

Research On the Impact of Credit Risk in Commercial Banks Under the Background of Fintech

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Abstract. In recent years, with the rapid development of technologies such as artificial intelligence, big data, and blockchain, FinTech has become the core driving force for the transformation of the global financial system. As the backbone of traditional finance, commercial banks face dual challenges of digital transformation and credit risk management. Based on this background, this article systematically explores the impact mechanism and response strategies of financial technology on commercial bank credit risk. Through literature review, this paper summarizes the domestic and international research trends on the relationship between financial technology and commercial bank credit risk, focusing on dimensions such as digital transformation, construction of financial technology subsidiaries, and third-party cooperation. Commercial banks have promoted the intelligence of business processes through large-scale technological investment, but the innovative practices of subsidiaries in areas such as green credit and rural finance have also exposed problems such as insufficient technological adaptability and regulatory coordination. Based on this, further analysis was conducted on the causes and impacts of credit risk in commercial banks under the background of financial technology. The risk characteristics include data security vulnerabilities, lack of model interpretability, and cross platform compliance risks. Therefore, this article proposes four-dimensional management strategies: firstly, accelerate digital transformation and build an open and collaborative technology ecosystem. The second is to improve the compliance framework, balance innovation incentives and risk prevention and control; The third is innovative regulatory technology, which utilizes sandbox testing and real-time monitoring to enhance regulatory efficiency. The fourth is to strengthen data governance and ensure information security through encryption technology and permission management. Financial technology is not only a tool innovation, but also a reconstruction of the financial ecosystem, providing theoretical support and practical reference for the sustainable development of the banking industry.

Keywords: FinTech; Commercial banks; Credit risks; Risk management; Digital transformation.

1. Introduction

In recent years, a wave of digitisation has swept through the financial sector, and the state has stepped up its efforts at all levels to promote the deep integration of science and technology with finance. In 2019, the Central Bank adopted policies and measures to introduce cutting-edge technology and improve risk management capabilities; and in the Rural Revitalisation Pilot Project 2021, it explored the close integration of scientific and technological tools with agricultural financial services. Meanwhile, as a central intermediary of the national economy, its asset size and credit operations have grown steadily, reaching new peaks over the years. In this environment, the application of financial technology, characterised by a sharp increase in the number of clients, diversification and renewal of service models, and a sustained decline in costs, has helped the bank to achieve economies of scale, but it has also brought with it the potential for the spread of risk factors. Information tools have lowered transaction thresholds, optimised interactions with customers and facilitated silent changes in the traditional credit model. However, behind the dividends of emerging technologies, hidden risks such as data security and information asymmetry have emerged. Therefore, exploring the role of digital technology in the credit system of commercial banks and the transmission path of risk has become an important topic that urgently needs to be studied. At present, various reform measures are constantly being promoted, and technological advances are constantly updating the concept of risk management, promoting the increasing optimisation of the structure of the financial industry, forming a multi-level service system, and facilitating the improvement of

regulatory instruments, laying the foundation for stable financial development. It promotes continuous financial improvement in the future. This study focuses on theory construction and practical application, with the aim of analysing the internal logic of the evolution of commercial bank credit risk in the context of digital transformation. Theoretically, by constructing the indicator system and risk transmission model, it can expand the scope of research in the field of financial technology and risk management and provide new ideas for improving credit risk assessment. In practice, with the continuous promotion of inclusive finance, banking business has been expanded from large companies to small and medium-sized enterprises, and risk factors are diversified and intertwined. With the help of big data and intelligent analysis methods, banks can achieve stratified management and precise control of customer risk, but they must also guard against hidden dangers caused by data leakage and technical failures. Based on a large amount of sample data from commercial banks, this study adopts an empirical method to reveal the interaction between technology application and credit risk, and to clarify the accumulation and transmission path of risk. The findings help banks optimise their business strategies and improve internal risk identification, while providing practical references for regulators to improve system design. In addition, exploring the impact of financial technology on credit restructuring and risk diversification mechanisms can help establish a multi-level risk prevention and control system and promote the sustainable and healthy development of the sector. The study not only enriches the theoretical perspectives of financial risk and promotes the healthy development of the financial industry, but it also provides new practical ways and strategic options for banks and regulators.

