The Impact of the Development of Artificial Intelligence Technology on the Risk Control Mode of the Financial Industry

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Abstract. The emergence of artificial intelligence technology has had a significant impact on human development, and human society has begun to closely integrate intelligence and dataization. With the help of artificial intelligence, a large amount of information can be processed and analyzed with precision, which can greatly reduce people's work costs. However, it also brings many risks. In the face of new risks, artificial intelligence can make prevention and control management, and accurately provide risk assessment and quantification models. Therefore, understanding the impact of different artificial intelligence technologies on risk control in the financial sector is of great significance. This article first summarizes the background and significance of the current need for intelligence in the financial industry to help control risks, and then summarizes the different technologies that can be applied in the financial industry in different periods. Secondly, based on risk prediction, risk assessment, and fraud detection, the main applications of artificial intelligence in the financial field are summarized. Finally, the current problems and future solutions that can be addressed are proposed. This article aims to provide researchers in related fields with clearer research directions.

1 Introduction

With the rapid development of artificial intelligence, the financial industry is undergoing unprecedented digital transformation. The value of artificial intelligence in the financial industry is reflected in various scenarios. For example, in the banking industry, by introducing artificial intelligence big model technology to reconstruct the risk management framework, the efficiency of risk prevention and control has been greatly improved. At the same time, it has also promoted the cross disciplinary development of business models from the traditional human model to the current data-driven model. In recent years, multiple financial security incidents have made researchers realize the need to use artificial intelligence for risk prevention and control. According to statistics, more than 30 large financial institutions in China have already adopted artificial intelligence models, covering various large banks. There are also many researchers currently studying it. Padagnassou et al. used the framework of the International Risk Governance Council to identify the

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regulatory risks that small banks may face when facing these collaborations, focusing on two different ways in which banks use fintech to provide innovative services to customers and fintech to provide banking infrastructure. They provided recommendations on how to handle and reduce the risks encountered [1]. Chen discussed the impact of artificial intelligence on corporate financial risks, outlined how artificial intelligence can improve the efficiency of processing financial data, predict financial trends, and identify potential risks. He also focused on analyzing how artificial intelligence can be applied to optimize financial corporate governance, providing development directions for the stable operation of enterprises [2]. Durongkadej et al. investigated the impact of artificial intelligence on financial enterprises and analyzed data provided by five American financial service companies and banks. They found that the average short-term cumulative excess return loss and negative impact of artificial intelligence events had a higher bankruptcy risk and lower operating cash flow compared to financial enterprises that did not utilize artificial intelligence [3]. Zhao et al. studied the impact of generative artificial intelligence on financial risk in Chinese banks. This study collected data from 42 banks and found that banks using generative artificial intelligence significantly increased their financial risk due to the increased vulnerability of the system caused by transitional challenges during the adoption process. However, smaller banks and banks with higher non-performing loan ratios faced higher risks compared to larger banks, indicating that artificial intelligence is a double-edged sword that brings about short-term risks through the transformation of intelligence [4]. This article focuses on the impact of artificial intelligence on risk control in the financial industry. Chapter 2 first outlines the development of mainstream artificial intelligence technologies currently applied in the financial field. Chapter 3 elaborates on specific applications from three aspects: risk assessment, risk prediction, and fraud detection. Chapter 4 discusses the challenges and solutions faced by artificial intelligence in financial risk control, and finally makes a summary. This study hopes to provide more references and future research directions for the industry by summarizing the above content.

