

# A Study on the Application of Big Data in Credit Risk Management

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**Keywords:** Big Data, Credit Risk Management, Commercial Banks, MSMEs.


**Abstract:** Credit in the modern economy has a vital role. In today's increasingly complex financial markets, the problems of traditional manual credit scoring in credit risk assessment have become more prominent. The emergence of big data technology, on the other hand, has enabled some financial institutions to discover its potential value. This paper analyzes the value of applying big data in credit risk management and the challenges that need to be faced. Therefore, this paper aims to analyze the value of the application of big data in credit risk management and the challenges that need to be faced. For current credit risk problems, big data technology can produce corresponding countermeasures to effectively reduce credit risk. At the same time, the application of big data in credit risk management is also characterized by the risks and challenges of privacy leakage, lack of talent, and dominance of traditional credit thinking. Comprehensively speaking, there is great value in applying big data to credit risk management. The technology can provide effective solutions to the current problems, and it can also provide some reference for other risk management research.

## 1 INTRODUCTION

Credit is an important part of the modern economy, providing a partial source of funding for individuals as well as businesses. With the increasing complexity of the global financial market and the gradual rise of Internet finance, some credit risk management challenges have arisen. Traditional credit risk management methods often rely on manual credit scoring, so it is difficult to capture changes in information and prone to subjective bias accurately. With the gradual transition of credit business to an online model, financial institutions face new challenges and opportunities. The institutional reform of the State Council and the establishment of the National Digital Agency have made digitalization a central force driving economic growth. As the core technology of this change, big data is gaining attention for its potential value for credit risk management. The use of big data for credit risk management is of great practical significance. Big data can provide richer data samples and more precise model analysis, thus improving the accuracy and reliability of risk assessment and prediction (Zhong, 2024). At the same time, big data can optimize the

credit decision-making process through the comprehensive analysis of multi-dimensional information on borrowers, providing financial institutions with a more scientific and objective basis for credit decision-making. Big data can also track credit evaluation dynamically regularly to ensure the continuity, accuracy, and timeliness of project database updates (Lin, 2024).

Currently, relevant researchers have analyzed the current status of the application of big data in credit risk management. For example, Tingting Wang (Wang, 2024) summarized the credit business and risk management innovation of commercial banks in the context of big data. In addition, Yu Hongfei (Yu, 2023) summarized the research on credit risk assessment and control of micro, small and medium enterprises (MSMEs) in the big data environment. However, it is necessary to summarize and review the existing studies again and look forward to the future research direction due to the following three reasons. First, the rapid development of big data technology and the proliferation of related studies require constant updating of the review. Second, most of the existing reviews focus on specific areas or issues and lack a comprehensive analysis of overall credit risk management. Finally, with the advancement of digital

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transformation, enterprises need to build a more comprehensive digital system in credit risk management.

This paper aims to analyze the application of big data in credit risk management. The paper is developed along the following lines. Firstly, this paper will give an overview of big data technology. Then it will sort out the current problems of big data in credit risk management in the literature. Further, the value of big data in credit risk management is analyzed. In addition, it analyzes the main challenges of big data in credit risk management, such as privacy protection and other issues. Finally, summarize the whole paper and look forward to the research prospect and direction.

## 2 OVERVIEW OF BIG DATA TECHNOLOGY DEVELOPMENT

With the increasing complexity of global financial markets and the deepening of China's digital economy, financial institutions face a number of credit risk management challenges. Traditional credit risk assessment methods often rely on limited data and expert experience. The data sources mainly rely on limited information, such as financial statements and credit reports provided by borrowers, so it is difficult to accurately capture the impact of market fluctuations, changes in the economic environment, and changes in the behavior of individual borrowers on the risk of credit defaults, and at the same time, because it is an artificial score, it is susceptible to subjective bias, which all increase the credit risk. These challenges provide new opportunities for applying big data technology in credit risk management. Due to the massive, diverse, and fast nature of big data can provide more comprehensive

and dynamic data support to help financial institutions identify and manage credit risk more effectively (Wang, 2024). The value density of big data is low, and generally valuable data accounts for no more than 10% of all data. Finally, big data technology has efficient processing capabilities and can quickly mine high-quality information from massive amounts of data.