2. Literature Review

2.1. Research on fintech

The intersection of digital innovation and financial services has sparked a wide-ranging academic discussion on how financial technology can redefine traditional financial paradigms at different operational and institutional levels. This study explores the relationship between technology deployment, financial inclusion, and systemic risk dynamics, and provides a detailed introduction to the transformative potential of financial technology.

Ayu and his colleagues studied the binary impact of financial literacy and the use of financial technology on corporate sustainability, particularly in micro, small, and medium-sized enterprises (MSMEs). Their analysis emphasizes that while financial knowledge increases decision-making autonomy, the integration of fintech tools brings both opportunities and vulnerabilities. For example, companies that use digital platforms for trading and risk management typically improve operational efficiency, but without proper risk awareness, excessive reliance on technology may lead to cybersecurity threats or algorithmic biases. This duality highlights the urgent need for a balanced strategy that coordinates technology deployment with basic financial education. In terms of affordability, Deng Jingfan conducted in-depth research on the role of bank financial technology in narrowing the credit gap between enterprises. By analyzing mechanisms such as automatic credit rating and blockchain based verification systems, this study reveals how financial technology can eliminate traditional barriers to accessing capital. Technical solutions allow lenders to evaluate non-traditional data points, such as digital transaction history and interactions in the supply chain, thereby expanding credit in underserved industries. In areas where traditional banking infrastructure is still fragmented, this financial democratization is particularly transformative, indicating that financial technology can be a catalyst for inclusive economic growth.

Dong Xiaolin and other researchers further investigated the impact of financial technology on the dynamics of commercial bank loans. Their work highlights how the competitive pressure brought by technological innovation forces banks to thoroughly reform their traditional systems. By utilizing artificial intelligence to simulate credit risks and deploying distributed ledger technology to improve transaction transparency, financial institutions have optimized credit allocation while minimizing operational efficiency. This study also reveals a paradigm shift in the interaction between customers

and banks, with personalized financial technology solutions increasing customer engagement and satisfaction, thereby promoting long-term loyalty in the digital market. In the field of professional finance such as supply chain finance, Fan Yuliang has studied the risk management mechanisms brought by financial technology. It has been proven that the integration of big data analytics with Internet of Things (IoT) devices alleviates the inherent information asymmetry in multi-layered supply chains. For example, real-time tracking of inventory and automatic verification of transaction files can reduce fraud risks and improve the accuracy of mortgage valuation. In addition, smart contracts integrated into pre-defined compliance protocols simplify the payment process and provide liquidity, while minimizing counterparty misconduct. These innovations emphasize the ability of financial technology to transition from passive to active risk management through predictive analysis and real-time monitoring. Zhang's research supplements these viewpoints by analyzing the uneven impact of different types of commercial banks' use of financial technology on credit risk. This study found that banks with dispersed technology priority structures are better able to withstand credit fluctuations than traditional institutions that rely on centralized systems. By using cloud computing and open banking APIs, flexible banks can adapt to market fluctuations faster, while traditional systems often encounter difficulties in addressing scalability and network security issues. This difference emphasizes the importance of strategic technological consistency, where the integration of fintech adapts to institutional capabilities and market positioning.

