

Research on Building a Financial Risk Early Warning Mechanism for Enterprises in the Context of Big Data

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Abstract: In light of the ongoing advancements in the economy and society, enterprises are increasingly confronted with uncertainties within a highly competitive landscape, which poses potential risks to their growth. Conversely, the advent of the digital economy has introduced novel opportunities for the identification of financial risks. Organizations can leverage big data technologies to establish financial risk warning mechanisms, thereby enhancing their capabilities in risk identification, improving the efficiency of financial management, and fostering sustainable development. This article primarily examines the financial risk warning mechanisms of enterprises within the context of big data. It begins with the processes of data collection and organization, subsequently constructing a financial risk warning framework based on the sequence of “financial risk identification, financial risk evaluation, and financial risk warning.” The study identifies challenges related to financial risk warning in Chinese enterprises in the context of big data and proposes countermeasures and recommendations, with the aim of providing insights for the long-term, healthy development of Chinese enterprises.

Keywords: Big data; Financial Risk; Financial Risk Identification; Financial Risk Assessment; Financial Risk Warning

1. Introduction

In an environment characterized by intensifying market competition, enterprises are compelled to adopt various strategies aimed at reducing costs and enhancing efficiency to capture market share and sustain a competitive advantage. However, these strategies often entail exposure to diverse

financial risks. To effectively navigate the evolving market economy, it is imperative for enterprises to continuously optimize and innovate their financial management approaches. The traditional financial management model, with its inherent limitations, is increasingly inadequate to meet the demands of contemporary enterprises. Consequently, there is a pressing need for enterprises to explore alternative financial management strategies that align with the challenges and opportunities presented by the big data era. This necessitates the integration of emerging technologies, such as cloud computing, blockchain, and big data, to establish a comprehensive financial risk warning system and enhance traditional financial management frameworks. Such advancements are essential for addressing the complexities of the market environment and fostering the long-term development of enterprises. Currently, big data technology is extensively utilized across various sectors, enabling the processing of vast datasets and the extraction of valuable insights, which can assist enterprises in identifying financial risks. Therefore, the establishment of a financial risk warning mechanism grounded in big data is of paramount importance for enterprises in China.

2. The Importance of Establishing a Financial Risk Warning Mechanism in the Context of Big Data

2.1 Enhancing Risk Identification Capabilities

Enterprise managers predominantly rely on a combination of financial and non-financial data when making decisions, necessitating an understanding of real-time fluctuations in this data. Big data technology is adept at processing vast and varied datasets, encompassing both structured data generated internally and unstructured data sourced

externally. By leveraging big data technology, enterprises can extract valuable insights from unstructured data, such as information derived from social media and statistical reports. Through comprehensive analysis and mining of this data, organizations can more promptly and accurately identify potential financial risks, including credit risk, market risk, and liquidity risk, thereby enabling them to implement preventive measures and responses prior to the manifestation of these risks. Consequently, the integration of big data technology significantly enhances the timeliness and precision of risk identification within enterprises.

2.2 Enhancing the Efficiency of Financial Management

In the digital era, the proliferation of data is unprecedented, leading to the revelation of previously concealed information within the market. As such, the effective management and utilization of this information has emerged as a critical concern. During the course of enterprise development, organizations frequently need to make investment and financing decisions informed by this data, wherein the advantages of big data technology become evident. The integration of big data technology into the routine financial risk management processes of enterprises can significantly enhance decision-making capabilities by providing robust data support. Furthermore, it serves as an effective mechanism for risk mitigation ^[1]. Data is increasingly recognized as a vital asset for organizational growth, facilitating the integration of business operations and financial management. By initiating financial sharing and employing new technologies as tools, with big data management as the ultimate objective, enterprises can steer their financial management practices towards greater refinement and intelligence ^[2]. Furthermore, the application of big data technology fosters the dismantling of informational silos between departments, promoting seamless data flow across various organizational units. This not only enhances the timeliness of data but also bolsters the financial management capabilities of enterprises. At the same time, this information sharing mechanism also helps departments to supervise each other and avoid financial fraud

^[3]. Establishing a financial risk warning mechanism grounded in big data enables comprehensive monitoring of enterprise activities, facilitates in-depth analysis of financial management processes, and systematically addresses issues and risks at each stage. This approach provides essential support for financial personnel in executing financial management tasks, ultimately improving the efficiency and value of financial management operations.

