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Research on the Construction of Enterprise Financial Risk Early Warning Model Under the Background of Big Data

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ABSTRACT
In the context of the rapid development of the digital economy, big data technology has provided a new path for enterprise financial risk early warning. This paper focuses on the construction of enterprise financial risk early warning models under the background of big data, elaborates on the value implication of model construction, and puts forward specific and implementable construction strategies from three core aspects: the construction of a multi-dimensional indicator system, the integration and optimization of AI algorithms, and the establishment of a dynamic iterative management and control mechanism. It solves practical problems such as insufficient model accuracy and imperfect mechanisms, realizes accurate early warning and effective control of financial risks, provides theoretical and practical reference for enterprises to improve their financial governance level and achieve stable development, and helps enterprises avoid risks and enhance their core competitiveness in a complex market environment.

KEYWORDS
Big data; Financial risk early warning; Early warning model construction

1 Introduction

With the in-depth integration of big data technology and enterprise operation and management, enterprise financial activities have shown the characteristics of diverse data and hidden risks, and the difficulty of financial risk management and control has continued to increase. Constructing a scientific and efficient financial risk early warning model has become an urgent need for enterprises' high-quality development. At present, some enterprises have problems such as single indicators and insufficient accuracy in financial risk early warning, which are difficult to adapt to the risk management and control needs of the new era. Based on this, this paper, from the perspective of big data, carries out research on the construction strategy of financial risk early warning models, puts forward targeted schemes, and provides reference for enterprises to strengthen financial risk prevention and control and improve governance efficiency.

2 The Value Implication of Constructing Enterprise Financial Risk Early Warning Model Driven by Big Data

2.1 Empower the Modernization of Financial Governance and Lay a Solid Foundation for the Stable Development of Enterprises

Constructing a financial risk early warning model driven by big data plays an irreplaceable supporting role in the modernization of enterprises' financial governance system and governance capacity, and is also an important guarantee for enterprises to achieve long-term stable development. At present, digitalization has been deeply integrated into all links of enterprise operation. Financial activities are no longer limited to traditional accounting processing, but involve multi-channel data sources, high-speed information transmission, and more hidden risk transmission paths, which puts forward higher requirements for enterprise financial governance. The application of big data technology provides an effective path to solve this problem. It can comprehensively integrate and systematically sort out enterprise financial information, business operation data and external market environment data, break the information barriers between various departments in the past, truly realize the in-depth integration of financial data and business data, and promote the transformation of financial management and control mode from traditional post-event remedy to the combination of pre-event prevention and overall planning [1]. Through this model, enterprises can conduct full-process and all-round monitoring of core financial links such as capital flow, cost control, and investment and financing efficiency, clearly grasp the formation causes and evolution rules of financial risks, and then provide practical and scientific basis for the optimization of resource allocation, the standardization of financial processes and the improvement of internal control mechanisms. At the same time, organically linking the early warning system with the enterprise governance structure can further strengthen the coordination and cooperation between the decision-making level, the executive level and the supervision level, improve the scientificity and standardization of financial decisions, fundamentally reduce the possibility of systemic financial risks, and help enterprises move forward steadily in a complex and changing market environment to achieve high-quality and sustainable development goals.

2.2 Strengthen the Accuracy of Risk Prediction and Improve the Level of Enterprise Risk Management and Control

The core advantage of the big data financial risk early warning model lies in taking data elements as the core driving