2.2. Research on credit risk of commercial banks

For a long time, credit risk management in commercial banks has been a focus of financial research, driven by complex interactions between business practices, customer profiles, and external economic variables. Scholars are increasingly concerned about how internal governance structures and external market forces jointly shape risk exposure, with a particular emphasis on technological intervention and system adaptability. Zhong Kai and his collaborators studied the intersection of Fintech and green credit initiatives and found that environmental, social, and governance indicators embedded in algorithmic models have a significant impact on credit risk assessment. His analysis of commercial bank practices shows that technology driven ESG frameworks not only improve the accuracy of risk prediction, but also encourage sustainable lending behavior, thereby aligning financial goals with green accountability. This dual focus on profitability and sustainability emphasizes the developmental role of banks as catalysts for economic and environmental resilience. Zhang Xin's empirical research on 43 Chinese commercial banks found a contradictory relationship between the adoption of financial technology and credit risk mitigation. Although advanced analysis has improved the prediction of loan defaults, the rapid digitization of the credit process has brought new gaps, such as data fragmentation in legacy systems and excessive reliance on opaque machine learning models. This study emphasizes the disproportionate impact of algorithm bias on the risk scores of small and medium-sized enterprises, which exacerbates information asymmetry rather than alleviating it. These findings challenge the assumption of unified risk reduction technology integration and urge a more detailed evaluation of digital tools in heterogeneous banking environments.

Xiao Feng and Tang Guoji further discussed this tense relationship by analyzing the correlation between financial technology adoption, bank performance, and green credit growth. His work shows that banks using Fintech to monitor investment portfolios in real-time can achieve higher profitability indicators, but this efficiency often comes at the cost of increased cyber risk and regulatory violations. Case studies demonstrate how institutions can balance automatic risk control mechanisms and manual monitoring to maintain a more stable credit portfolio, particularly in industries transitioning to a low-carbon economy. Chen Lihong and Wang Chaofan shifted their research focus to organizational performance, demonstrating that credit risk is a mediating variable between financial technology deployment and bank profitability. When analyzing transaction data from commercial banks, they found that institutions that use blockchain to issue loans and execute smart contracts have fewer non-performing loans. However, the study also warns against adopting decentralized technologies,

indicating that partial digitization of risk management processes may create operational blind spots, particularly in cross-border lending activities.

Bitetto and his colleagues questioned the reliability of machine learning in predicting credit risk for small businesses and challenged the concept of the correct algorithm. His comparative analysis of the European and Asian markets shows that there are significant differences in the accuracy of the model due to differences in data quality and regulatory reporting standards. For example, machine learning models trained on unstructured data in the informal sector exhibit higher error rates, often mistakenly classifying viable small and medium-sized enterprises as high-risk borrowers. This study emphasizes the need to place technological solutions within a localized financial ecosystem to avoid the persistence of systemic biases. Wangodu and Muath's survey on the panoramic view of fintech in Kenya compared how mobile based lending platforms can alleviate the credit deficit of micro enterprises. By avoiding traditional guarantee requirements and using alternative data such as mobile currency transaction history, these platforms have reduced default rates while expanding financial inclusiveness. However, the study also documented cases of aggressive digital lending practices leading to excessive debt for borrowers, revealing a subtle balance between innovation and consumer protection.

Wang Manchang and his colleagues analyzed the role of financial technology in optimizing credit resource allocation and emphasized the impact of financial technology on financing efficiency. Their model suggests that banks using AI driven dynamic pricing mechanisms achieve greater consistency between risk appetite and loan terms by reducing speculative loans. However, this study also found unexpected consequences, such as marginalizing industries that lack fingerprints and are systematically excluded from automatic credit assessment systems. These studies depict a complex picture of credit risk management in the era of financial technology. Although technological advancements have provided unprecedented tools for risk prediction and operational efficiency, their implementation is fraught with challenges, ranging from algorithmic biases to regulatory fragmentation. The interaction between automated systems and human judgment has become a key issue, and some scholars advocate for hybrid models that combine the scalability of machine learning with expert supervision. For example, Xiao Feng's research on green credit growth emphasizes the need for interdisciplinary teams to validate algorithm outputs, especially in emerging industries with limited historical data. Similarly, the comparison between Bitetto markets emphasizes the importance of an adaptive regulatory framework developed in conjunction with technological capabilities. The discussion further expands to the ethical aspect of adopting Fintech. Zhang Xin's research on data asymmetry and Chen Lihong's analysis of mediation effects both emphasize the social impact of automated decision-making. When credit scoring algorithms unintentionally exacerbate existing inequalities, such as excluding cash dependent industries or punishing regions with limited digital infrastructure, the financial system risks exacerbating socio-economic disparities. These ethical issues require a reassessment of the risk management paradigm, going beyond purely quantitative indicators and incorporating qualitative assessments of fairness and inclusivity.