2.3 Promoting Sustainable Development of Enterprises

In the era of big data, enterprises can leverage financial risk warning mechanisms to analyze market information, thereby enhancing economic efficiency and bolstering market competitiveness. The application of big data analytics enables organizations to gain a more precise understanding of the financial conditions across various departments and projects, facilitating optimal resource allocation ^[4]. By conducting comprehensive analyses of factors such as profitability, operational capacity, and risk exposure, enterprises can judiciously allocate resources, directing investments towards areas with higher potential returns and profit margins, thus improving overall resource utilization efficiency. Furthermore, big data technologies empower enterprises to more accurately forecast market trends, customer preferences, and other fluctuations, thereby mitigating potential financial risks. The establishment of a financial risk warning mechanism not only equips companies to manage short-term financial uncertainties but also fosters a long-term risk management mindset, culminating in the development of a holistic risk management framework. Big data analysis serves as a critical foundation for enterprises to timely adjust their strategic positioning, while financial risk warning mechanisms enable a comprehensive understanding of market dynamics, including competitors' financial health and shifts in market share. This understanding aids enterprises in formulating effective market strategies, adapting to evolving market conditions, and sustaining competitive advantage. Moreover, a robust financial risk warning mechanism enhances the transparency of a company's financial status

and risk management capabilities, thereby bolstering investor confidence and attracting increased investment and financial support. This, in turn, contributes to the enhancement of the company's economic performance and market competitiveness. Consequently, it is evident that the implementation of financial risk warning mechanisms within the context of big data not only mitigates risks and optimizes operational processes but also enhances the economic viability and market competitiveness of enterprises, thereby fostering a more conducive environment for their sustainable development.

3 The Concept of Implementing a Financial Risk Warning Mechanism in the Context of Big Data

3.1 Data Collection and Organization

The distinction between big data and traditional data is characterized by the former's extensive volume and the variety of information types it encompasses. Consequently, the processes of data collection and organization serve not only as the foundational step in the establishment of a financial risk warning mechanism but also as a critical element in ensuring the accuracy of the resultant warnings. The application of big data technologies enables organizations to gather routine financial data from internal sources, various macroeconomic data from external environments, as well as unstructured data. Furthermore, these technologies

facilitate the cleaning of data, integration of financial datasets, and the processing of missing or duplicate values, thereby enhancing the accuracy and completeness of the information. Additionally, it is imperative to convert semi-structured and unstructured data into structured formats to facilitate subsequent analysis and comparison. This phase necessitates substantial effort, thereby providing a robust data foundation for the development of a financial risk warning system and the establishment of a financial risk warning indicator library. Specifically, financial risk warning indicators encompass both internal financial data and external non-financial data, as shown in Figure 1. The internal influencing factors mainly include financial indicators such as debt repayment, profitability, cash flow, as well as some key financial indicators and internal governance structure indicators [5,6]. The levels of these indicators significantly influence the assessment of an enterprise's financial risk exposure. Conversely, external influencing factors pertain to macroeconomic indicators, including tax incentives, economic policy uncertainty, and exchange rate volatility, which can impact the financial risk profile of enterprises from a macroeconomic perspective. Therefore, the data collection and organization efforts are predominantly focused on gathering and structuring indicators that correspond to the internal factors influencing the financial risk of enterprises.

