

Research on Financial Risk Evaluation of New Energy Vehicle Listed Companies Based on Z-value Model

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Abstract: The new energy automobile industry is a strategic emerging industry developed in China. The new energy automobile industry develops rapidly, and the rapid development is often accompanied by the occurrence of financial risks. Since there are many factors affecting the financial risk of new energy vehicle listed companies, the theoretical basis of financial risk assessment, assessment methods and related empirical research will be cited. This paper conducts an empirical study on the data of listed companies of new energy vehicles in Shanghai and Shenzhen in the past five years as a sample to analyze the impact of financial risks on listed companies of new energy vehicles. However, there are not many studies on the financial risks of listed companies of new energy vehicles in China at present. The current research will help the listed companies of new energy vehicles in China to understand the financial risks, understand the reasons for the risks and the consequences that will be caused, which is beneficial to new energy vehicles. Enterprises make financial risk prevention measures and further development.

Keywords: New energy vehicle, Financial risk, Risk assessment, Risk prevention.

1. Introduction

With the vigorous development of China's economy and science and technology, the new energy vehicle industry is a strategic emerging industry developed in China. In today's society, new energy vehicles have become an inevitable trend in the automotive industry, mainly involving pure electric vehicles, hydrogen-powered vehicles, and alcohol-ether vehicles. From the introduction of the national policy to support the development of new energy vehicles, a large number of automobile enterprises that produce new energy vehicles or lithium batteries have emerged. The research and development and application of electric vehicles, hybrid electric vehicles and fuel electric vehicles with the ultimate goal of energy saving, environmental protection and safety have become the focus of the development of the automobile industry. However, the rapid development of new energy vehicle listed companies is accompanied by huge financial risks, and financial risks will always exist in daily operations. Financial risk has a broad and narrow distinction. Financial risk in a narrow sense usually refers to the uncertainty of the financial results of the enterprise due to borrowing. Financial risk in a broad sense refers to the possibility of losses due to the deviation of the actual financial returns from the expected financial returns within a certain period of time due to the internal and external environment and various unpredictable or uncontrollable financial activities of the enterprise. The factors affecting the financial risk of listed companies in the new energy vehicle industry have attracted more and more attention. Although listed companies can raise funds in many ways, they can quickly expand their scale and enhance the popularity of their products and market share, but it will also increase the financial risks of listed companies. However, for listed companies in the new energy vehicle industry, the quality of their financial status directly reflects the efficiency of the company's operations. Therefore, it is of great significance to study the influencing factors of financial risk of listed companies in the new energy vehicle industry.

2. Literature Review

2.1. Risk Identification

First of all, in the study of financial risk, many researchers started from risk identification. Cabarkapa proposed the combination of artificial intelligence technology and financial risk identification and evaluation method, which provided a good research idea for subsequent research. artificial intelligence technology is also involved in a wide range of financial applications, which solves the problem of constantly changing financial indicators [1]. Yao and Deng mentioned that risks come not only from the external environment, but also from internal decision-making risks. They are influenced by both internal and external factors. They propose to encourage employees to improve their sense of responsibility for corporate risks and strengthen their sense of responsibility through compensation incentives [2]. Mistakes in internal decision-making can also lead to financial risks, so risks must not only be combined with the external environment but also need to consider the impact of internal factors. Hichiner pointed out that the analysis of enterprise financial risk must be combined with the background of the industry, otherwise the conclusion will be untrue [3]. Research without the background of the research has no meaning, so Hichiner's proposal is valuable. Vladimir proposed that financial risk is the impact of risk factors, the possible financial risks and the loss of potential financial risks suffered by enterprises, so he established a set of methods and measures to solve the problems of financial management of different enterprises [4]. Chen Xu pointed out that the financial risk of an enterprise exists objectively, and the financial risk caused by the decline of expected returns is due to the unreasonable structure of the enterprise [5]. The financial risk problem of enterprises does exist objectively, but the occurrence of financial risk cannot be just the unreasonable structure of the enterprise. This conclusion needs to be further improved. Financial risk issues exist objectively and cannot disappear out of thin air. Chen Zhibin, Cao Jiamin, and Wang Shiyu discovered an important

