

Applications of Data Analysis in Risk Control under the Background of Financial Science and Technology

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Abstract: In the context of the rapid development of financial technology, the traditional risk control model is facing new challenges. The purpose of this paper is to explore how data analysis technology plays a key role in the field of financial risk control. The article first elaborated the financial risk control connotation and the credit risk, the market risk, the operation risk and so on main type. The specific application status of data analysis in the above three types of risk control is analyzed, and the core value of its transformation from passive response to active prevention is revealed. In view of the bottleneck in the current application, this paper puts forward the optimization path suggestions from three dimensions: improving the data governance system, strengthening technological innovation, and strengthening personnel training. Deep integration of data analysis technology is an inevitable choice for financial institutions to build an intelligent and forward-looking risk control system and enhance their core competitiveness.

Keywords: Risk Control; Fintech; Data Analysis; Data Technology.

1. Introduction

Under the background of the deep integration of finance and science and technology, the rapid development of financial science and technology is profoundly reshaping the ecological pattern and service mode of traditional financial industry. This change not only improves the efficiency and inclusiveness of financial services, but also makes financial risks show new characteristics of stronger concealment, faster dissemination and higher correlation, which poses a serious challenge to the traditional risk control model. In this context, how to effectively use advanced data analysis technology to identify, measure, monitor and manage risks has become a key issue for financial institutions to enhance their core competitiveness and achieve sound operation [1]. As one of the core driving forces of financial technology, the value of data analysis lies in its ability to extract valuable information and insights from massive, multi-dimensional and real-time data, thus providing more accurate and forward-looking support for risk decision-making.

2. Connotation and Main Types of Financial Risk Control

Financial risk control is the core link in the management activities of financial institutions. Its fundamental goal is to identify, evaluate, monitor and manage the uncertainties faced in the process of operation through a series of systems, methods and technologies, aiming at minimizing potential losses and ensuring the stable operation of institutions and the safety of assets [2]. In the modern financial system, effective risk control is not only the cornerstone to meet the requirements of regulatory compliance, but also the internal guarantee for financial institutions to enhance their ability to resist risks and achieve sustainable development. With the increasing complexity of the financial environment, risk control has been engaged in the passive role of post-disposal, and has gradually evolved into a strategic function that runs through the whole business process and emphasizes forward-looking early warning and active management.

Financial risk can be divided into credit risk, market risk and operational risk according to its source and nature. Credit risk refers to the possibility of economic losses caused by the counterparty's failure to fulfill its contractual obligations, which is the most traditional and basic risk form in the banking industry, and widely exists in credit, bond investment and derivatives trading. Market risk originates from the risk of loss caused by adverse fluctuations in financial asset prices due to market factors such as interest rates, exchange rates and stock prices, which covers trading accounts and bank accounts and has obvious systemic characteristics [3]. Operational risk is defined as the risk of direct or indirect loss caused by inadequate or failed internal processes, human actions, information systems or external events. Such risks are complex and cover a series of internal and external factors, ranging from internal fraud to system interruption. These three types of risks are intertwined and constitute the main objects of the risk management and control system of financial institutions, and their accurate identification and effective management are the key to financial stability.

3. Application Scenarios of Data Analysis in Financial Risk Control

3.1. Application Scenario of Data Analysis in Credit Risk Control

In the field of credit risk control, the application of data analysis has changed from the traditional mode of relying on static financial indicators and mortgage guarantees to the comprehensive credit evaluation based on multi-dimensional dynamic data. The core of this transformation is to use big data and machine learning algorithms to build more sophisticated and forward-looking credit rating models. By mining the complex nonlinear relationship between these variables and default probability, the model can identify potential risk signals or high-quality customer characteristics that traditional scorecards may ignore, and achieve early warning and accurate pricing of credit risk [4]. This method based on data analysis significantly improves the efficiency and accuracy of credit decision. In the pre-loan process, the

automated approval system can quickly screen a large number of applications, concentrate manpower on the analysis of high-risk or boundary cases, and greatly shorten the approval cycle. In the stage of loan management, the model can dynamically adjust the risk level and credit limit by continuously monitoring the changes of borrowers' behavior data to realize the dynamic management of risk. In the post-loan process, data analysis can predict the possibility of overdue, optimize the resource allocation of collection strategies, and adopt differentiated collection methods for customers with different risk characteristics. This data-driven management of the whole process makes credit risk management change from single-point judgment to closed-loop system of continuous monitoring and iterative optimization, effectively reducing the incidence of non-performing assets.