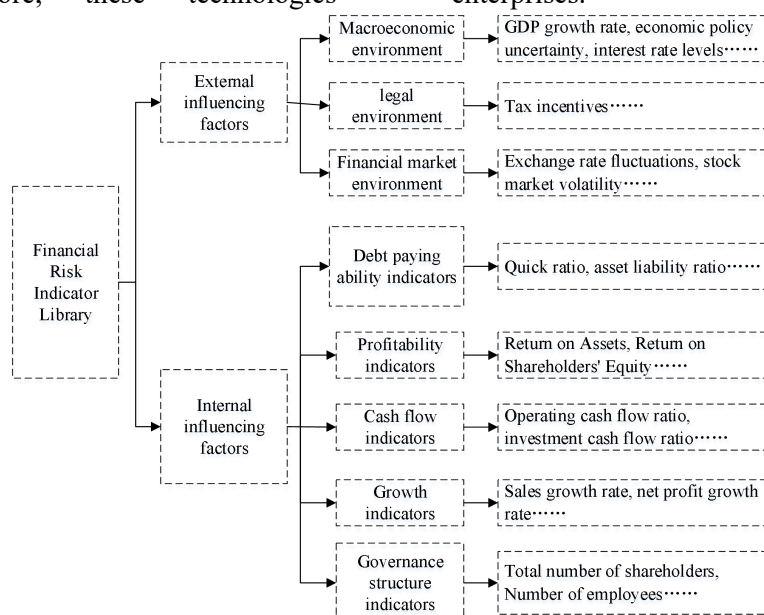


Figure 1. Financial Risk Indicator Database

3.2 Financial Risk Identification

The process of financial risk identification involves recognizing the potential risks faced by an enterprise, constituting a vital component of the early warning system. An enterprise develops a financial risk identification model utilizing a range of internal and external data, which allows for the pinpointing of risk sources. This model facilitates the analysis of these risk sources, identification of the underlying causes of financial risks, and evaluation of the resultant implications. Based on the identified categories of financial risk, appropriate risk prevention and control measures are implemented, alongside continuous monitoring of changes in the risk sources. It is essential for all departments within the enterprise to remain vigilant regarding the potential for financial risks, effectively executing various preventive measures to ensure the efficacy of risk management. During the risk identification process, enterprises may employ multiple risk identification models to analyze and assess the likelihood of financial risks from diverse perspectives.

3.3 Financial Risk Assessment

In the context of financial risk assessment, it is imperative for enterprise managers to establish evaluation metrics that are aligned with the prevailing market conditions and the strategic objectives of the organization. To quantify the likelihood of financial risk events, enterprises may employ Bayesian network models, ^[7] which facilitate the ongoing refinement of warning systems in response to real-time data, thereby enhancing the accuracy of information pertinent to financial risk management initiatives. Additionally, managers can utilize diverse methodologies, including interviews and surveys, to assess the magnitude of risk factors and to inform subsequent risk mitigation strategies.

3.4 Financial Risk Warning

Big data technology can mine relevant information, mark risks, and issue warnings ^[8], but enterprises of different sizes have varying levels of risk tolerance, consequently, they should delineate distinct thresholds in accordance with their strategic objectives and

implement appropriate preventive measures based on the identified warning levels. A warning level categorized as “no warning” signifies that the enterprise’s operational status is stable, with no significant risk factors detected. Conversely, a “light” warning level indicates that the enterprise is encountering minor financial risks, which, while present, are deemed to have low potential for harm. In this scenario, the enterprise should engage in risk prevention activities to mitigate financial threats. A “medium” warning level suggests that the financial risks faced by the enterprise have escalated to a notable degree, with the potential for substantial losses if not addressed promptly. It is essential for the enterprise to implement targeted interventions to manage these risks and prevent further escalation. Finally, a “severe” warning level denotes that the financial risk issues confronting the enterprise have reached a critical state, posing significant challenges to its internal operations and management. Immediate action is required to address and mitigate these risks effectively.

4 Challenges in Establishing an Enterprise Financial Risk Warning Mechanism in the Context of Big Data

4.1 Insufficient Awareness of Financial Risk Warning

A significant number of management teams within enterprises exhibit a deficiency in the awareness of financial risk warning. Their focus tends to be predominantly on short-term gains and the overarching strategic framework of the organization, often at the expense of recognizing the critical importance of financial risk warning. This oversight results in inadequate attention and resource allocation towards financial risk warning initiatives. Furthermore, many enterprises have yet to acknowledge the value of leveraging big data for financial risk warning purposes. Despite the extensive application of big data technologies, which offers enhanced opportunities for risk management, certain organizations have not fully grasped the potential of big data in this domain, thereby hindering the effective utilization of such technologies.

4.2 Obsolete Financial Risk Warning

Systems

The obsolescence of financial risk warning systems is primarily evident in two key areas: technological stagnation and a weak theoretical foundation. Firstly, as the era of big data progresses, it is imperative for financial risk warning systems to undergo continual updates to accommodate emerging risk types and characteristics. However, numerous companies continue to rely on traditional models, failing to incorporate advanced technologies such as big data, which results in suboptimal warning outcomes. Secondly, the theoretical underpinnings of existing financial risk warning systems predominantly draw from conventional financial theories, which do not adequately reflect the unique characteristics and demands of the big data era. This disconnect leads to a lack of innovation and adaptability within the warning systems.

