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Study on Financial Risk Prevention of NIO in the Context of Big Data

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Abstract: With the continuous advancement of global informatization, the way of enterprise financial management under the big data environment is undergoing profound changes. This paper takes NIO as the research object to explore how to prevent financial risks in the context of big data. Firstly, the definition of big data and its specific application in financial management are studied to reveal the supportive role of big data technology in the collection, analysis and decision-making of enterprise financial information. Second, this paper provides a detailed definition and categorization of financial risks to help identify potential financial problems. Through in-depth analysis of NIO's financial data, possible financial risk points are identified, and an effective risk early warning model is established by combining the methods of big data analysis, aiming to realize the early identification and prediction of financial risks. Finally, based on the results of the analysis, relevant financial risk prevention measures are proposed, in order to provide reference and reference for NIO and other similar high-tech enterprises in financial risk management. Financial risk management in the context of big data not only requires enterprises to have strong data analysis capabilities, but also needs to eliminate potential risk factors in the system design to enhance the enterprise risk prevention capabilities. The research in this paper is of great practical significance to promote the intelligence and scientization of enterprise financial management.

Keywords: Big data, Financial risk, NIO, Risk prevention.

1. Introduction

With the rapid development of information technology, big data has become an important factor affecting the operational decisions of modern enterprises. In the era of big data, the use of big data technology for financial risk analysis has become an inevitable choice for enterprises. Big data technology can help enterprises obtain data from all aspects, including market trends, customer demand and supply chain dynamics. With the processing and analyzing ability of big data, enterprises can carry out forward-looking financial risk assessment, so as to better predict future market trends and provide reference for decision makers. In addition, big data can also help companies improve customer service and optimize the supply chain. In the context of big data, enterprises can obtain information from different data sources and process and analyze the data to help conduct financial risk assessment.

In 2014, NIO was founded with the aim of focusing on the development and manufacturing of high-end intelligent electric vehicles. China's electric vehicle market is expanding rapidly with policy support and consumers' increased awareness of environmental protection. However, the high barriers, rapid technological updates and fierce competition in the electric vehicle industry have caused NIO to face tremendous financial pressure while growing rapidly. By analyzing a large amount of user feedback data, NIO is able to keep abreast of consumer evaluations and expectations of its products, so that it can quickly adjust its product development and marketing strategies. On the other hand, by analyzing supply chain data, NIO is able to predict the risk of raw material supply and prepare for it in advance. With the acceleration of the process of global economic integration, the business environment of enterprises has become more complex, and various risk factors are intertwined. Therefore, how to use big data to identify, analyze and prevent financial risks is particularly important. As a pioneer in China's electric vehicle industry, NIO is facing unique challenges and opportunities. Therefore, it is of great theoretical and practical significance to study in depth the financial risk prevention strategy of NIO in the era of big data.

In the era of big data, the development of information technology has promoted the change of various industries, especially in the automobile industry, this trend is particularly obvious. As a leading enterprise in China's new energy automobile field, the research on the prevention of financial risk of NIO has significant research significance, which is reflected in the following aspects:

(1) From the theoretical level, this study helps to enrich and improve the theoretical system of financial risk prevention in the context of big data. Traditional financial risk management methods mostly focus on financial statement analysis, while ignoring diversified data sources and complex data relationships. By introducing big data analysis technology, more valuable information can be extracted from massive data, providing new perspectives and methods for financial risk management. For example, based on the analysis of NIO's financial data, key risk indicators in the financial system can be identified, and a risk early warning model based on big data can be established to detect possible financial risks in advance.

(2) From the practical point of view, as a representative of new energy vehicles, the study of financial risk prevention of NIO not only concerns the sustainable development of the enterprise itself, but also helps to improve the risk management level of the whole industry. Against the background of fluctuating market demand, changing policy environment and accelerating technological innovation, NIO needs to ensure financial

soundness through perfect financial risk management tools to support its long-term brand strategy and market positioning. Through big data analysis methods, market risks can be more accurately assessed and product sales and revenue levels can be forecasted, thus providing a scientific basis for the company's strategic decisions.

