ new energy financial risk identification, evaluation and control has certain theoretical significance.

6.2.2. Practical implications

This paper takes the new energy enterprise JZ New Energy as the starting point of the research, studies the actual financial statements of JZ New Energy, identifies the sources of financial risks existing in JZ New Energy, evaluates the existing financial risks and proposes corresponding control measures, which is conducive to the reduction of the financial risks of the enterprise. Therefore, through the study to help enterprises to find, control financial risk, is conducive to help JZ New Energy better management and development, but also for other new energy enterprises to provide a certain reference ideas, to help the country to achieve the goals of the "14th Five-Year Plan", to accelerate the construction of a strong energy country.

6.3. Outlook

This paper focuses on JZ New Energy, a new energy enterprise, and investigates its actual financial statements to identify the sources of various financial risks. It evaluates these risks and proposes corresponding control measures to help mitigate them, ultimately supporting the company's financial stability. The findings not only aid JZ New Energy in improving its operations and development but also offer valuable insights for other new energy enterprises. This research contributes to achieving the goals of the 14th Five-Year Plan and accelerating the construction of energy power in the country.

Additionally, the paper suggests that future efforts should leverage big data and artificial intelligence technologies to collect real-time production, operational, market, and policy data from new energy enterprises. By updating risk assessment models dynamically, these technologies can enable continuous monitoring and early warning systems for financial risks. For example, real-time tracking of product price fluctuations, raw material supply, and policy changes can help predict potential financial risks, allowing companies to adjust their strategies proactively.

New energy industry is indispensable to complete the national "14th Five-Year Plan" and respond to the call of "double carbon" policy. The new energy industry has unlimited potential, this paper analyses the financial risk of JZ new energy, and puts forward control measures, but due to the changing external environment, new financial risks may arise, so the study of financial risk should keep abreast of the times, and continue to monitor the enterprise's financial risk. As an important support for achieving high-quality economic and social development, the new energy industry should always pay attention to financial risks and prevent financial risks in time, so as

to contribute to the building of a beautiful China with evergreen mountains, evergreen water and ever-new air to build a solid energy security barrier.

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References

1. Yin S, Han S, Liu Y, et al. Impact of new media use on farmers' willingness to use clean energy: the role of topography and agricultural income. Humanities and Social Sciences Communications. 2024; 11(1). doi: 10.1057/s41599-024-03877-7
2. Index copernicus. Electric Power Technology and Environmental Protection. Editorial Office of Electric Power Technology and Environmental Protection; 2024.
3. Yin S, Wang Y, Liu Y, et al. Exploring drivers of behavioral willingness to use clean energy to reduce environmental emissions in rural China: An extension of the UTAUT2 model. Journal of Renewable and Sustainable Energy. 2024; 16(4). doi: 10.1063/5.0211668
4. Liu E, Tang G. A Discussion on the Definition of Corporate Financial Risks. Beijing Business School Journal. 1989; (1): 50, 54.
5. Pan M, Zeng M. Research on Financial Risk of Listed Companies Based on Principal Component Analysis--Taking China's Manufacturing Industry as an Example. Friends of Accounting. 2015; (21): 63-68.
6. Liu F, Ge L. Chain enterprise financial risk identification, evaluation and prevention. Finance and accounting newsletter. 2016; (23): 98-101.
7. Yin S, Lv X, Lui M. Adaptation to climate change in rural China to enhance the welfare effects of clean energy transition considering topography and e-commerce. Management Theory and Studies for Rural Business and Infrastructure Development. 2024; 46(3): 285-311. doi: 10.15544/mts.2024.28
8. Sun S, Wang Y, Zhang Z. An Analysis of New Methods for Corporate Financial Risk Evaluation. China CPA. 2021; (12): 105-108.
9. He M, Wang M. An analysis of the application of big data in financial risk identification and control. China CPA. 2022; (10): 107-112.
10. Yan J, Zheng W. Does the hometown relationship between CEOs and directors affect corporate financial risk? --A study of financial risk causation based on factor analysis construction. Finance and accounting newsletter. 2022; (08): 29-34+117.
11. Fu S. Design and system construction of financial risk indicators for new energy enterprises. Journal of Solar Energy. 2023; 44(12): 579.
12. Li B, Zhao L. A study on the mechanism of the impact of financial risk on audit failure in listed companies: the case of Fu Ren Pharmaceuticals. Accounting Newsletter. 2023; (23): 15-22.
13. Zhang L, Wang Y. An analysis of financial risk prevention strategies for internet enterprise mergers and acquisitions. Finance and Accounting. 2023; (18): 80-81.
14. Yu T. Financial Risk Analysis and Internal Control Improvement Suggestions of Treasury Payment Centre. Finance and Accounting. 2023; (16): 72-73.