4.3 Deficient Financial Risk Warning Mechanism

The inadequacy of financial risk warning mechanisms is manifested in two principal aspects: the absence of robust supervision and audit frameworks, and insufficient execution. Although many enterprises have established financial risk warning systems, they often lack the necessary supervisory and auditing structures, which can lead to laxity and a lack of rigor in the operationalization of these systems, significantly diminishing their effectiveness. In terms of execution, several enterprises tend to focus solely on the institutional framework when developing financial risk warning mechanisms, neglecting to formulate specific execution plans and measures. This oversight results in the warning mechanisms being largely ineffective and unable to fulfill their intended purpose.

4.4 Inadequate Comprehensive Competence of Financial Personnel

The effective implementation of big data technology necessitates the support of specialized talent; however, many enterprises currently face a deficiency in professionals who possess a dual understanding of finance and big data technology, particularly in the context of financial risk warning systems. This shortfall hampers the development and functionality of such warning systems.

Furthermore, some personnel responsible for financial risk warning exhibit limited comprehensive abilities, which hinders their capacity to fully leverage big data technology for the identification, assessment, and warning of risks, ultimately leading to suboptimal warning outcomes.

5. Recommendations for Enhancing the Construction of Enterprise Financial Risk Warning Mechanisms in the Context of Big Data

5.1 Strengthening Financial Risk Management Awareness

To begin with, it is essential to enhance the risk awareness among management and financial staff. Enterprise leadership should acknowledge the critical importance of financial risk warning, integrating it into the core framework of strategic management, and ensuring adequate resource allocation and personnel deployment. Financial professionals ought to focus on leveraging big data technology to acquire extensive mobile financial risk information, thereby facilitating a comprehensive evaluation and monitoring of financial risks throughout the entire process^[9]. Additionally, promoting risk education is vital. Through internal training sessions, lectures, and other educational initiatives, organizations can elevate the awareness and prevention of financial risks among all employees, fostering a culture of active participation in risk management.

5.2 Development of an Advanced Warning System

Organizations ought to enhance their research and development efforts focused on fundamental technologies, leverage big data methodologies for the collection, processing, and analysis of data, and refine the precision and promptness of their early warning systems^[10]. This can be achieved by establishing modules such as data warehouses and data mining capabilities, which facilitate comprehensive monitoring and in-depth analysis of financial data. In this endeavor, the integration of artificial intelligence technologies, including machine learning and deep learning algorithms, is crucial for the intelligent identification and prediction of financial risks. By continuously refining

algorithmic models, organizations can enhance the automation and intelligence of their warning systems.

5.3 Establishing an Effective Early Warning Mechanism

In selecting warning indicators, organizations should identify representative and sensitive financial metrics that align with their specific circumstances and industry benchmarks. Examples of such indicators include the asset-liability ratio, current ratio, and quick ratio. Utilizing historical data and industry comparisons, it is essential to establish scientifically and rationally defined warning thresholds. These thresholds must be capable of accurately identifying risks while minimizing the occurrence of false positives and false negatives. Upon the issuance of an alert by the warning system, a rapid response mechanism should be implemented to ensure that relevant departments and personnel can promptly address potential risks. Additionally, it is crucial to monitor and evaluate the outcomes of the warning system, facilitating ongoing improvements to the mechanism.

5.4 Developing a Professional Financial Management Team

The effectiveness of the financial management team significantly influences the successful implementation of the risk warning system; even the most comprehensive warning system is rendered ineffective without skilled financial professionals. Organizations can enhance the overall competencies and professional skills of their existing workforce, particularly in the application of big data and artificial intelligence technologies, through internal training programs, external networking, and other initiatives. Furthermore, organizations can encourage employees to pursue independent learning in specialized areas by refining assessment criteria, thereby ensuring the effective operation of financial risk warning mechanisms^[11].

6. Conclusion

The integration of big data technology with enterprise management practices has emerged as a prominent trend in contemporary development. For organizations to maintain a competitive edge in a challenging market

environment, it is imperative to focus not only on profitability but also on potential financial risks. By leveraging big data technology, organizations can establish intelligent financial risk warning systems that facilitate timely identification and management of potential financial threats through effective response strategies. To enhance the efficacy of these intelligent financial risk warning systems, organizations must cultivate a robust risk management culture, develop a comprehensive warning system and mechanism, and rely on a proficient financial management team to establish a foundation for the long-term, stable growth of the enterprise.

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