2 The Development Process of Artificial Intelligence in the Financial Sector

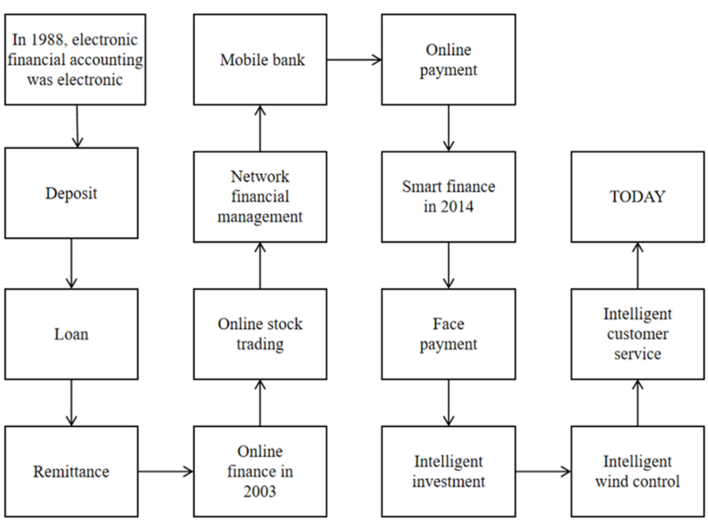

Fig. 1. Development history of artificial intelligence in the financial field [5]

As early as several decades ago, researchers proposed some algorithms or models applied in risk assessment and market prediction, such as early credit scoring models, whose core is to make the experience of credit officers quantifiable and assess the level of risk; Some funds in the market have started using simple algorithms to predict future trends and assist in investment, which has become the beginning of artificial intelligence in the financial field. However, for early artificial intelligence technologies, their self-learning ability cannot be fully relied upon, and most require human experts to assist in operation. The scope of application is also relatively limited, making it difficult to process complex data and the accuracy is not stable. Around the year 2000, with the gradual development of machine learning, emerging statistical methods such as random forests and support vector machines were increasingly applied to data processing and analysis. For example, in fraud detection, machine learning models can help workers process and analyze users' historical behavior in real time, facilitating more accurate identification of user violations. In risk management, machine learning models can be more conducive to analyzing large amounts of data, improving the performance of credit scoring models and helping people analyze financial risks in real time. At the same time, early robot customer service emerged, which could simply answer users' basic questions. The accuracy of identifying risks at this stage has been significantly improved, but it is not yet fully intelligent. Since 2010, deep learning and generative artificial intelligence technologies have been the main driving forces. For example, computer vision technology has brought the application of facial recognition, improving security and user experience. At the same time, natural language processing technology has also enabled customer service robots to recognize complex human meanings and provide more accurate and appropriate answers. Generative AI can autonomously generate financial model code, improving the efficiency of developers and analysts. In addition to generating code, it can also generate relevant data for training models, avoiding the risk of increasing the leakage of user privacy data. The current development process of artificial intelligence in the financial field in China is shown in Figure 1. From the above development stages, it can be seen that artificial intelligence has become an irreplaceable part in the financial field.

3 Research on the Application of Artificial Intelligence in Financial Rish Control

3.1 Risk Assessment

In financial risk control, artificial intelligence plays a crucial role in risk assessment. Some models and methods improve the accuracy of assessment, and there are many applications in the field of credit risk assessment. The process of credit risk assessment is generally shown in Figure 2, and the risks that customers face in loan application requests can be roughly divided into different characteristics. How to evaluate these risk characteristics has become a hot research topic. Nallakaruppan et al. proposed an interpretable AI model to help solve the problems in credit risk management. This model can quantify the risk of credit borrowing on P2P lending platforms and process and predict the data through two mainstream models, random forest and decision tree models [6]. The experimental results showed that the performance of the random forest was good, achieving an accuracy of 94%. In order to prove the stability of the two models, larger datasets were selected for testing, and the random forest and decision tree achieved accuracies of 93% and 90%, respectively. Although these models are currently unable to distinguish whether some detailed customer data needs to be kept confidential, they have achieved a high level of stability and accuracy. In the future, combining privacy protection technology can further improve credit risk assessment.