With the continuous development of big data technology, financial institutions have begun to realize the huge potential for big data in credit risk management. Big data has features that make it capable of integrating and processing data from multiple channels, including but not limited to comprehensively capturing all types of information about borrowers, including transaction records, social media behavior, consumption behaviour, credit history and other multi-dimensional data (Chen, 2022). This data provides financial institutions with unprecedented insights that enable more comprehensive, in-depth and accurate credit risk assessment.

In addition, with the rise of Internet finance, credit business has gradually shifted from offline to online, with a broader customer base and more diversified credit needs. Financial institutions must have more flexible and efficient credit default risk control mechanisms to cope with the complex and changing credit market environment. The application of big data technology provides financial institutions with such a possibility. Financial institutions can quickly identify potential risks and realize precise prevention and control of credit default risks by monitoring, analyzing and adjusting massive data in real time. Therefore, the study of big data in credit default risk control is of great significance.

The comparative differences between manual credit scoring and big data techniques are noted in Table 1. The table focuses on the comparison in terms of data sources, processing power, accuracy, efficiency and timeliness.

**Table 1:** Comparison of manual credit scoring and big data techniques

	Data sources	Processing capability	Accuracy	Efficiency	Timeliness
Manual credit scoring	Limited data sources	Weak processing capacity	Accuracy is subjective	Less efficient	Limited ability to monitor data and lag in adjustments
Big data technology	Wide range of data sources	High processing power	High accuracy	High efficiency	Real-time monitoring, dynamic adjustment

### 3 PROBLEMS IN CREDIT RISK MANAGEMENT

Credit risk refers to the possibility that the borrower cannot repay the loan's principal and interest on time due to various reasons in the course of the loan, which leads to the creditor (usually the bank or other financial institutions) to suffer losses. The objects facing credit risk mainly include borrowers and creditors. Borrowers include MSMEs, large enterprises and individuals. Creditors are mainly financial institutions. Large enterprises are generally not exposed to credit risk because of their strong economic strength and ability to repay debts. Individuals contain diverse and complex groups that need to be treated appropriately and will not be discussed here. And MSMEs face credit risk because of their small production scale, illiquid capital and other problems. So, this paper will discuss the credit risk problems faced by MSMEs as representatives of borrowers. Meanwhile, the representative of financial institutions is commercial banks, and this paper will discuss commercial banks as the representative of creditors.

#### 3.1 Main Credit Risks of Commercial Banks

Under the traditional credit risk management system, commercial banks mainly face the problems of insufficient credit system, difficulty obtaining comprehensive, accurate and real customer information and difficulty in post-loan risk control.

##### 3.1.1 The Credit System Is not yet Perfect

In credit risk management, having a perfect credit risk system is key to reducing credit risk. The credit business development of China's commercial banks started late, and the immaturity of the credit market led to the difficulty of managers to adapt to market changes, and the credit risk management system needs to be improved (Du, 2021). As a result, some problems have arisen. Due to the lack of exhaustive customer information checking, the credit credit system can not give full play to its role, which makes it difficult for banks to assess customer risk accurately (Yin, 2024). Compared with developed countries with hundreds of years of management experience, there are still obvious deficiencies in the setup of credit market structure and the usefulness of information management platform in China. This

affects the efficiency of credit risk management and increases the possibility of credit default (Huang, 2023). At the same time, there are a series of problems in the regulatory system, such as the regulatory content not being detailed, the regulatory power not being clear, the regulatory efforts not being strong enough, and the regulatory duties not being strictly fulfilled.