Wang Manchang's exploration of resource allocation efficiency and his attention to emerging markets have revealed the geographical and industrial imbalances in the impact of financial technology. Although developed markets benefit from complex risk modeling tools, developing economies often face infrastructure barriers that limit the effectiveness of these technologies. This difference requires solutions that adapt to local challenges, such as hybrid analog digital systems in the area of intermittent Internet access or community credit networks that complement algorithmic assessments.

2.3. Research on the impact of fintech on credit risk of commercial banks

The integration of financial technology and commercial banking has fundamentally changed the mechanism for identifying, evaluating, and managing credit risks. The characteristic of this transformation is a dual narrative of efficiency improvement and emerging vulnerabilities, and scientists have put forward different views on how technology can change the risk dynamics in credit

practices, regulatory frameworks, and market interactions. Tang Changchun and his employees studied the synergistic effect between technology support loan allocation and corporate green innovation, and proposed an ecological indicator algorithm for monitoring, which can dynamically adjust loan conditions and promote sustainable practices. Their analysis of credit regulatory mechanisms shows that tracking real-time data on emission reduction or energy efficiency indicators enables banks to directly link financing costs with environmental performance. However, this approach also makes risk modeling complex, as fluctuations in sustainability management standards can bring uncertainty to long-term risk predictions. This study promotes an adaptive risk framework that aligns environmental goals with financial stability and warns against adopting overly strict algorithmic standards to avoid stifling innovation in emerging green industries. Yударuddin and his colleagues studied liquidity risk in Indonesia's fintech based financial ecosystem and identified a contradiction between digital payments and credit risk disclosure. Although mobile banking platforms have improved liquidity management for small businesses, their reliance on credit rating algorithm models has inadvertently increased the concentration of financial data to diversify industry risks. For example, informal enterprises without a history of digital transactions face the problem of automatic credit system exclusion, forcing banks to rely on proxy indicators, which increases incorrect risk classification. This phenomenon highlights the technological limitations of emerging economies in addressing structural inequality, where traditional and digital financial systems cannot coexist.

Yu Mei and Zhou Xiaofei studied the role of financial technology in the restructuring of rural credit processes, with a focus on small and medium-sized farmers. By analyzing blockchain based supply chain financing models, they demonstrated how decentralized ledgers can improve transparency in collateral valuation and reduce defaults caused by false asset declarations. However, the study also documented the challenges of scaling up these solutions, especially in areas with limited Internet infrastructure. Farmers who rely on cash transactions or verbal agreements are still excluded from the digital credit system, highlighting the gap between technological capabilities and local applicability. The author proposes a hybrid risk assessment model that combines community trust networks with digital tools to bridge this gap. He Yanlin and Liu Kefu turned their attention to the impact of financial technology on the supply of credit to small and medium-sized enterprises, stating that although big data analysis has lowered entry barriers for underserved borrowers, it has also introduced new forms of exemptions. Their analysis of emerging Chinese companies shows that AI based risk pricing models disproportionately penalize companies in traditional industries such as manufacturing due to their limited digital footprint. This bias drives companies to prioritize digital transformation over major operational improvements, distorting market competitiveness. The study calls for recalibrating algorithm models to consider industry-specific risks, rather than imposing a single numerical readiness standard.