The in-depth study of NIO's financial risk with the support of big data can not only bring practical benefits to the enterprise itself, but also provide important references for the development of the industry and policy making. Through the identification, assessment and control of risk characteristics, the enterprise can improve its competitiveness in the complex and changing market environment and realize the strategic goal of sustainable development. At the same time, this research is of great significance in promoting the application of big data in the field of financial risk prevention, which can provide theoretical and practical reference for related research, and further accumulate and improve the knowledge system of financial risk management.

2. Overview of Financial Risk in The Context of Big Data

With the rapid development of information technology, big data has gradually become an important tool for enterprise financial management. Through in-depth analysis and application of big data, enterprises can better make financial decisions, risk control and resource allocation.

(1) Big data can effectively improve the accuracy of financial forecasting. Through big data analysis, enterprises can use massive real-time data for modeling and simulation to more accurately capture market trends and optimize financial forecasts.

(2) In terms of financial risk management, big data provides more accurate risk identification and assessment tools. Through data mining and pattern recognition, big data can help enterprises reveal hidden financial risks and develop corresponding control measures. The risk early warning system constructed based on big data can monitor the enterprise's financial indicators in real time, identify potential risks in advance, and ensure the stability of the enterprise's finances.

(3) The application of big data in cost management also significantly improves the operational efficiency of enterprises. Through the big data analysis of the production process, supply chain and market information, enterprises can accurately measure the cost of each link, thus realizing the minimization of costs and maximization of profits.

(4) Big data provides a guarantee for the transparency and credibility of corporate financial reporting. Through real-time data collection and analysis, companies can conveniently generate detailed and realistic financial reports to help management and investors better understand the company's financial situation. In recent years, more and more companies have come to rely on big data-generated reports as an alternative to traditional manual financial statements.

(5) Big data promotes innovation and change in enterprise financial management. Through the combination of cloud computing and Internet of Things technology, big data is not only limited to data collection and analysis, but can also provide intelligent decision support and strategic planning for enterprises. For example, some enterprises integrate external market information and internal operation data through big data to achieve cross-sectoral collaboration and resource optimization.

The application of big data in financial management has become an important factor in improving the competitiveness of modern enterprises. By continuously tapping and utilizing the potential of big data, enterprises can more effectively achieve the goals of financial management, improve financial transparency, reduce financial risks, and occupy a favorable position in the fierce market competition.

Financial risk is the potential loss due to uncertainties in the process of financial operations, which has a direct impact on the financial stability and operational effectiveness of enterprises. It is defined on a number of levels, including trading risk, market risk, credit risk, liquidity risk and operational risk.

(1) Transaction risk usually refers to financial losses arising from exchange rate fluctuations in an enterprise's cross-border or foreign exchange activities. This risk is particularly significant in internationally operating enterprises, as instability in currency exchange rates can directly affect an enterprise's financial statements and profitability. For example, according to international exchange rate statistics, the value of an enterprise's assets may fluctuate as a result of daily fluctuations in the foreign exchange market, which can have an impact on the enterprise's financial position.

(2) Market risk, on the other hand, is related to fluctuations in market prices, including sensitivity to changes in interest rates, stock prices and raw material prices. For example, during the period of global supply chain turbulence, the prices of some important raw materials may fluctuate drastically, thus directly affecting the production costs and profitability of manufacturing enterprises.

(3) Credit risk is the risk of loss arising from the failure of a borrower or counterparty to fulfill its contractual obligations. Improper credit risk management may directly lead to the insolvency of an enterprise. According to data from internationally recognized credit rating agencies, cases of corporate bankruptcy due to credit risk abound every year. For example, after the global financial crisis in 2008, several large enterprises suffered from broken capital chains due to downgraded credit ratings, which in turn led to an increase in financial risk.

