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Perspective on Pathways for Improving Financial Risk Modeling Accuracy Driven by Data Governance

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Abstract

Data defects have become an important obstacle hindering the precise recognition and early warning of financial risks in the present financial risk modeling. Various problems like inconsistent data standards, insufficient data samples, and delayed data timeliness result in systematic deviations in model performance and decrease the practicality of risk modeling. In this study, we comprehensively investigate the internal working mechanism of data governance that affects the accuracy of financial risk modeling from different aspects such as data quality, procedures, security standards, and collaborative governance. We also focus on the practical data limitations in current financial risk modeling and propose specific improvement strategies, including comprehensive quality control, enhancement of standardized mechanisms, construction of collaborative platforms, and iterative governance optimization. The obtained results can effectively solve the accuracy problems of risk modeling due to imperfect data governance, improve the matching degree between data resources and risk model algorithms, and offer technical and institutional assistance for financial institutions to perform accurate risk evaluation and market risk prevention and control.

Keywords

Financial risk modeling; data governance; data quality; risk prediction accuracy

With the further advancement of financial market liberalization and the rapid growth of digital financial business, the financial market shows obvious features of diversity, complexity, and cross-border integration, and the kinds and concealed dimensions of financial risks become more and more complicated. The traditional financial risk assessment methods, which depend on experiential knowledge and basic statistical data, can no longer satisfy the requirements for detailed and real-time risk prevention and control. Now, financial risk modeling based on large-scale data and algorithm techniques has become the main approach of modern financial institutions in identifying, measuring and forecasting risks. However, the digital transformation of the financial industry is associated with the sudden increase of multi-source heterogeneous data, and problems like inconsistent data governance standards, scattered data resources, and inadequate data security management have become more and more serious. These data-related issues result in low modeling accuracy, unstable risk prediction outcomes, and a restricted range of risk detection. Under such circumstances, it is significant to investigate the internal mechanism of data governance affecting financial risk modeling and to build reasonable optimization schemes in order to enhance the ability of financial risk prevention and control and to ensure the stable operation of the financial system.

1. Data Constraints Leading to Low Accuracy of Financial Risk Modeling

Various and complicated financial market conditions result in different data structures. An insufficient data basis is

the main reason for inaccurate financial risk models. In their routine business, financial institutions generally gather multi-source heterogeneous data such as customer basic information, transaction histories, credit evaluation data, and market variation data. Due to the differences in the statistical criteria and collection methods used by various data sources, many problems occur like missing data, erroneous data and redundant data in the modeling datasets [1]. The original unorganized and irregular data cannot truly show the relationship among the financial risk factors and affects the extraction of features and analysis of risk factors in the risk models. Moreover, the delay in the update of financial data does not fit with the real-time change of market risks, and the static historical data cannot effectively detect the potential dynamic risks in the financial business. These data deficiencies lead to the estimation errors in the risk model parameters and failures in rule fitting, which seriously decreases the ability to predict and issue warnings for financial risk models [2].

2. Mechanism of Data Governance Affecting the Accuracy of Financial Risk Modeling

2.1 Data Quality Governance: Consolidate Basic Data Dimensions for Risk Modeling

Data quality management regards data authenticity, integrity, precision, and up-to-dateness as the main management objectives, and supplies dependable fundamental assistance for the precise financial risk modeling. A systematic review of 1,155 peer-reviewed studies confirms that governance maturity mediates the relationship between data governance practices and financial decision outcomes, underscoring the foundational role of data quality governance in risk model reliability [3]. Rational data quality management procedures carry out regular screening, verification, and correction of the original financial data, eliminate abnormal and erroneous data that affect model operation, and make the modeling data fully adapt to the actual business rules of finance. Regular quality management can supplement missing data of the important risk indicators, unify the statistical standards of data from different business divisions, and decrease the systematic errors in the input data of the model. Good basic data can assist the risk models to correctly identify the relationship between the business behavior and the risk factors, improve the fitting degree between the model algorithms and the real risk situations, and provide a solid data basis for enhancing the discriminatory ability and predictive efficiency of the financial risk models in complicated market conditions [4].

2.2 Data Process Governance: Standardize the Full-Process Operation Logic of Risk Modeling

Standardized data process management involves the entire procedure of financial risk prediction data from collection, classification, processing, analysis, and utilization, and establishes standardized operating procedures for the risk modeling work. A perfect data process management system specifies the operating rules and division of responsibilities for each step in risk modeling, prevents arbitrary operations and disorderly procedures in data processing, and ensures the uniformity and standardization of the data processing logic in the training and testing of the model. It can effectively prevent the distortion and loss of data caused by disorderly manual operations and chaotic program executions during the modeling process, preserve the stable logical operation of the risk model iteration and update, and allow the model algorithms to carry out unified and standardized analysis on multi-dimensional financial data. The standardized management of the whole process can significantly decrease the systematic errors in model building due to process irregularities and stabilize the basic operating effect of the risk models [5].