phenomenon in research. Financial risks not only have an adverse impact on their own financial status, but also affect other companies in the same industry, thereby affecting the stability of the market environment, thus affecting the stability of the market environment. It is proposed that financial risk has an industrial effect [6]. The impact of financial risk is often similar, and the impact on companies in the same industry tends to have the same effect. Zhao Jian pointed out that financial risk is caused by the common external and internal environment of the enterprise, which causes the enterprise to suffer losses. There are many factors that cause the external environment, such as changes in market economy, demand and other factors, and there are many internal risk factors, such as internal control. factors such as organizational structure, internal risk personnel management quality and so on [7]. Internal financial risks are controllable to a certain extent, while external environment is to avoid risks as much as possible.

2.2. Risk Assessment

William H. Beaver calculated and analyzed the data of bankrupt and non-bankrupt enterprises for nearly ten years and found that the asset-liability ratio, debt protection ratio, asset safety ratio, and return on assets are the 30 indicators that can best reflect the size of financial risks. Evaluation index [8]. This finding laid the foundation for subsequent research. Edward Altman proposed the famous Z-score model on the basis of Fitz Patrick. The Z-score model is a multivariate model and needs to use multiple financial indicators to calculate and analyze the financial status of the company, including financial coefficients, profitability, etc., This model has been continuously improved since then, and this theory is still used today [9]. The Z-score model was widely used in subsequent research and played a key role in subsequent empirical research. Osypenko proposed that mathematical models can be used to evaluate corporate financial risks. Using mathematical models can effectively reduce work costs and improve work efficiency. Some problems in corporate finance can be evaluated [10]. The use of mathematical models not only improves work efficiency, but also improves the accuracy of conclusions. After that, many empirical analyses have applied mathematical models. Since then, the risk assessment system has become more and more perfect, and the evaluation index system has become more and more complete. Chen Qian and Tian Zhiwei used factor analysis to identify the main factors affecting the financial risk of forestry enterprises, and then combined with cluster analysis to classify the risk levels, and then came to the conclusion that the overall financial risk of forestry enterprises is relatively large [11]. Li Haidong and Zhang Shaoyang selected financial indicators according to the four aspects of the enterprise's profitability, debt, operation and development, and adopted the efficacy coefficient method to evaluate the financial risk of the manufacturing enterprise. The results obtained were the profitability and solvency of the enterprise. There is a greater risk [11]. Xiong Yi and Zhang Youtang integrated non-financial indicators with traditional financial indicators to form a new financial risk early warning model. Based on the scoring results of the indicator system, it is concluded that the model that integrates non-financial indicators such as audit elements and corporate governance structure has higher performance. accuracy [13]. The risk assessment model combines the elements of non-financial indicators to make the results more accurate. Although

financial indicators are important, the combination of non-financial indicators perfectly makes up for this defect. This proposal is very meaningful.

2.3. Risk Prevention

Gorbunow Vladimir, proposed that financial risk refers to the risk of sluggish operation caused by the high uncertainty of the environment, and changes in market and industry factors will also increase the possibility of risk [4]. Suisun redefines and defines financial risk, and believes that financial risk mainly includes cash flow management, liability management and accounts receivable management. Cash flow is a manifestation of dynamic capital operation, which can comprehensively and comprehensively reflect the financial status and actual operation of an enterprise. Changes in cash flow may lead to the occurrence of financial risks, and corporate cash flow will directly reflect corporate financial risks. There is an inseparable relationship between cash flow and financial risks. Tu Xiangyong believes that the main manifestations of financial risks are studied from the perspective of listing, and the quantitative analysis method, qualitative analysis method and comprehensive identification method combining quantitative and qualitative analysis are the most common analysis methods for listed companies [15]. The combination of qualitative and quantitative methods. Qualitative mainly predicts the possibility of occurrence of enterprise financial risks, and judges the structural nature of enterprise financial risks. Quantitative mainly sets the scope of risks according to financial indicators, establishes a risk early warning model, and improves risk identification. The combination of the two will more accurately analyze the company's financial risks and provide a strong guarantee basis for subsequent prevention and control. Dou Xiaohong analyzed the definition, causes and types of risks in modern enterprises. He believed that the main risks faced in the operation of modern enterprises are still investment, financing and business risks. The research on modern risk management issues is of great significance [16]. Han Yao and Ma Chunying also proposed that optimizing the capital structure and improving the internal control system are effective measures to prevent risks [17]. Risk prevention from the perspective of internal control is also a good way of thinking. The function of internal control is mainly to improve the management level and risk method ability of the enterprise; to promote the sustainable development of the enterprise, so perfecting the internal control is an effective way to prevent financial risks.