(4) Liquidity risk refers to the risk that an enterprise will not be able to liquidate its assets in time to meet short-term debt pressures. A shortage of liquidity may cause an enterprise to struggle when faced with temporary funding needs. According to recent research data, about 30% of SMEs have difficulty operating for more than five years due to poor liquidity management.

(5) Operational risk, on the other hand, involves the risk of loss due to system failure, human error or other internal procedural problems in the day-to-day operations of an enterprise. This type of risk is particularly significant in industries that rely heavily on precise operations, such as finance and information technology. According to research

data, losses due to improper internal operations account for more than 15 percent of the total losses of enterprises.

Understanding the definition and categorization of financial risk is the basis for enterprises to improve their financial management level. Traditional risk classification methods can no longer fully meet the needs of modern enterprises. Therefore, comprehensive risk management frameworks based on big data analysis are gradually becoming mainstream. These methods do not only consider a single risk type, but comprehensively assess risk exposure by analyzing the relationship between massive data and complex variables. For example, risk management software based on big data technology can monitor the fluctuation of multiple risk factors in real time and make dynamic adjustments, thus improving the accuracy of risk prediction. The definition and categorization of financial risks is an important step in the development of risk management strategies for enterprises, and the application of big data technology will help enterprises better assess and prevent the potential impact of various types of financial risks.

3. Analysis of NIO's Financial Condition

Founded in 2014, NIO is an innovative company headquartered in Shanghai, China, specializing in high-performance smart electric vehicle research. With the mission of 'driving the world's shift to sustainable energy', NIO is committed to providing consumers with high-quality electric vehicle products. As a representative of the new forces in car manufacturing, NIO has demonstrated strong growth momentum in a competitive market with its excellent technology development capabilities and innovative thinking.

NIO 's market positioning focuses on the high-end electric SUV market, attracting consumers through an innovative power exchange model. This business model not only reduces the cost of purchasing a vehicle, but also greatly improves the convenience of the vehicle during use. Through the ecosystem of NIO services, users can enjoy a series of value-added services, such as free roadside assistance, charging subsidies and vehicle customization services, which enhance the user experience.

NIO's R&D and production capacity continues to expand globally. By the end of 2023, NIO has set up several R&D centers around the world and built an advanced production base in Hefei, China. The automation level and production quality of this production base have reached the international leading level, providing strong support to meet the growing market demand.

In terms of funding, NIO has gained sufficient financial support through multiple rounds of financing and a successful listing in the U.S. capital market. For example, NIO raised US$1 billion when it went public in the U.S. in 2018, which provided a guarantee for the subsequent R&D and market expansion of the company. NIO has also actively raised funds by issuing convertible bonds and other means, ensuring the company's sustainable development in a competitive market.

However, NIO is also facing fierce market competition and pressure for technological innovation. As the electric vehicle market continues to grow, other competitors are emerging. In order to maintain its leading position, NIO is actively optimizing its cost structure and investing significant resources in R&D and innovation. By continuously improving its technology and product quality, NIO will continue to stay ahead of the fierce market competition and achieve sustainable development.

Since its IPO in 2018, NIO's calendar year financials are shown in Table 1 below.

Table 1. Financial Key Indicators of NIO Statement (in billions of dollars)

statement date		2018	2019	2020	2021	2022	2023
total assets		188.4	145.8	546.4	828.8	962.6	1174
total liability		106.9	194.0	227.8	448.2	686.2	877.9
revenues		49.51	78.25	162.6	361.4	492.7	556.2
business costs		52.07	90.24	143.8	293.1	441.2	525.7
business expense							
Among them:	R&D costs	39.98	44.29	24.88	45.92	108.4	134.3
	marketing cost	53.42	54.52	39.32	68.78	105.4	128.8
	business expense	93.40	98.80	64.20	114.7	213.7	263.2

The data shows that NIO's total assets have grown from $18.84 billion in 2018 to $117.4 billion in 2023, indicating that the company has undergone significant capital accumulation and significant expansion over the past few years. However, total liabilities also show a rapid growth trend, increasing from $10.69 billion in 2018 to $87.79 billion in 2023. Despite the faster growth in total assets, total liabilities are growing even more rapidly.