force, effectively improving the accuracy of enterprise risk identification and prediction, and helping enterprises' risk management and control mode to steadily upgrade towards refinement and intelligence. In the current complex operating environment, enterprises are facing increasingly diverse financial risks, and various risk signals are often hidden in massive and messy data, which is difficult to accurately capture only by relying on traditional management and control methods. The powerful data processing and algorithm analysis capabilities of big data technology can just solve this dilemma. It can conduct in-depth excavation and sorting of massive unstructured and semi-structured financial related information generated in the process of enterprise operation, accurately capture the hidden risk signals that are difficult to detect by traditional methods, and provide strong support for enterprises to achieve early detection, early warning and early disposal of potential risks.In order to fully reflect the enterprise's financial risk situation, the model constructs a multi-dimensional and multi-level risk indicator system, covering core dimensions such as solvency, profitability, operational efficiency and cash flow status, which can quantitatively analyze various risk levels and their impact, effectively avoid deviations caused by subjective judgment, and make risk assessment more objective and scientific. In addition, the dynamic monitoring and real-time analysis functions of the early warning system can synchronously track various changes in the internal and external environment, timely capture the impact of external factors such as market fluctuations, policy adjustments and industry competition on the enterprise's financial situation, and provide accurate and targeted risk prompts for enterprises.This accurate early warning capability can help enterprises adjust their business strategies more reasonably, optimize their financial structure, avoid various risk hazards, promote the transformation of enterprise risk management and control from passive response to active prevention and control, and then comprehensively improve the comprehensive strength of enterprises to resist risks and meet market challenges, and effectively maintain the financial security and operational stability of enterprises [1].

2.3 Activate the Value Potential of Data Elements and Assist Enterprises in Scientific Strategic Decision-Making

One of the core values of constructing a big data financial risk early warning model is to deeply activate the inherent value of data elements, and provide solid data support and intellectual guarantee for enterprise strategic planning and scientific decision-making. In the context of the digital economy, data has long transcended the scope of traditional production factors and become an important part of enterprises' core competitiveness.As a direct reflection of enterprise operation activities, financial data is a key carrier that accurately presents enterprises' operating conditions, development potential and market competitiveness, and the excavation and utilization of its value is crucial [2].The big data financial risk early warning model is not just a risk prevention and control tool. Its integration, cleaning, analysis and application of financial and related data can penetrate the scattered and messy surface of data, excavate the hidden operating rules, development trends and potential risk hazards behind it, and transform the originally scattered and irrelevant data into systematic, usable and high-value decision-making information to provide solid support for enterprise decisions.In actual operation, the model jumps out of the limitation of focusing solely on risk prevention and control. Through the comprehensive research and judgment on core dimensions such as enterprise financial benefits, asset structure and development potential, it provides objective and reliable reference for major strategic decisions such as enterprise investment and financing planning, industrial layout adjustment, business model innovation and market expansion direction, and gradually promotes the transformation of enterprise strategic decision-making from traditional experience-driven to more scientific data-driven.The full release of the value of data elements can not only help enterprises optimize the efficiency of resource allocation, improve the efficiency of fund use and the quality of asset operation, but also enhance the core competitiveness and market adaptability of enterprises. Empowering decision-making with data and ensuring development with early warning can enable enterprises to accurately grasp development opportunities, effectively avoid potential risks in a complex market environment, occupy an active position in fierce market competition, realize the coordinated improvement of operating benefits and strategic layout, and inject lasting motivation for the long-term and stable development of enterprises.

3 Construction Strategies of Enterprise Financial Risk Early Warning Model Under the Background of Big Data

3.1 Construct a Multi-Dimensional Big Data Financial Risk Indicator System

In the big data environment, the formation and transmission of enterprise financial risks show the characteristics of comprehensiveness, relevance and dynamics. The selection of single-dimensional indicators has been difficult to fully depict the overall risk situation. Establishing a multi-level, wide-coverage and implementable risk indicator system has become the primary link in the construction of the early warning model [3].The multi-dimensional big data financial risk indicator system is not a simple stack of financial ratios, but based on the whole process of enterprise operation, integrates internal operation data and external environment information [2], forms a mutually supportive and logically consistent set of indicators, and provides a stable and reliable data foundation for risk identification and quantification.In the process of constructing the risk model by the enterprise's financial department, the core financial dimension focuses on key contents such as enterprise capital operation, solvency, profit quality and cash flow security, selects quantitative indicators that can truly reflect the financial health status, focuses on the monitoring of data continuity and stability, and

ensures that the indicators can objectively present the enterprise's financial operation status. The business support dimension breaks the information barrier between finance and business, incorporates data from links such as production, sales, supply chain and project management into the system, and predicts potential factors that may cause financial fluctuations through the change trend of business data, so as to realize the synchronous monitoring of financial risks and business activities.The external correlation dimension relies on big data resources to introduce external information such as industry development trends, market supply and demand changes, policy orientation adjustments, and the credit status of upstream and downstream enterprises, and examines enterprise risks in the overall environment to improve the comprehensiveness and forward-looking of the indicator system.