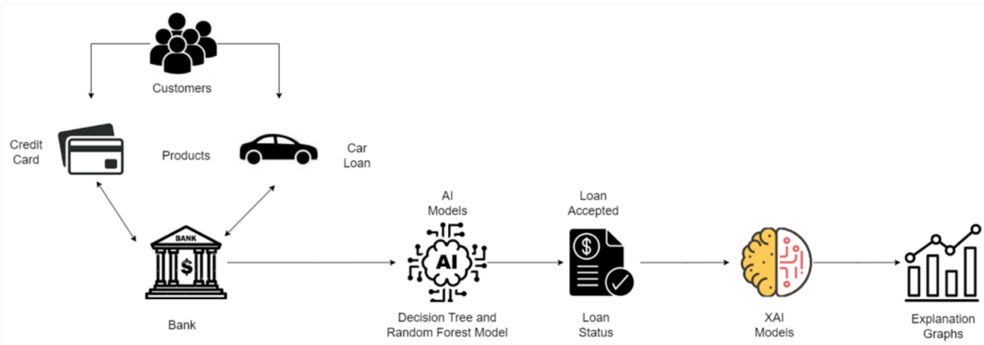

Fig. 2. Credit risk evaluation architecture [6]

3.2 Risk Prediction

Only by accurately predicting the potential risks in the financial industry can we better avoid them, and the development of artificial intelligence technology has greatly helped people predict risks. Figure 3 shows the intelligent process of financial risk prediction and management. For example, an increasing number of researchers in the stock market are using machine learning techniques for risk prediction. Liu proposed a hybrid prediction model to predict the risk of credit default for A-share listed companies [7]. The model achieved prediction rates of 0.912 and 0.878 in bull and bear markets, respectively, and accuracy of 0.837 in extreme event environments. These achievements allow researchers to advance the risk warning period and have more sufficient time to respond and prepare. After integrating social media sentiment analysis, the accuracy of this study has further improved, indicating that market sentiment factors also have a certain impact on financial risk prediction. With the emergence of these machine learning models, investors can have more accurate risk predictions and investment opinions.

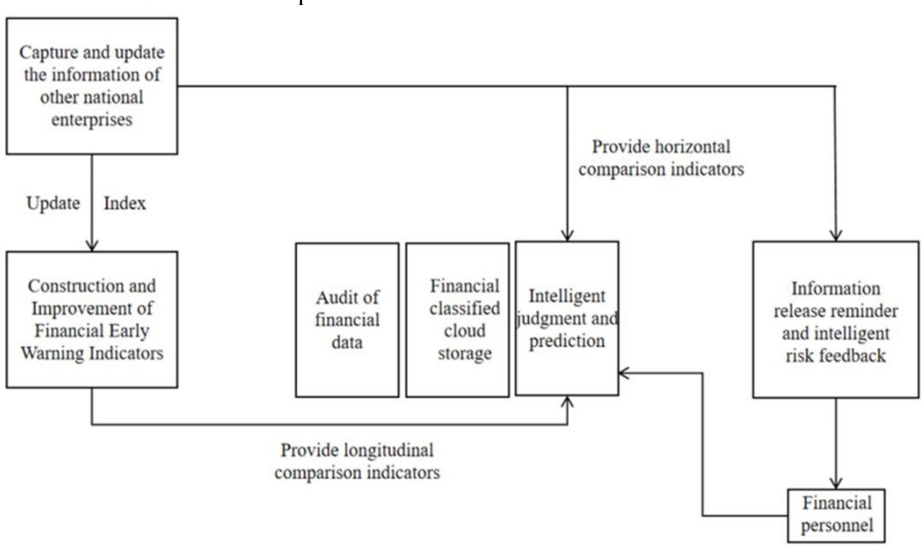

Fig. 3. Artificial Intelligence in Financial Risk Prediction and Management Mechanism [5]

3.3 Fraud Detection

At the same time, artificial intelligence is playing an increasingly crucial role in fraud detection. Fraudulent behavior has brought many negative impacts and economic losses to society, and traditional expert rules are no longer able to cope with such problems. Recently, research has shown that graph fraud detection models based on link aggregation can achieve high recognition accuracy in fraud detection [8]. This method has variable length link sampling, unified link encoding that is related to location, interactive link information, and aggregated fraud detection Through global pattern interaction and similarity comparison between several links starting from nodes, common patterns between fraudulent links can be discovered, which can more comprehensively reveal the correlation patterns between fraudulent behaviors, and fraud detection can be achieved through link aggregation. This method achieved better accuracy compared to baseline models in multiple datasets in different fraud scenarios. In addition, some commonly used transaction software, such as Alipay, also introduced in-depth learning technology to form an advanced fraud detection system, which conducts real-time monitoring and analysis through users' transaction equipment information, geographical location information and transaction operations to ensure that possible fraud events can be identified in a timely manner.