##### 3.1.2 Difficulty in Obtaining Comprehensive, Accurate and Truthful Customer Information

The main risk in credit business originates from the repayment ability of customers. Therefore, in the process of credit business, banks need to check and record customer information in detail to reduce the repayment risk (Yin, 2024). Chinese commercial banks have a single channel for obtaining data and information, the cost of obtaining them is high, and the data are not updated in a timely manner. And Chinese banks are easily affected by changes in the external market environment in the process of credit management (Hu, 2023). The backwardness of the data information acquisition and processing mode has led to the inability of commercial banks to accurately and timely identify external market risks, and the failure to take timely and reasonable interventions has resulted in interest rate losses, affecting profitability. At the same time, the indicators for obtaining information under the traditional credit risk management system are relatively single, including credit, records of violations, economic disputes and so on. For enterprises and individuals associated with the financial / material / human data can not be obtained, can not be cross-validation and correlation analysis of all aspects of information, resulting in the credit front-line staff and credit approving officers to determine the strength of the customer's repayment ability, it is difficult to pass the data and other objective records, the determination is more subjective (Huang, 2023). At the same time, the relevant information is also easy to tamper with, so the data that can not pass the approval can be approved, which leads to the bank is difficult to grasp the customer's real business and financial situation, and can not accurately measure the credit risk of the lender.

### 3.1.3 Difficulty in Post-Loan Risk Control

According to the field research, the research bank after the loan carries out risk control mainly through the phone, door to door, contact with customer units and other ways to collect, at the same time to encourage the borrower through the monthly, quarterly, semi-annual and other ways to settle the interest rate, the use of risk clues to monitor the system of regular decentralization of suspicious loans (Xue, 2023). Numerous commercial banks, however, have shortcomings in financial data monitoring, making it difficult to capture and follow up on key data information quickly. This limits the ability of commercial banks to predict risks in a timely manner, take stop-loss measures, or develop reasonable response strategies. Although China's commercial banks have set up a post-loan risk warning mechanism, by technology, data and other factors constraints, only based on loan overdue, deposit and loan ratios and other direct indicators to set early warning rules, early warning matters are not comprehensive enough (Huang, 2023), or failed to take the results of post-loan risk control.

## 3.2 The Main Credit Risks of MSMEs

Under the traditional credit risk management system, MSMEs are mainly faced with the problems of low information transparency, high financial management risk and high market competition credit risk. These problems affect the quality of assets affecting financial institutions, the development of MSMEs and the stability of the overall financial market.

### 3.2.1 Low Information Transparency

Low information transparency is a significant disadvantage for MSMEs in the financial market. Specifically, due to their small size and limited resources, MSMEs often find it difficult to establish a sound financial management system and information system, leading to deficiencies or lags in the collection, organization and disclosure of financial information and operational data. This information opacity firstly affects financial institutions' credit assessment of MSMEs. In the pre-credit review stage, financial institutions need to judge the repayment ability and operational stability of MSMEs on the basis of sufficient and accurate information. Still, the opacity of information makes this process complicated and uncertain. Financial institutions may make conservative credit decisions

because they are unable to fully understand the real situation of MSMEs, thus limiting the financing space for MSMEs. In addition, at the post-loan supervision stage, information opacity also poses a challenge to financial institutions. It is difficult for financial institutions to monitor the operation status and capital flow of MSMEs in real time, and discover potential risk factors in time and take effective measures to prevent and control them. This information opacity makes credit institutions have blind spots in pre-credit review and post-credit supervision, thus increasing the riskiness of credit investment (Zhang, 2024).

### 3.2.2 High Risk of Financial Management

Cash flow stability is the key to the survival of MSMEs, and its impact is extremely significant. Insufficient monitoring of cash flow by MSMEs may lead to the risk of capital chain breakage (Zhang, 2024). When the enterprise faces cash flow problems, its daily operations will be seriously constrained, resulting in a tense or even broken capital chain, which not only puts the enterprise itself in a difficult situation, making it difficult to fulfill its payment obligations to suppliers and employee payroll but also triggers credit defaults due to the inability to repay bank loans on time, which in turn affects the banking system that provides it with credit support, resulting in a decline in the asset quality of the bank, which may ultimately cause This could lead to a decline in the quality of bank assets and ultimately lead to asset losses, affecting financial stability. The credit review and accurate risk assessment can effectively control costs and correctly recognize the feasibility of return on earnings, which is the basis of credit risk management (Zhang, 2024). Financial information is the core of credit assessment. However, the asymmetry of financial information makes risk assessment more complicated, and it is difficult for credit institutions to grasp the true and accurate condition of the enterprise accurately, thus increasing the risk of default. In addition to financial management risks, MSMEs face unique challenges in market competition, which also have an impact on credit risk.