3.2. Application Scenario of Data Analysis in Market Risk Control

The application of data analysis in market risk management is mainly reflected in the leap of accurate measurement and real-time monitoring ability of high-dimensional and high-frequency market risk. Modern data analysis techniques, especially time series analysis, volatility modeling and Monte Carlo simulation, can more profoundly reveal the law of asset price volatility, clustering characteristics and tail risk [5]. Machine learning algorithms have shown great advantages in identifying nonlinear market patterns and processing unstructured information. By analyzing textual information such as news public opinion, social media discussions and market announcements, natural language processing technology can quantify changes in market sentiment and incorporate them into the model as risk factors, thus providing early insight into irrational fluctuations in market prices. Stress testing and scenario analysis are also more in-depth and realistic due to the improvement of data analysis capabilities. Institutions can simulate the impact of various extreme but possible macroeconomic scenarios or unexpected events on portfolios, and assess their capital adequacy and ability to withstand risks. This dynamic and forward-looking risk perspective enables financial institutions to make more timely and effective response decisions in the face of sharp market fluctuations.

3.3. Application Scenario of Data Analysis in Operational Risk Control

Operational risk has been the difficulty of risk management for a long time because of its endogenous and unpredictable characteristics. The application of data analysis provides a new technical path for the identification, early warning and prevention and control of operational risk. Its core is to automatically detect abnormal activities or potential vulnerabilities by real-time scanning and pattern recognition of massive data generated in the internal operation process. In the field of anti-fraud, complex network analysis can depict the flow of funds and the relationship between accounts, and effectively identify organized fraud gangs. Machine learning model can intercept suspicious transactions in real time by learning the subtle differences between normal transactions and fraudulent transactions in time, place, amount, equipment and other dimensions, which greatly improves the detection probability and response speed of fraud. In terms of internal control, data analysis embeds risk monitoring into business processes. Through the continuous analysis of employee

operation logs, system access records, internal approval process and other data, we can monitor whether there are abnormal operations that violate the authority division or internal regulations, and achieve the prevention of internal fraud and process failure. For business interruption risks caused by system failures or external events, data analysis can help organizations analyze the vulnerabilities of IT systems, assess their impact areas, and optimize disaster recovery plans. Overall, data analysis shifts operational risk management from loss recording and accountability after the event to early warning and prevention in advance and real-time intervention in the event, which enhances the robustness and compliance of institutional operations.

4. Path Suggestions for Optimizing the Application of Data Analysis in Risk Control

4.1. Improve the Data Governance System

Data is the cornerstone of driving the efficient operation of modern risk control models, and its quality and governance level directly determine the reliability and effectiveness of data analysis results. Therefore, improving the data governance system is the first prerequisite and basic project to optimize the application of data analysis in risk control. At present, many financial institutions are still facing challenges in the field of data, such as inconsistent data standards, uneven quality, serious data islands and prominent compliance risks, which greatly restrict the maximization of data analysis efficiency. To build a sound and efficient data governance system, we need to carry out top-level design from a strategic perspective and systematically solve all kinds of problems in the whole life cycle of data collection, integration and application. The core goal of data governance is to ensure the accuracy, consistency, integrity, and availability of data. Institutions should establish enterprise-level data governance committees, formulate unified data standards and norms, clarify data ownership and management responsibilities, and form a cross-sectoral data management coordination mechanism. Through the implementation of data quality monitoring and continuous improvement process, the data source is strictly checked and cleaned, and the wrong data and information missing are found and corrected in time, so as to fundamentally improve the purity of data raw materials used for risk modeling. At the same time, we must break the data barriers between different business lines and departments, build a logical or physical centralized data platform or data warehouse, realize the effective integration and sharing of internal and external data, and provide a comprehensive and multi-dimensional perspective for risk analysis.