Due to delayed submission of regulatory data, real-time credit approval algorithms sometimes violate regional credit limits, resulting in banks facing compliance sanctions. This study emphasizes the necessity of a "human in the loop" verification system, which cross verifies algorithm solutions with constantly changing legal requirements, providing flexibility and accountability. Lee and his colleagues raised these issues in the broader discussion of 'smart credit', arguing that the impact of financial technology on risk varies greatly in different institutional contexts. Their editorial emphasizes that decentralized financial platforms (Defi) reduce counterparty risk through smart contracts, but at the same time create system vulnerabilities through interrelated algorithm dependencies. The case study on the joint credit network shows how automatic liquidity pools can trigger liquidity crises when multiple algorithms simultaneously initiate additional guarantees. This emphasizes the importance of conducting stress tests on fintech infrastructure in the context of market turbulence. Hu Jiya's monograph combines these themes from the perspective of strategic industry support, arguing that the risk and profit balance of financial technology depends on policy coordination. By mapping the application of fintech in high-tech manufacturing clusters, this study demonstrates how targeted credit guarantees and IoT monitoring can reduce the risk for lenders

seeking capital intensive innovation financing. However, due to the lack of standardized risk indicators for new technologies such as quantum computing or biotechnology, banks are susceptible to speculative and excessive openness. This work advocates establishing risk corridors for specific industries, where regulatory thresholds can adapt to the cycles of technological maturity. These studies describe financial technology as a disruptive force that both democratizes credit access and undermines the stability of traditional risk management paradigms. The tension between algorithm effectiveness and system vulnerability has become a recurring topic, and scientists advocate for context sensitive implementation. For example, Tang Changchun's emphasis on an adaptive green finance system contrast sharply with Yudaluddin's warning to exclude algorithms from the informal sector, but both emphasize the necessity of balancing innovation and inclusiveness. Similarly, Yu Mei's rural credit hybrid model and He Yanling's industry risk calibration reflect a broader academic drive to adapt fintech solutions to heterogeneous market realities. The ethical aspect of automated decision-making makes the situation more complex. The discovery of regulatory loopholes and analysis of Defi vulnerabilities emphasize the social impact of prioritizing speed over stability. The pursuit of efficiency can institutionalize predatory lending, optimize shareholder profits through algorithms, without embedding guarantees for borrower welfare (such as debt sustainability thresholds). This criticism echoes Hu's political viewpoint that moral hazard management is a prerequisite for implementing sustainable financial technologies.

2.4. Literature review and commentary

Synthesising the existing literature, research on fintech and its impact on commercial bank credit risk has shown a diversified trend. There are obvious differences in the theoretical perspectives, research methods and data selection, with some focusing on the expansion of the connotation of the technology application itself, while others conduct in-depth analyses from the perspectives of risk transmission, internal control and market competition. Although different studies have their own focus on samples, indicators and model construction, they generally emphasise that risk management must be promoted in tandem with business innovation in the process of fintech application. Although the existing results have made some progress, there are still deficiencies in how to construct a risk early warning system with stronger adaptability and wider coverage. Future research should further explore the inherent balance between technology and risk management in cross-regional and cross-market comparative analyses, so as to provide more forward-looking and operational strategic recommendations for the sound operation of commercial banks.

3. Related Theoretical Concepts

3.1. Fintech

The concept of Fintech emerged in the early 2010s as an adjective for technology driven innovation in non-bank payment systems, particularly in the technology ecosystems of Silicon Valley and London. The term initially focused on improving transaction efficiency and security, and later expanded to include various financial activities, including credit services, asset management, and risk control. Its evolution reflects the development from basic business automation to complex data centric financial solutions.

The development of financial technology is usually divided into three stages. The first stage involves digitizing internal business through traditional computer systems. Financial institutions use software tools to perform tasks such as mobile transaction recording and report generation, while external IT providers provide technical infrastructure without directly participating in business strategies. This stage laid the foundation for more comprehensive technological applications.