In terms of operating income, NIO increased from $4.951 billion in 2018 to $55.62 billion in 2023, showing the rapid expansion of the company's business scale. However, operating costs also showed a rapid growth trend, increasing from $5.207 billion in 2018 to $52.57 billion in 2023. Despite the growth in operating revenue, the increase in operating costs was more significant, with the growth rate of costs significantly higher than the growth rate of revenue, resulting in compressed profit margins and greater fluctuations in gross profit margins. The gross profit margins in 2018 and 2019 were negative, indicating that the Company was unable to effectively cover its operating costs in these two years, while the gross profit margins in subsequent years, although rebounding, failed to translate into stable profits, reflecting that cost control and operating efficiency still needs to be improved. In terms of net profit, NIO showed losses from 2018 to 2021, and although the loss was gradually narrowing, the loss expanded again in 2022, reaching a trough of -20.72 billion in 2023, expanding by 43.50% year-on-year. over the past 6 years, NIO has accumulated a loss of 65.42 billion yuan.

Table 2. NIO's Cash Reserves, 2018-2023 (in billions of dollars)

statement date	2018	2019	2020	2021	2022	2023
Cash and cash equivalents	31.34	8.628	384.3	153.3	198.9	329.4
Restricted cash and other (current)	0.57	0.83	0.78	29.94	31.54	55.42
short term investment	51.55	1.11	39.51	370.6	191.7	168.1
add up the total	83.46	10.568	424.59	553.84	422.14	552.92

As shown in Table 2, looking at cash reserves in terms of cash and cash equivalents, restricted cash and other (current), and short-term investments, NIO's cash reserves have been sizable. in 2023, NIO's cash reserves amounted to $55.292 billion, a significant increase of $13.078 billion from the previous year.

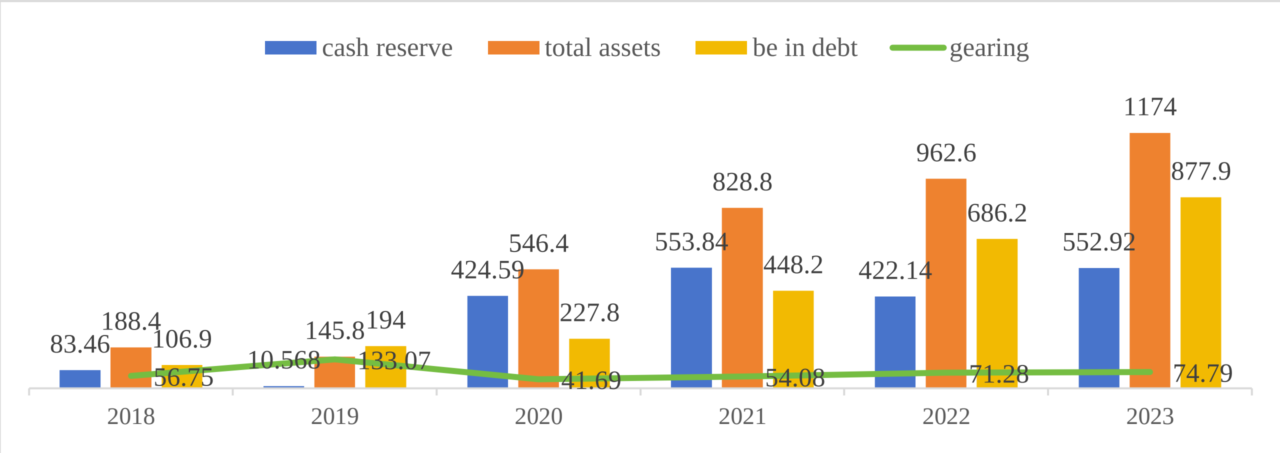

Figure 1. NIO 2018-2023 Asset and Liability Changes

Since its listing, NIO's gearing ratio has always been high, and in 2019, it was even as high as 133.07%. Although it improved in 2020, dropping to 41.69%, but in the last three years, it has risen again, and although the total assets in 2023 have been as high as $117.4 billion, the liabilities have also grown from $68.62 billion in 2022 to $87.79 billion, and the gearing ratio has grown from 71.28% in 2022 to 74.79%. Looking at the gearing ratios of Tesla (TSLA.US) and Ideal (LI.US) in the same industry, NIO's gearing ratio in the last three years has been significantly higher than those two.