4.2. Strengthen Technological Innovation

The dynamic evolution of the current risk situation has put forward higher requirements for the depth and breadth of analysis technology, and it is difficult to cope with the increasingly complex risk scenarios by relying on a single model or traditional algorithms. The direction of technological innovation should focus on improving the intelligence level, computational efficiency and the ability to capture complex risk patterns of the model, and promote the evolution of risk management system from assistant decision-making to intelligent autonomous decision-making. This requires organizations not only to focus on the optimization

of the algorithm itself, but also to build the underlying architecture and R & D environment that supports rapid iteration of technology. At the level of model algorithm, we should actively explore and introduce more advanced machine learning and artificial intelligence technology. Deep learning model has significant advantages in processing unstructured data, such as image, text and voice information, and can automatically extract high-risk features from massive heterogeneous data to make up for the blind area of traditional wind control model. The ensemble learning method is a way to combine multiple weak learners to effectively improve the overall prediction accuracy and stability of the model. Graph neural network technology has a special value in explaining complex relationships among entities and discovering potential fraud gangs or risk contagion paths. We must also attach great importance to the technological innovation on the interpretability of models and develop tools and methods that can explain the logic of model decisions clearly and transparently. At the level of technical infrastructure and architecture, cloud computing and edge computation technology provide unprecedented elastic computing power and real-time processing possibilities for risk control. By using the distributed computing capability of cloud platform, the training and iteration cycle of complex risk model can be greatly shortened, and the efficient processing of large-scale data sets can be realized.

4.3. Enhance Personnel Training

Constructing a multi-level and sustainable talent training system and forming talent gathering effect have become the key to building the core competitiveness of intelligent wind control. The primary task of personnel training is to optimize the knowledge structure. The traditional single discipline background of finance or computer is no longer enough to cope with the current complex needs. Educational institutions and employers should work together to design training programs, focusing on the cross-integration of disciplines, so that talents can not only master hard skills such as machine learning and programming languages, but also systematically learn professional knowledge such as finance, risk management and economics, and understand regulatory policies and business logic. The key is to cultivate its ability to connect abstract mathematical models with specific financial risk scenarios, so that it can accurately define business problems and transform them into technical issues that can be solved by data analysis and modeling. This transformation ability is the core of distinguishing ordinary technicians from senior wind control experts. At the practical level, institutions should establish systematic internal training and career development paths. By organizing symposiums, technical workshops and encouraging participation in industry exchanges, we can keep the knowledge system of talents continuously updated. The implementation of cross-departmental project cooperation will enable data analysts to

go deep into the front line of business, personally understand the actual process of credit approval, market transactions and compliance operations, and at the same time enable business personnel to have basic data literacy, so as to promote in-depth understanding and efficient collaboration between business and technical teams. Establishing an open and inclusive innovative culture and encouraging questioning and reflection on the model are important soft environments to stimulate talent potential and prevent model risks. The ultimate goal is to build a high-level talent team that dares to innovate in technology and abides by the bottom line of risk through continuous investment, to provide inexhaustible intellectual support for the long-term development of risk management.

5. Concluding Remarks

This paper systematically discusses the application of data analysis in the field of risk control under the background of financial science and technology. The analysis shows that data analysis technology is profoundly changing the paradigm of traditional risk management by enabling credit evaluation, market risk measurement and operational risk monitoring, making it more accurate, dynamic and forward-looking. However, giving full play to its effectiveness depends on a solid data base, sustained technological innovation and compound talent support. Facing the future, financial institutions must upgrade the concept of data-driven wind control to a strategic level, through systematic optimization of data governance, technical architecture and talent team, in order to build a more resilient intelligent wind control system, so as to achieve stable and sustainable development in the complex and changeable financial environment.

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