Literature review: The literature review mainly analyzes and sorts out financial risks from the main line of risk identification, risk assessment, and risk prevention. Most scholars have studied financial risks, and they all put forward their own corresponding viewpoints, starting from risk identification, risk assessment and risk prevention and control. It mentioned the establishment of the famous Z-score model. The Z-score model was proposed by Edward Altman to evaluate and predict the risks of enterprises. This model is still used today. From the perspective of financial risk assessment, Xiong Yi and Zhang Youtang put forward the view that non-financial indicators such as corporate governance structure affect financial risk from the perspective of empirical research, and used relevant models to prove their views and draw relevant conclusions. Most of these research results have carried out corresponding research theoretically, which reduces the financial risk of enterprises, and has a certain guiding role for enterprises to deal with financial risks in real

life. However, there is very little empirical research from specific industries. Therefore, the research on financial risk should focus on the financial risk of the enterprise under the premise of the actual management activities of the enterprise and the challenges of the complex economic environment, so as to establish a risk prevention strategy suitable for itself. Control measures remain the top priority.

3. Research and Theoretical Assumptions

3.1. The Impact of Corporate Solvency on Corporate Financial Risks

The solvency of an enterprise is the ability of the enterprise to repay its debts, and the solvency of debt is an important symbol that reflects the financial status and operating ability of the enterprise. Solvency is the ability or guarantee ability of an enterprise to repay its due debts, including the ability of short-term and long-term debts. The stronger the solvency of the enterprise, the greater the possibility of repaying the principal and interest on time, and the smaller the possibility of financial risk.

Hypothesis 1: Corporate financial risk is negatively correlated with corporate solvency.

3.2. The Impact of Corporate Profitability on Corporate Financial Risks

Enterprise profitability refers to the level of profitability of an enterprise in production and operation. For an enterprise operating in debt, the funds for repayment of the principal and interest ultimately come from the income of the enterprise, and the profit is the most powerful guarantee for the enterprise's debt. Corporate financial risk decreases as its profitability increases.

Hypothesis 2: Corporate financial risk is negatively correlated with corporate profitability.

3.3. The Impact of The Company's Operational Capabilities on The Company's Financial Risks

Operational capability reflects the efficiency of enterprise

asset utilization. Enterprises with strong operating ability are helpful for the growth of profitability, thereby ensuring that the enterprise has a good solvency, thereby reducing the financial risk of the enterprise.

Hypothesis 3: Corporate financial risk is negatively correlated with corporate operational capability.

4. Research Design

4.1. Model Construction

this paper, the multivariate model adopted by the Z-value model is used to establish a multivariate linear function equation, that is, a weighted summary of various financial indicators is used to obtain the Z-value, and then the Z-value is used to predict the financial risk of the enterprise. The Z-value model was established in 1968 by Edward Altman, a professor at the Stern School of Business at New York University. He observed bankrupt and non-bankrupt production companies in the United States and used 22 financial ratios to pass through mathematical statistical screening. This famous 10-variable model was established. According to the statistical results of Edward Altman, its prediction accuracy can reach more than 90% in the year before bankruptcy, and as high as 70% in the five years before bankruptcy. The model was created by Edward Altman, a professor at New York University. This model has been widely used in the United States, Britain, France, Brazil and other countries. The smaller the indicator Z is, the greater the company's financial risk, and vice versa. According to China's annual financial statements, the Z-score model can be converted into: $Z=0.012 \times (\text{current assets} - \text{current liabilities}) \times 100 / \text{total assets} + 0.014 \times (\text{unknown Distributed profit} + \text{surplus reserve}) / \text{total assets} + 0.033 \times (\text{pre-tax profit} + \text{financial expenses}) \times 100 / \text{total assets} + 0.006 \times \text{shareholders' equity} \times 100 / \text{book value of liabilities} + 0.999 \times \text{sales revenue} / \text{total assets}$, "Z Partition model" has an empirical critical data value, which is $Z=2.675$.