Table3. Assets and Liabilities of The Same Industry 2018-2023

statement date	2018	2019	2020	2021	2022	2023
an ideal	51.51%	51.85%	18.06%	33.61%	47.78%	57.78%
Nikola Tesla (1856-1943), Serbian inventor and engineer	78.77%	76.36%	54.49%	49.17%	44.26%	40.34%

Table 4. Funding Operations of NIO Motor, 2018-2023 (in billions of dollars)

statement date	2018	2019	2020	2021	2022	2023
issue shares	76.10	--	346.1	126.8	--	209.6
Proceeds from the exercise of stock options	0.4225	0.5079	1.549	1.446	0.7873	0.8682
New borrowings	26.68	--	18.65	61.12	69.19	80.14
Note-related gains	--	43.22	--	--	--	--

The numbers look like NIO's fundraising ability is there for all to see. Even in the not-so-great environment of 2023, Li Bin still received two investments from Middle East capital CYVN, totaling about 21 billion yuan. But capital is the pursuit of return, in the case of NIO continued losses, NIO can still get how much investment, is not yet known. According to the current "continue to burn money" rate, how long can NIO support be still unknown.

Overall, NIO faces a number of challenges in terms of financial performance, with high levels of debt and sustained losses, showing its vulnerability in terms of financial health and profitability. Therefore, it is crucial to conduct a study on financial risk analysis and prevention for NIO from the perspective of risk identification, assessment and management.

NIO, as an innovative electric vehicle manufacturer, requires a comprehensive and in-depth analysis of factors such as liquidity risk, capital structure risk, market risk and credit risk in its financial risk assessment.

(1) Liquidity risk. NIO's cash flow position directly affects its short-term solvency. According to its annual financial report, NIO has obtained sufficient cash flow support through multiple rounds of financing, but still needs to pay attention to the risk of negative cash flow from operating activities.

Especially in the case of increased sales and marketing activities, more attention needs to be paid to cash flow management and forecasting to ensure that the company is able to pay off its debts and working capital needs in a timely manner.

(2) Capital structure risk. NIO faces relatively high debt ratios and financial leverage. High debt ratios may lead to increased pressure on debt servicing, especially in the face of high debt service payments. High financial leverage may also increase the company's financial risk, as rising debt costs may negatively impact the company's profitability and credit rating. Therefore, NIO needs to pay close attention to its capital structure and balance the structure of long-term funding and short-term debt to reduce financial risk.

(3) It is market risk. The electric vehicle market in which NIO operates is characterized by a certain degree of uncertainty and volatility. Uncertainty in market demand and changes in policies will have an impact on NIO's sales and profitability. With the continuous adjustment of new energy policies around the world, NIO will need to flexibly adjust its product strategy, market positioning and sales channels to meet the challenges arising from fluctuations in market demand and policy changes. NIO needs to strengthen its monitoring and analysis of its competitors and adjust its business strategies in a timely manner in order to maintain its competitive advantage in the market.

(4) Credit risk. The maintenance of good relationships with major suppliers and customers and the effective management of accounts receivable are important measures to reduce credit risk. NIO needs to establish stable relationships with suppliers to ensure the stability and reliability of the supply chain. At the same time, it should strengthen the collection of accounts receivable and control the recovery cycle of accounts receivable in order to minimize the credit risk due to overdue or bad debts of accounts receivable. Establishing good relationships with financial institutions and obtaining timely financing support can also help reduce credit risk.