The second phase coincided with the rise of Internet and mobile technology, which realized real-time data collection and interoperability between platforms. During this period, online loan platforms and digital insurance products have become commonplace. For example, Deng Jingfan's analysis of banking financial technology emphasizes how digital interfaces can reduce reliance on physical

documents, enabling lenders to evaluate borrowers' creditworthiness through alternative indicators such as transaction history and supply chain interactions. This change not only accelerates the credit approval process, but also expands access for small businesses that have historically been marginalized by the traditional banking system.

In the current third stage, advanced technologies such as artificial intelligence and big data analysis dominate the application of financial technology. Ayu and his colleagues' research on micro, small and medium-sized enterprises show how Fintech tools can improve financial literacy through interactive education platforms, while also increasing risk awareness through simulated market scenarios. These tools enable businesses to balance growth goals and risk mitigation strategies. At the same time, Dong Xiaolin and his collaborators studied how algorithms optimize the credit supply of commercial banks by analyzing macroeconomic trends and personal financial behavior. His research suggests that machine learning models enable banks to dynamically adjust their lending strategies to cope with market competition, such as adjusting interest rates based on real-time risk assessments.

The International Financial Stability Board defines Fintech as the integration of modern technologies such as cloud computing and blockchain to promote financial innovation. This definition emphasizes its role in addressing inefficiencies in traditional finance, such as slow trading and opaque risk assessment methods. For example, the decentralized book technology of blockchain has improved the transparency of cross-border payments, while cloud computing supports scalable data processing to monitor risks in real-time. Fintech continues to redefine the global financial ecosystem by bridging the gap between technological capabilities and providing financial services. Its scope ranges from the democratization of credit entering underserved markets to the improvement of risk management agreements for mature institutions. However, the rapid pace of innovation requires regulatory agencies and professionals to constantly adjust to ensure stability and fairness in the increasingly digitized financial environment.

3.2. Credit risk of commercial banks

Commercial banks face inherent credit risks in their credit activities due to uncertain factors such as borrower bankruptcy, information asymmetry, and macroeconomic fluctuations. This risk manifests differently in different types of loans: individual credit ratings prioritize repayment history and debt capacity, while corporate loans emphasize operational stability, cash flow continuity, and project feasibility. The complexity of credit risk lies in its duality - it is objectively inevitable when economic activity begins, but subjectively uncertain because it relies on historical data and predictive models. Credit risk management is based on information asymmetry and trust theory. The theory of information asymmetry suggests that unequal access to critical financial data between lenders and borrowers leads to opposite choices and moral hazard. For example, borrowers may conceal operational weaknesses in order to obtain loans, while lenders may find it difficult to verify the feasibility of the project. The delegation theory further explains how inconsistent incentives between bank managers (agents) and shareholders (principals) prioritize short-term profits over strict risk control. This conceptual framework emphasizes the need to establish mechanisms to coordinate the interests of stakeholders and improve transparency. Recent research has explored how technology integration can change credit risk management in these theoretical contexts. The supply chain finance analysis conducted using FinTech emphasizes how blockchain and IoT devices can alleviate the information gap in multi-layered supply chains, which is a direct response to the problem of information asymmetry. By tracking inventory in real-time and automatically verifying transaction documents, banks have reduced the risk of guarantee fraud and improved the accuracy of valuation. However, Fan also pointed out that excessive automation may weaken human supervision, especially in exposing subtle differences in contracts, which echoes the concerns of trusted parties about accountability in automated systems. Zhang studied the heterogeneity of banks to reveal different risk situations among commercial banks and conducted contextual analysis from the perspective of institutional theory. Compared to traditional banks that rely on central decision-making, institutions