Table 1. Criteria for judging the company's financial status by the Z-Score model

Z value range	Financial Judgment Results	Result analysis
When $Z \leq 1.81$	extremely poor financial condition	The financial risk is very high, and the company is likely to go bankrupt if it is not properly controlled
When $1.81 < Z < 2.675$	unstable financial situation	It belongs to the "grey area", if the financial risk is not properly controlled, the company is more likely to fall into financial risk
When $Z \geq 2.675$	financial health	The possibility of the company falling into financial difficulties in the future is very small, and the financial risk is small

4.2. Variable Design

Table 2. The meaning of Z-Score model variables and their calculation formulas

independent variable name	meaning	Calculation formula
X_1	Working capital/Total assets	$(\text{current assets} - \text{current liabilities}) / \text{total assets}$
X_2	Retained Earnings/Total Assets	$(\text{undistributed profit} + \text{surplus reserve}) / \text{total assets}$
X_3	EBIT /Total assets	$(\text{profit before tax} + \text{interest expense}) / \text{total assets}$
X_4	Total shareholders' equity/liabilities	$(\text{Price per share} * \text{Total share capital}) / \text{Total liabilities}$
X_5	Operating Income/Total Assets	$\text{Main business income} / \text{total assets}$

4.3. Sample Selection

This paper selects the representative listed companies in the new energy automobile manufacturing industry in Shanghai and Shenzhen from 2016 to 2020 as the research sample. The data required for the empirical research in this paper mainly come from the data of Oriental Fortune Network and Sina Finance Network, and the sample data are mainly processed as follows: excluding all companies in the financial industry; excluding ST listed companies; excluding the undisclosed management fee details, And in the details of management expenses, the R&D expenses have not been spent for two years or more (because this paper mainly studies the impact

of government subsidies on enterprises' innovation investment); excluding government subsidies, total assets, asset-liability ratio and other key indicators of lack of enterprises. In the end, 9 listed manufacturing companies were obtained: SAIC Group, Huayu Automobile, Dongfeng Technology, GAC Group, BYD, FAW Car, King Long Motor, Ankai Bus, and Zhongtong Bus.

5. Empirical Results and Analysis

5.1. Descriptive Statistics

The Z values of 9 companies from 2016 to 2010 were calculated, and the calculation results are shown in Table 3.

Table 3. Z value of each sample data

stock code	company	2016 z-value	2017 z-value	2018 z-value	2019 z-value	2020 z-value
600104	SAIC	1.8406	1.9534	1.8565	1.7322	1.6181
600741	Huayu Automobile	1.4706	1.9952	2.0421	1.2792	1.5219
600081	Dongfeng Technology	1.5191	1.6771	1.8131	1.0427	1.4751
601238	GAC Group	1.9022	1.9448	4.3233	1.3210	1.3340
002594	BYD	1.4288	1.6873	1.6003	1.4865	3.4730
000800	FAW Car	2.1649	3.1642	2.3546	1.8254	3.1856
600686	King Long	1.7444	1.4281	1.1753	1.1749	1.3239
000868	Ankai bus	1.0980	0.9384	0.4326	0.7005	0.9856
000957	Zhongtong Bus	2.9419	1.5742	1.9396	1.9830	1.3135
	mean	1.7901	1.8181	1.9486	1.3939	1.8034