### 3.2.3 High Credit Risk of Market Competition

MSMEs themselves are small in production scale and not strong enough in production strength (Yu, 2023). In the fierce market competition, MSMEs often have limited resources, which causes it to be more difficult



to obtain credit compared with large enterprises (Zhang, 2024). Banks and other financial institutions tend to be more cautious about the repayment ability of MSMEs when assessing the risk of loans. However, the financial needs of MSMEs also continue to increase (Feng, 2023). The existence of these reasons has led to the persistence of the problem of difficult and expensive financing for MSMEs. Moreover, MSMEs are often at the end of the supply chain, with a high degree of dependence on upstream suppliers and downstream buyers. Once a problem occurs in one part of the supply chain, such as price increase by upstream suppliers or default by downstream buyers, it will significantly impact the production and operation of MSMEs. This transmission effect of supply chain risks makes MSMEs more vulnerable in the face of market changes, and their credit risks are further amplified.

## **4 THE VALUE OF BIG DATA FOR CREDIT RISK MANAGEMENT**

Big data used in credit risk management has certain value. For example, big data can provide richer data samples and more accurate modelling analysis, making it easier and more comprehensive to obtain data, and more scientific and objective to process the data results. At the same time, big data has high efficiency, which can quickly process data processing data and efficiently find valuable data from massive data. Big data also allows for regular dynamic tracking of credit evaluations, ensuring that problems can be identified and interventions taken promptly. The paper will expand and analyze the value of big data for commercial banks and MSMEs.

### **4.1 The Value of Big Data Used in Credit Risk Management of Commercial Banks**

Applying big data to commercial banks' credit risk management system has certain value. Firstly, it can build a complete credit system and enhance the effect of risk management. Secondly, it can effectively mine, process and follow up the data information. Finally, it can solve the problem of post-credit management.

#### **4.1.1 Constructing a Complete Credit System and Enhancing the Effect of Risk Management**

For commercial banks, credit risk is the main risk factor (Feng, 2023). Applying big data technology in credit credit system is more conducive to building a complete credit system and enhancing the effect of credit risk management (Yin, 2024). Big data helps build a credit credit system by analyzing a large amount of data, identifying customer information and repayment ability, to accurately judge their borrowing qualifications and reduce credit risk. Big data can also innovate the bank risk decision management mode. In the actual development of risk management, banks should first identify the risk, the impact of the risk, and the risk level, which should be scientifically divided, and do a good job of risk decision management (Wang, 2024). At the same time, big data can establish a more complete risk monitoring mechanism, which has a positive role in risk management innovation and internal risk management of banks, is an important initiative for the development and innovation of commercial bank credit business (Yin, 2024).

#### **4.1.2 Effectively Mining, Processing and Following up Data Information**

Big data can establish a data sharing platform and break data silos. Banks can strengthen cooperation among themselves to eliminate data barriers and realize data sharing. The government can take the lead in establishing a data sharing platform, integrating credit data from government departments and various credit bureaus, and granting and regulating access to financial institutions (Xue, 2023). The sharing platform can improve the efficiency of data mining, while making data collection more comprehensive. And the synchronization of data to regulatory agencies strengthens the credibility and accuracy of data, thus enhancing the accuracy of risk assessment. Meanwhile, the correlation between the data can enhance the power of risk prediction. Commercial banks should make full use of the large amount of customer information they have accumulated, and classify and process it with the specific situation to further explore the correlation between the sample data and customer behavior, such as the connection between the non-performing loan rate and the borrower's investment behavior, the type of work, and

other factors, in order to comprehensively improve the level of controlling credit risk (Xue, 2023). Furthermore, the timeliness characteristics of big data technology can deliver customer information to the bank in real time, so that if the latest data show that the customer's credit risk is too high, it can stop the loss in time and reduce the credit risk.