2.3 Data Security and Standard Governance: Ensure Stable and Credible Modeling Results

Data security and standard governance serve as two important restrictions for the reliable operation of financial risk modeling and keep the accuracy and stability of the modeling results. Unified data governance standardizes the coding rules, measurement dimensions, and access methods of financial modeling data, eliminates the deviations in analysis due to different data standards, and achieves the standardized combination and unified analysis of multiple financial data sources. Strict data security governance sets up perfect data access, encryption, and anti-theft mechanisms, prevents the alteration, leakage, and misuse of core financial data and modeling parameters, and guarantees the integrity and confidentiality of the modeling data throughout the entire process [6]. Standardized specifications and security requirements prevent the sudden change of parameters and distortion of the modeling results caused by data errors, ensure that the modeling results can reflect the true financial risk levels objectively, and enhance the credibility and referential value of the risk evaluation conclusions.

3. Optimization Paths for Data Governance to Drive the Improvement of Financial Risk Modeling Accuracy

3.1 Build a Full-dimensional Data Quality Control System to Reduce Modeling Data Deviation

Financial institutions should establish a comprehensive and cyclic data quality control system to effectively deal with the problem of data discrepancy in modeling and enhance the applicability of data for risk modeling. The system covers the entire process of data generation, collection, processing, and application, clearly defines the quality assessment criteria for data integrity, accuracy, timeliness, and uniformity, and implements real-time supervision and automatic early warning for data defects. According to the different features of financial business data, the institutions should set up specific data cleaning and correcting algorithms, delete the duplicated and abnormal data automatically, and correct the missing important data by hand. Regularly checking the data quality and dynamically evaluating the modeling data can significantly decrease the random errors and systematic deviations in the input data of the model, improve the basic quality of the modeling dataset, and supply precise data for increasing the prediction precision of the financial risk models [7].

3.2 Improve the Standardized Data Governance Mechanism to Standardize the Modeling Process System

Both the industrial and institutional aspects should cooperate to enhance the standardized data governance systems in order to establish a consistent and standardized procedure for financial risk modeling. The supervisory bodies must set uniform rules for financial data handling and risk modeling specifications, defining the standard conditions for data screening, algorithm choice, model training, and validation in the risk modeling operations. Financial organizations need to arrange and improve their own modeling procedures, set up standardized operating rules for each stage of data processing and model execution, and build a supervisory loop for process control and an inspection system for effectiveness. A standardized regulatory mechanism can avoid the diversity and randomness in the different risk modeling projects, maintain the consistency of the model training and data analysis, decrease the mistakes caused by the non-standard procedures, and accomplish the standardized and normalized operations of financial risk modeling [8].

3.3 Build a Data Collaborative Sharing Governance Platform to Enrich Modeling Data Samples

Financial organizations and market institutions should establish a secure and effective data cooperative sharing management system to eliminate the barriers among data and increase the number of risk prediction data sets. This system is based on privacy computing and data de-sensitization techniques to achieve secure sharing and cross-boundary combination of business data between banks, securities, insurance, etc., while protecting data security and user privacy. It combines various types of data resources such as micro-business transaction data, meso-industry operating data, and macro-economic operating data, thus extending the range and intensity of risk prediction data sets. Uniform collaborative management rules are established to standardize the data sharing standards and access rights, guarantee the normal flow of multi-source data, and offer ample and diversified sample support for the training of risk models, thereby improving the generalization capability and precise recognition ability of the models for complicated financial risks [9].

3.4 Improve the Data Security and Iterative Governance System to Ensure Long-term Accurate Modeling

Financial institutions should enhance the integrated management of data security and dynamic updating to keep the continuous accuracy and stability of financial risk models. The system establishes a multi-layered data security protection structure including data storage, transmission and usage, and conducts supervision throughout the process of model data to avoid data alteration, disclosure and illegal use. At the same time, according to the changing features of financial market risks and business methods, a dynamic updating procedure for data management and model improvement is set up. Continuous monitoring of the variations in market risks and data characteristics is done to modify the data management standards and model parameter settings in a timely way. Regular assessment of model performance and re-examination of data quality remove outdated data and invalid parameters, achieve the dynamic coordination between the management system, data resources and risk models, and guarantee the long-term stable and accurate operation of financial risk models.

4. Conclusion

Data governance is involved in the entire financial risk modeling process and has a direct influence on the precision, stability, and credibility of the financial risk evaluation outcomes. This research reviews the main data constraints in low-precision financial risk modeling and studies the differential action mechanisms of multi-dimensional data governance on the optimization of risk modeling from the viewpoints of data quality, procedure standardization, security assurance, and collaborative sharing. A systematic optimization scheme suitable for the present development trend of financial risk modeling is established. The enhancement of financial risk modeling accuracy depends on the combined effect of whole-process quality control, standardized procedure restrictions, cross-discipline data cooperation, and dynamic iterative governance. Continuous improvement of data governance systems can effectively overcome the data obstacle in risk modeling, broaden the analysis dimensions of the models, and improve the capability of financial institutions to identify and alert about potential risks. The obtained results can offer useful guidance for the digitization and refinement of financial risk management and assist the financial sector in dealing with the complicated market risk issues.

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