15. Jin D, Pang X. The impact of digital finance on corporate financial risk - based on empirical data of A-share listed companies in China. Wuhan Finance. 2023; (08): 80-88.
16. Dang A. Research on financial risk and internal control management strategy of feed enterprises. China Feed. 2023; (12): 97-100.
17. Sheng L, Wang X. Common Institutional Investors and Corporate Financial Risk Diffusion. Business Research. 2024; (01): 103-110.
18. Tatiparti S, Mahajan KN, Reddi SK, et al. Analyzing the Financial Risk Factors Impacting the Economic Benefits of the Consumer Electronic Goods Manufacturing Industry in India. Journal of Advanced Manufacturing Systems. 2023; 22(04): 823-847. doi: 10.1142/s0219686723500385
19. Huang X, Zhang J. Financial Risk Management and Effectiveness of Enterprise Management. The Frontiers of Society, Science and Technology. 2023; 5(10). doi: 10.25236/fsst.2023.051011
20. Zhang S, Li T. Construction and Analysis of the Financing Risk Network of Chinese Fisheries Enterprises. Ocean & Coastal Management. 2024; 251(1).
21. Ronyastra IM, Saw LH, Low FS. Monte Carlo simulation-based financial risk identification for industrial estate as post-mining land usage in Indonesia. Resources Policy. 2024; 89: 104639. doi: 10.1016/j.resourpol.2024.104639
22. Wei X, Han Z, Wang P. Research on financial risk evaluation system of construction enterprises based on cash flow perspective. Construction Economics. 203; 44(S1): 423-426.
23. Wang X. Financial risk evaluation of large real estate enterprises under multiple shocks - TOPSIS analysis based on entropy value CRITIC synthetic assignment. Finance and Accounting Monthly. 2023; 44(12): 94-99.
24. Tan C. Analysis of financial risk management and hedging strategies in seed companies. Molecular Plant Breeding. 2023; 21(24): 8311-8316.
25. Sun R, Li T. Exploration on the construction and application of financial risk early warning model in public hospitals. China Health Economics. 2023; 42(11): 73-77.
26. Xuan F. Regression analysis of supply chain financial risk based on machine learning and fuzzy decision model. Ramachandran V, ed. Journal of Intelligent & Fuzzy Systems. 2021; 40(4): 6925-6935. doi: 10.3233/jifs-189523
27. Yang D, Ma H, Chen X, et al. Design of Financial Risk Control Model Based on Deep Learning Neural Network. Computational Intelligence and Neuroscience; 2022.
28. Wang B. A Financial Risk Identification Model Based on Artificial Intelligence. Wireless Networks; 2022.
29. Li B, Tao R, Li M. Identification of Enterprise Financial Risk Based on Clustering Algorithm. Sharma K, ed. Computational Intelligence and Neuroscience. 2022; 2022: 1-9. doi: 10.1155/2022/1086945
30. Fan M, Chen X, Liu B, et al. An analysis of financial risk assessment of globally listed football clubs. Heliyon. 2023; 9(12): e22886. doi: 10.1016/j.heliyon.2023.e22886
31. Min J, Li ZQ, Liu Y, et al. Automotive manufacturing enterprise financial risk evolution monitoring and early warning simulation: based on the perspective of value chain analysis. Management System Engineering. 2023; 2(1). doi: 10.1007/s44176-023-00021-8
32. Wang Q, Zhang Q. Financial Risk Evaluation of Real Estate Enterprises under Supply-Side Reform. accounting and Corporate Management. 2023; 5(5): 11- 23.
33. Duan Y. Research on the Problems of Financial Risk Control in Commercial Banks--Taking Bank Z as an Example. Mall Modernisation. 2021; (09): 181-183.
34. Huang S, Ye F, Li S. Identification and assessment of financial risks in the context of carbon neutrality. Finance and Accounting Monthly. 2021; (22): 7-11.
35. Zou J. Research on financial risk evaluation model based on risk management theory. Heilongjiang Science. 2022; 13(22): 43-45.
36. Pan H, Zhou Y. Does financial risk control affect executive compensation - Empirical evidence from Chinese A-share listed companies. Accounting Research. 2023; (08):73-87.
37. Wang L, Sun D, Zhang Y. Financial risk prevention and control measures for administrative institutions under the background of big data. Finance and Accounting. 2023; (24): 73.
38. Zhou Z. Construction of enterprise financial risk management system in the context of digital transformation. Finance and Accounting. 2024; (02): 70-71.

39. Ren D, Wu H. Design and Implementation of Enterprise Financial Risk Control Information Management System Based on Big Data of Internet of Things. Rao Y, ed. Mobile Information Systems. 2022; 2022: 1-12. doi: 10.1155/2022/5677870
40. Jing M, Ruitao Z. Financial Risk Identification and Management: Based on the Case Study of "Crude Oil Treasure" of Z Bank. Academic Journal of Business & Management. 2023; 5(26). doi: 10.25236/ajbm.2023.052610
41. Fu C, Yu C, Guo M, et al. ESG rating and financial risk of mining industry companies. Resources Policy. 2024; 88: 104308. doi: 10.1016/j.resourpol.2023.104308
42. Yin S, Zhao Y, Hussain A, et al. Comprehensive evaluation of rural regional integrated clean energy systems considering multi-subject interest coordination with pythagorean fuzzy information. Engineering Applications of Artificial Intelligence. 2024; 138: 109342. doi: 10.1016/j.engappai.2024.109342