#### **4.1.3 Solve the Problem of Post-Loan Management**

China's banking industry in the loan supervision often focusing on pre-loan and loan strict review, but the post-loan management attention is insufficient, mainly due to information asymmetry. After the customer loan, the actual use of funds is difficult to control, often deviating from the original direction, such as business loans for investment, increasing the risk of repayment, affecting the bank's wind control. Big data can solve the problems of post-loan management (Huang, 2023). It can track the flow of funds in real time, provide timely warning of illegal use, and reduce loan risks; at the same time, record information about customers and their affiliates to help approve new loans; and improve the efficiency of interdepartmental communication to solve the time gap and collaboration problems in traditional post-loan management. In addition, big data technology accumulates rich post-loan management data through data traces, providing strong support for risk analysis and customer resource mining.

### **4.2 The Value of Big Data Used in the Credit Risk Management of MSMEs**

Applying big data to MSMEs' credit risk management system has certain value. First, it can solve the limitations brought by low information transparency. Secondly, it can reduce the risks brought by insufficient financial management. Finally, it can enhance market competitiveness.

#### **4.2.1 Addressing Constraints Brought About by Low Information Transparency**

Restricted by their size and financial transparency, these MSMEs often face heavy obstacles in obtaining credit funds, which largely binds their development potential. As a result, how to scientifically and efficiently assess the credit risk of MSMEs has become a common issue for both financial institutions

and MSMEs. In this context, the application of big data technology shows irreplaceable value (Zhang, 2024). Traditional credit assessment favors financial reports and ignores unstructured information such as online activities, social media reputation, and geographic location. Big data technologies, on the other hand, excel at mining these pieces of Internet information and applying advanced algorithms to identify credit risk signals. For example, analyzing online purchases to predict cash flow stability, or social media public opinion to assess a company's public image and potential risks. This provides financial institutions with a comprehensive and multi-dimensional view of credit assessment, helping them identify risks and accurately make more informed lending decisions. Even though information transparency is low, big data can still mine information from other sources to effectively address its limitations.

#### **4.2.2 Reducing the Risk of Inadequate Financial Management**

On the one hand, big data can solve the risks brought about by financial information asymmetry. The big data platform can promote data sharing and integration among the government, financial institutions, enterprises and other parties. By integrating data from different sources, credit institutions can gain a more comprehensive understanding of the real situation of MSMEs and reduce the risks brought by information asymmetry. In addition to traditional financial data, big data technology can also mine and analyze non-financial information of MSMEs, such as online behavior and social media reputation. This information helps credit institutions to more comprehensively assess the creditworthiness and operational capacity of enterprises, thus making more informed lending decisions. On the other hand, big data also monitors cash flow in real time to prevent businesses from getting into trouble and thus avoiding property damage. Big data technology monitors key financial data such as online transactions, bank account changes, supply chain payments, etc. of MSMEs in real time, and analyzes and predicts cash flow trends through algorithms. This real-time monitoring helps enterprises identify potential cash flow shortage risks in a timely manner and take measures to address them in advance. This can effectively solve the problems caused by insufficient cash flow monitoring.

### 4.2.3 Enhancing Market Competitiveness

MSMEs can actively utilize the big data platform to accumulate their own credit data. By timely and accurately recording the enterprise's transaction behavior, repayment records and other information, it can gradually build up a good credit record and improve its credit rating among financial institutions. At the same time, MSMEs can establish a data sharing mechanism with other enterprises in the supply chain, and use big data technology to monitor and analyze data changes in each supply chain link. This helps enterprises identify potential risk points in a timely manner and take appropriate measures to prevent and respond to them. The big data-based risk early warning system is also able to monitor anomalies in the supply chain in real time, such as price increases by upstream suppliers and defaults by downstream buyers. When the system detects a potential risk, it will immediately issue an early warning signal to remind the enterprise to pay attention and take corresponding measures to reduce the impact of supply chain risks on the enterprise's production and operation, thus increasing market competitiveness.