4 Analysis of Challenges and Limitations of Artificial Intelligence in Financial Risk Control

4.1 Data Privacy and Security Issues

In the application of artificial intelligence in financial risk control, data privacy and security issues are particularly important. Currently, financial enterprises generally require a large amount of user data for training and building models, so that artificial intelligence can more accurately predict possible risks. However, in the process of collecting data, it is easy to face data leaks, such as some users' consumption records, behavior patterns, etc. The security issues of current data privacy can be roughly divided into several different stages. Firstly, in the stage of data collection, the security issues mainly include software and hardware. Some marketing activities may produce false data. If the data quality is not monitored, it is easy to collect forged data, which will also have an impact on subsequent model training. At the hardware level, attackers may disrupt data collection by attacking the surrounding environment of sensors and interfering with electromagnetic fields; The above two problems can be solved by using deep learning anomaly detection techniques to identify false data and enhance sensors. In the data processing stage, a security issue that may arise is image scaling attacks, which forge images by adjusting their pixels and even bypass manual verification. To address this issue, image reconstruction techniques can be used to identify modified images.

4.2 The Cost and Standardization of Regulation

The cost and standardization of regulation are mainly reflected in the cooperation between regulatory agencies and financial institutions. Only a reasonable regulation can maintain stable and long-term operation. At present, there is data and information sharing between regulatory agencies and financial enterprises, which incurs high costs for data security sharing and transmission. Sometimes, due to the large amount of data, monitoring agencies find it difficult to conduct real-time detection. With the rapid iteration of model technology and the complexity of financial businesses and model structures, it is difficult for regulatory agencies to make judgments on whether they comply with regulations in the short term. Some monitoring agencies have insufficient understanding and awareness of new technologies, and some financial institutions may have restrictions on the use of new technologies due to regulatory requirements. Therefore, the design of a reasonable and standardized regulatory system puts forward higher requirements and standards. Meanwhile, effectively reducing the cost of regulation has also become a major research goal in the future. In recent years, researchers have studied methods to address data privacy issues by adjusting regulations. Akash et al. used qualitative analysis and case analysis to evaluate whether there would be changes in data breach risk and consumer trust in some scenarios where laws and technologies are combined. The research shows that the technology combined with regulations effectively increases data privacy protection. Therefore, only by combining advanced technology with legal backing can data receive more protection [9-10].

4.3 Interpretability of algorithms

The current artificial intelligence models are often difficult to explain black box models, making it difficult to explain their processes. Therefore, financial enterprises need to take measures to ensure the transparency and comprehensibility of the model process. In the face of such challenges, institutions can use more easily interpretable models, such as random forest, decision trees, logistic regression, etc., to avoid using overly complex black box models; Secondly, a complete set of criteria for evaluating the interpretability of the evaluation model can be specified and quantified to make the evaluation criteria more objective; Finally, it is necessary for the staff of the institution to participate in training and learn some professional knowledge, so that they can better understand the principles and processes of new technologies and models.

5 Conclusions

This article mainly summarizes and analyzes the rapid development and application of artificial intelligence in the financial field. From early scoring models to subsequent deep learning and generative AI, new solutions have been provided for risk control. Through data analysis, the application of early expert systems and later deep learning models has enabled the financial industry to achieve good results in risk prediction, assessment, and fraud detection. But the development of technology has also brought corresponding challenges, such as facing threats to people's security caused by data privacy or leakage, how to formulate a reasonable and effective regulation at the regulatory level, and how to popularize the interpretability of algorithms among staff. In future development, researchers should strengthen data protection, encourage financial institutions to actively cooperate with regulatory agencies to establish more reasonable rules and regulations, and enhance the interpretability of algorithms. In short, artificial intelligence has brought enormous challenges and advantages to the protection and control of risks in the financial industry. By continuously innovating new technologies and applying them reasonably, financial institutions can better prevent the occurrence of risks and further improve market stability.

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