To ensure that the indicator system is implementable, executable and updatable, full consideration should be given to the enterprise's data foundation, system docking capability and actual management needs in the design stage, so as to avoid setting indicators with high collection difficulty and vague significance. Standardize all kinds of data, clarify data sources, statistical standards, update frequency and calculation methods, establish a standardized data collection and review mechanism, and ensure that the data entering the model is true, complete and effective. At the same time, establish a dynamic adjustment mechanism, regularly screen, optimize and supplement indicators according to the enterprise's development stage, industry characteristics and changes in the external environment, eliminate indicators with weak explanatory power, and add content that can reflect new risks and key contradictions, so that the indicator system can always maintain sensitivity and applicability [3].

3.2 Integrate AI Algorithms to Optimize the Accuracy of Early Warning Models

Integrating AI algorithms to optimize the accuracy of early warning models is a key link for the effective implementation of enterprise financial risk early warning models under the background of big data.The core is to rely on the autonomous learning and in-depth excavation capabilities of AI algorithms to enable the early warning model to accurately capture risk signals, quantify risk levels, and truly play an early warning role.In actual operation, it is necessary to based on the enterprise's actual data and risk management needs, scientifically select suitable AI algorithms, do a good job in the in-depth integration of algorithms and data, and establish a sound algorithm optimization mechanism to ensure the continuous improvement of model accuracy and have implementable and promotable practical value.

In the selection and application of AI algorithms, it is necessary to combine the core needs of the early warning model, give priority to selecting algorithms with strong adaptability and high operability, and avoid blindly pursuing complex algorithms that are divorced from the enterprise's actual situation.Focus can be placed on introducing machine learning algorithms, including logistic regression, random forest, LSTM neural network, etc., and combining applications according to the advantages of different algorithms: logistic regression algorithm can be used for the initial classification of risk levels, which is simple to operate and highly interpretable, and is suitable as the basic algorithm of the model; random forest algorithm can effectively process multi-dimensional and high-redundancy big data, reduce the impact of abnormal data on early warning results, and improve the anti-interference ability of the model; LSTM neural network is good at capturing the time series characteristics of data [4], can accurately excavate the potential correlation between financial data and risk changes, and improve the early warning accuracy of hidden risks and long-term risks.

The enterprise's financial department also needs to do a good job in data preprocessing and algorithm training to ensure the implementation of algorithm applications. First, clean and standardize the data in the multi-dimensional indicator system, eliminate outliers and missing values, unify data formats and statistical standards, and provide high-quality data support for algorithm training; then divide the training set and test set, include the enterprise's historical financial data and risk case data into the training set, and make the algorithm accurately identify risk characteristics and adapt to enterprise risk rules through repeated parameter adjustment and model structure optimization; in the test phase, use the latest data not involved in training to test the model effect, and adjust the algorithm parameters according to the test results until the model early warning accuracy reaches the preset standard [4].

The enterprise's financial department also needs to arrange special personnel to be responsible for algorithm operation and maintenance, regularly collect model operation data, early warning result feedback and changes in the enterprise's operating environment, and analyze the causes of early warning deviations; for example, optimize and adjust the algorithm once a quarter, update the algorithm training data according to the changes in the enterprise's development stage and industry risk characteristics, and adjust the model parameters and algorithm combination methods; in addition, establish an algorithm application feedback channel, collect practical opinions from financial managers and business personnel, optimize the presentation form of model output results, make early warning signals more intuitive and guiding, truly realize the in-depth adaptation of AI algorithms to enterprise financial risk early warning needs, and improve the practical value and early warning efficiency of the model.