## 5 CHALLENGES OF BIG DATA IN CREDIT RISK MANAGEMENT

In this era of rapid development of information technology, the application of big data to credit risk management system also has the risks and challenges of privacy leakage, lack of talent traditional credit thinking dominates.

Currently, in the traditional credit field, risky cases of selling personal credit reports are common. However, with the arrival of the Internet of Things (IoT) era, any behavior may be collected and utilized by big data (Luo, 2019)]. Many other associated data will be involved once part of the data is leaked. Moreover, big data is characterized by sea quantization and huge amount of data, so it is extremely difficult to preserve and protect it. For these reasons, in the field of big data credit, it is easier to obtain information through the Internet, and the cost of crime is lower, which is more likely to increase the chance of the risk of information leakage (Luo, 2019)]. Privacy security is not negligible and

difficult to solve, which is undoubtedly a great challenge for big data in credit risk management.

Applying big data to credit risk management also has the problem of lack of talents. This is because integrating credit risk control with big data requires a group of composite talents familiar with credit business, data mining technology and system programming ability at the same time. However, at present, talents with experience in both fields are extremely scarce, resulting in financial institutions facing technical bottlenecks and talent gaps in the implementation of big data strategies. According to the current view, there is a great lack of talents that meet the needs in this area, resulting in commercial banks and MSMEs being unable to scientifically and effectively utilize big data technology, which is not conducive to their development. On the other hand, commercial banks and MSMEs also lack the corresponding talent training mechanism. As a result, the ability and quality of the employees of commercial banks and MSMEs have not been sufficiently improved, and it is difficult to effectively integrate big data technology into credit risk management, thus limiting the further development and expansion in the field of credit business.

In the traditional credit approval mode of commercial banks, human subjective judgment still occupies a dominant position (Xue, 2023). The use of big data technology is mostly limited to providing auxiliary information for manual decision-making, failing to give full play to its potential for risk identification, so that the approval process lacks fundamental changes compared with the past. In addition, although the concept of comprehensive risk management has been put forward, the implementation of the bank's internal implementation is not satisfactory, often on the surface, failed to penetrate into the various levels and business processes, resulting in the risk management of grassroots employees with a weak sense of risk management, and insufficient practical experience. In terms of specific operation, when approving loans, banks often tend to select key industries with high maturity and development potential as well as customers with rich experience in production and operation in order to minimize credit risks. However, this preference inevitably ignores those in the early stages of growth or small-scale "long-tail customers", whose financing needs are difficult to fully satisfy, which limits the expansion of the bank's revenue scale and the enhancement of credit risk control capabilities. Therefore, realising more

comprehensive and accurate risk assessment with the support of big data technology, while considering the financing needs of long-tail customers, has become an important issue for commercial banks to solve.

## 6 CONCLUSIONS

Credit is an important part of the modern economy and is widely concerned. This paper analyzes the study of big data in credit risk management. From it, the paper can conclude that there are many problems in traditional credit risk management, and the application of big data in it has a chance to solve these problems. However, applying big data also brings some risks and challenges, and people urgently need a corresponding policy system, technology and relevant professional talents.

Existing studies have comprehensively and deeply analyzed the opportunities and challenges of big data in credit risk management, etc., and have achieved rich research results, but there are still some niche areas that need more exploration.

First, improving the accuracy of the big data model is subject to more in-depth research. Although the current credit risk assessment model has achieved certain results, there is still room for improvement in terms of prediction accuracy and stability. How to further optimize the model algorithm to improve the accuracy and timeliness of risk identification is an area that requires in-depth study of big data in credit risk management.

Secondly, with the continuous development of big data technology, relevant laws and regulations are also constantly improving. However, in the field of credit risk management, balancing the contradiction between data security and data utilization and ensuring the effective implementation of laws and regulations is still a topic that needs to be studied in depth.

Third, with the development of financial technology, new credit business scenarios continue to emerge, such as Internet finance and supply chain finance. These emerging business scenarios are characterized by complexity and uncertainty, putting forward higher requirements for credit risk management. Utilizing big data technology to effectively identify and manage risks in these emerging business scenarios is another gap area that requires in-depth research.

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