Can be seen from Table 1, the z-values of 9 new energy companies in each year from 2016 to 2020 are as above. In 2016, 2017, 2018, 2019 and 2020, there were 5, 5, 3, 7, and 7 companies in the bankruptcy zone, respectively. The new energy listed companies in the bankruptcy area with continued high financial risks include Huaankai Bus; the typical ones whose financial situation has changed from good to bad are Zhongtong Bus and Guangzhou Automobile Group. According to the data analysis results, the financial risks of new energy listed companies are mainly concentrated in several aspects: the turnover rate of total assets is not very high, and the ability to use assets needs to be further improved; the financing risk is relatively large, and the investment risk of new energy listed companies is high. Obviously, the utilization rate of funds is not high enough, and the expected return may not be achieved, which may even lead to a waste of resources. Listed companies in the new energy vehicle industry do not pay enough attention to the research and development of core technology, which is reflected in the fact that most companies still have difficulty in making major breakthroughs in the research and development of core devices such as power electromagnetics, and the scientific research results in the short term are not satisfactory. Investments in such areas are very limited. Most companies ignore this, and it is difficult to form the key to long-term development. From the analysis of the main financial risks of the new energy vehicle industry, it can be found that the financial risks of the new energy vehicle industry are different in profit risk, operational risk and debt repayment risk. As the new energy vehicle industry begins to enter the transition stage, companies in this industry are affected by many uncertain factors in their daily operations, and are challenged by financial risks that come side by side with opportunities. However, the specific operating capabilities of listed companies in the energy vehicle industry in my country are different, and many of them have uncertain financial risks.

The lack of industry experience means that many companies do not have the ability to accurately judge and identify their own financial risks. The new energy vehicle industry has insufficient understanding of financial risk management. Financial management is often only superficial, ignoring internal and external risks, and the awareness of risk prevention and control is weak, and problems are not immediately considered as financial management. The issue of risk will only be considered from other aspects. The financial risk management system of enterprises is not perfect, there are many hidden dangers, and there is a lack of scientificity. The financial relationship within the enterprise is very chaotic, the flow of funds is not smooth, the loss is serious, and the security and integrity of capital are lacking.

6. Conclusions and Recommendations

First of all, for the new energy vehicle industry, it is a company with certain scientific research capabilities. In addition to encouraging it to improve its core competitiveness, it should also reasonably increase its own production capacity and conquer the power battery field of the industry. Large companies with strong own strength should optimize the quality and performance of their own products, moderately reduce production, and manufacture cost-effective new energy vehicles. The company also needs to pay attention to changes in consumer demand and consumer satisfaction in the market, and actively build word-of-mouth and better sales strategies. There must be certain strategies and measures for the sales of products, and sales are an important measure for the company's profit growth. At the same time, we must actively explore new points of interest growth, improve product performance, and take effective measures to increase product sales speed and increase sales.

Secondly, the investment in product research and technology needs to be increased to enhance the company's

scientific research capabilities. Technology is the cornerstone of the development of an industry. Only by mastering the core technology of the industry can each company ensure that its own development is not affected and has a place in such a fiercely competitive environment. Listed companies in the new energy vehicle industry should consider the company's long-term development direction, increase investment in scientific research, actively participate in external exchanges while striving to improve independent research and development, and learn from others' advantages as much as possible. Complement each other and break through the shackles of new energy vehicle power problems as soon as possible.

Thirdly, improve the early warning mechanism of financial risks and take preventive measures in advance. Problems under the financial peak accompany the operation process of the entire company. Although no company can avoid the occurrence of financial risk problems, we can predict the financial risks faced by the company in advance through financial early warning analysis, and take timely measures for problems that arise. To minimize the negative impact and loss brought to the company by facing serious financial risk issues. Listed companies in the new energy vehicle industry need to improve their ability to discriminate financial risks in order to have a place in such a competitive environment.

Finally, when the company enters the financial risk area, if it can change the company's operating conditions, identify the problem, strengthen the management of all aspects, and avoid financial risks as much as possible. For listed companies of new energy vehicles, adopt a reasonable financial risk analysis model and appropriate financial indicators. Among the five variables in the Z-value model, when working capital ratio, retained earnings to total assets ratio, EBIT, and total capital ratio become smaller or negative, it means that liquidity, profitability, and innovation and competitiveness are relatively high. Poor, the company is facing financial crisis. Raise awareness of financial risk prevention. To improve the quality of the data on which the financial analysis is based, first, expand the information disclosed in the financial report. Second, improve the timeliness of financial reporting and shorten the date of financial reporting. Actively create conditions, make full use of network technology platforms, and realize the coexistence of real-time reports and regular reports. Enterprises should release relevant information on their own internal information platforms in a timely manner to improve the efficiency and use value of accounting information.

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