NIO needs to deeply analyze all aspects of liquidity risk, capital structure risk, market risk and credit risk in its financial risk assessment. By optimizing cash flow management, reasonably adjusting the capital structure, flexibly responding to market changes, maintaining good credit relationships and strengthening risk management measures, NIO can effectively reduce financial risks and enhance the company's financial resilience and profitability to ensure sustainable development.

4. Financial Risk Prevention Strategies for NIO

As a rapidly developing new energy automobile enterprise in the context of the big data era, NIO's financial risk prevention strategy is crucial. In order to ensure operational stability and sustainable growth, NIO should take a series of measures to effectively deal with potential financial risks.

(1) Strengthen the real-time monitoring and analysis of financial data. First, with the help of big data analysis technology, the company carries out in-depth mining and efficient processing of financial data to improve the accuracy and processing efficiency of data [1]. Constructing a professional financial data analysis model, NIO can realize real-time monitoring of the company's financial situation with the help of the model and timely warning of potential financial risks [2]. Secondly, NIO utilizes big data technology to make accurate financial forecasts. Through the rich historical financial data and market trends grasped by big data, NIO can provide powerful data support for strategic decision-making by constructing a prediction model. At the same time, the model is also used to assess the impact of different market environments and policy changes on the company's financial situation, helping the company to formulate targeted response strategies [3]. In addition, NIO can optimize its supply chain management with the help of big data platform. For example, from the data, it seems that NIO's inventory turnover rate has improved greatly. According to the data of 2022, the inventory turnover days of NIO has been reduced to about 60 days, which is a significant improvement compared to 75 days in 2020. NIO should take advantage of the application of big data analytics in market demand forecasting, which enables it to grasp the market demand more accurately, avoiding the situation of too high or too low inventory, which effectively reduces the financial risk [4].

(2) Optimize fund management and financing channels. The first task is to improve fund liquidity management, establish a monitoring mechanism to guarantee sufficient cash flow to respond to emergencies, and rationally plan the use of funds to avoid shortages or idleness [5]. Given that NIO's R&D investment has increased from 3 billion yuan to 4.5 billion yuan from 2018 to 2022, reflecting its emphasis on technological innovation, the company must strengthen real-time monitoring and precise analysis of financial data to ensure stable working capital. In addition, NIO should broaden its financing channels, explore diversified methods such as bond issuance and equity financing, reduce its dependence on a single channel, and establish long-term cooperation with financial institutions to strive for more favorable financing conditions [6].

(3) Strengthen the construction of internal control system and risk management. NIO should build a perfect internal control system, clarify responsibilities and authorities, guarantee efficient and standardized operations, and conduct regular audits and assessments to correct problems [7]. At the same time, a comprehensive risk management mechanism should be established to identify, evaluate and control financial risks, and formulate contingency plans to minimize losses [8]. In addition, NIO needs to improve its sensitivity to changes in the external environment, respond quickly to policy, market and competitor dynamics, and avoid financial risks by building flexible market response mechanisms, such as an agile supply chain and a rapid production system [9].

(4) Promote the digital transformation of the company's financial management. Through the introduction of an intelligent financial management system, the automation and transparency of financial processes can be realized, reducing miscalculations and risks caused by human factors [10]. Digital financial management can also provide real-time and accurate financial reports to help NIO monitor its operating conditions in a timely manner, make timely decisions, and reduce financial risks [3].

As a rapidly developing new energy automobile enterprise in the context of the big data era, NIO needs to adopt a series of strategies in financial risk prevention to improve its ability to develop soundly in a competitive market. By strengthening financial data analysis, expanding multi-channel financing, optimizing supply chain management, responding sensitively to market changes and digitizing financial management, NIO will be able to cope with potential financial risks and ensure the company's stable development. NIO should conduct comprehensive risk assessments and internal audits on a regular basis to identify and address potential issues of financial risk. At the same time, it should establish a rigorous internal control mechanism, improve financial management processes and systems, ensure financial transparency and governance levels, and enhance investor and market trust in the company. These measures will help improve NIO's overall risk tolerance and market competitiveness.

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