3.3 Establish a Dynamic Iterative Risk Early Warning Management and Control Mechanism

Establishing a dynamic iterative risk early warning management and control mechanism is an important guarantee to ensure the long-term operation of the big data financial risk early warning model and give play to the continuous early warning role.The enterprise's financial department needs to break the static management and control thinking, so that the early warning mechanism can be continuously optimized with the enterprise's development and environmental changes, and realize the closed-loop implementation of risk early warning and management and control. The

establishment of this mechanism needs to be based on the enterprise's actual management and control needs, focus on the four core links of early warning process, responsibility division, data update and iterative optimization, and formulate specific and operable implementation rules to ensure that each measure can take root and play an effective role, and truly transform the value of the early warning model into the actual ability of enterprise risk management and control.

In terms of early warning process management and control, it is necessary to clarify the full-process operation specifications and realize the closed-loop management from risk early warning, signal transmission to disposal feedback. Clarify the classification standards of early warning signals, divide them into red, orange and yellow three-level early warnings according to the risk level, corresponding to different disposal priorities; assign special personnel to be responsible for the real-time monitoring and transmission of early warning signals, ensure that the early warning information is transmitted to the corresponding responsible departments and decision-making level within 1 working day, and avoid signal delay; at the same time, formulate hierarchical disposal plans, clarify the disposal process, responsible personnel and disposal time limit for each level of early warning, require the responsible departments to implement disposal measures within the specified time, and submit a disposal report to ensure that risks are resolved in a timely manner [5]. The division of responsibilities should be clear to avoid overlapping powers and responsibilities or management gaps. Establish a special group for financial risk early warning management and control, led by the enterprise's financial person in charge, with members covering financial, business, risk control, audit and other departments, and clarify the overall coordination responsibilities of the group; divide the specific responsibilities of each department: the financial department is responsible for model operation and maintenance, data update and early warning monitoring, the business department is responsible for the feedback and disposal of risk signals in its own links, the risk control department is responsible for supervising the implementation of the disposal process and effect evaluation, and the audit department regularly audits the operation of the early warning mechanism, forming a management and control pattern of multi-party coordination and clear powers and responsibilities [5].

Dynamic iterative optimization is the core of the mechanism, and a normalized update and optimization mechanism needs to be established.At the data level, clarify the update frequency of each dimension of indicator data: core financial data is updated daily, business data is updated weekly, and external related data is updated monthly; arrange special personnel to be responsible for data collection and review to ensure the timeliness and accuracy of data; at the mechanism level, conduct an evaluation of the operation of the early warning mechanism every six months, optimize early warning indicators, adjust early warning thresholds, and improve disposal plans according to the enterprise's development stage, changes in industry policies, and feedback on risk disposal; when constructing the model, enterprises also need to strengthen staff training to improve the risk awareness of financial and business personnel and their ability to operate the early warning mechanism, ensuring that the mechanism can be truly integrated into the daily operation and management of the enterprise, and realizing the continuous upgrading of risk early warning management and control.

4 Conclusion

The construction of enterprise financial risk early warning model under the background of big data is an important measure for enterprises to cope with the complex operating environment and strengthen financial management and control.The three strategies proposed in this paper - multi-dimensional indicator system, AI algorithm integration and dynamic iterative management and control mechanism - are in line with the actual needs of enterprises, can effectively improve the accuracy and long-term effectiveness of the early warning model, and help enterprises achieve early detection and early disposal of risks.In the future, enterprises can flexibly optimize the model and mechanism according to their own development reality, continuously tap the value of data, promote the improvement of the quality and efficiency of financial risk early warning work, and build a solid financial security line for the stable operation and high-quality development of enterprises.

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References

[1] Liu Xiqun. How big data drives enterprise financial risk early warning and internal control optimization [J]. China Business World, 2025(16): 88-90.

[2] Liu Xinyi, Zhao Wei. Research on Enterprise Financial Risk Early Warning in the Context of Big Data [J]. 2025.

[3] Xing Danhong. Research on Prevention and Control Measures of Corporate Financial Risks in the Context of Big Data [J]. Economic and Technical Cooperation Information, 2025(1):0052-0054.

[4] Meng Hui, Li Ying, Yang Jing, et al. Research on the Construction of Financial Risk Early Warning Model for Central Enterprises Based on Big Data [J]. Contemporary Accounting, 2025(16):132-134.

[5] Wang Shishuai. Research on Corporate Financial Risks in the Context of Big Data [J]. Frontiers of International Accounting, 2024.