with decentralized management and flexible financial technologies, such as digital banks, have lower non-performing loan ratios. This difference is related to advanced risk modeling capabilities, where machine learning algorithms process alternative data (such as social media activity, utility payments) to detect default warning signals. These models implement the principles of behavioral economics by capturing non-traditional credit indicators, thereby reducing information asymmetry. The green credit research conducted by Zhong Kai and his colleagues demonstrates the application of sustainability theory to credit risk. Renewable energy or sustainable infrastructure projects typically face longer investment return periods and depend on the profitability of policies that require banks to adjust risk thresholds. Their survey results indicate that incorporating environmental risk indicators such as carbon emission targets or compliance into credit assessments may improve the stability of long-term investment portfolios, but specialized monitoring systems are needed. This is in line with the concept of "dual importance" in sustainable development theory, which emphasizes that environmental risks have an impact on both financial stability and social well-being. Empirical research, including Zhang Xin's analysis of 43 Chinese banks, has demonstrated the dual impact of financial technology on credit risk from the perspective of complexity theory. Although AI based risk models have improved the accuracy of default prediction, the opacity of algorithms and data silos has exacerbated system vulnerabilities. For example, banks using decentralized digital systems encounter difficulties in integrating industry risk data, resulting in inconsistent risk assessments, indicating the complexity of the system. Xiao Feng and Tang Guoji further linked this fragmentation to the results, pointing out that in the absence of unified risk control, banks that prioritize green credit growth have greater fluctuations in return rates, reflecting the nonlinear interactions predicted by chaos theory. Active risk management requires continuous adaptation and relies on dynamic capability theory. Banks must find a balance between technical efficiency and scenario judgment, such as combining algorithmic risk assessment with specific experiences in industries such as manufacturing or agriculture. Dynamic monitoring of macroeconomic indicators such as interest rate fluctuations or changes in trade policies can also help adjust credit policies in a timely manner. This approach aligns with emerging practices, where fintech tools enhance rather than replace human experience and develop sustainability in a constantly changing financial environment. By integrating adaptive learning mechanisms into risk models, banks can better manage the interaction between technological revolution and system stability.

4. Analysis of the Current Development Status of Fintech in Commercial Banks

4.1. Advancement of digital transformation

With the integration of technologies such as cloud computing, artificial intelligence, and big data analysis, commercial banks are actively reshaping their operational frameworks through digital transformation. This transformation is consistent with the broader trend of technological innovation in the economy, which enables banks to simplify resource allocation, strengthen interdepartmental cooperation, and modernize customer-oriented services. For example, the research of Chen Lihong and Wang Chaofan emphasizes how the introduction of financial technology can standardize credit risk management and indirectly improve banking business by optimizing and adjusting profits. Their research findings indicate that digital tools can not only improve operational efficiency, but also adjust the link between risk and profit. The significant investment highlights this transformation. In 2024 alone, the six major state-owned banks in China - Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China (ABC), China Construction Bank (CCB), Bank of Communications, Postal Savings Bank of China, and Bank of China - have cumulatively injected approximately 95.7 billion US dollars. The total expenditure of the banking industry in the field of financial technology is about 250-million-yuan, accounting for nearly half of the total expenditure of the banking industry in the field of financial technology. These investments support infrastructure upgrades, such as the artificial intelligence credit rating system researched by Bitetto and colleagues, which aims to improve the reliability of risk assessment for small businesses. However, Bitetto's work

also warns against excessive reliance on machine learning models and points out that algorithm opacity and data bias may undermine the accuracy of heterogeneous market predictions.

The restructuring of human resources also reflects this digital transformation. At present, IT employees account for more than 4% of the total number of employees in large banks, and technology related expenses account for 2% of operating income. This labor expansion helps to deploy advanced analytics in fields such as retail banking and corporate financing. For example, Van Mankan and his team demonstrated how financial technology can improve the efficiency of credit resource allocation by automating credit approval processes and reducing management bottlenecks. Their analysis of corporate financing models shows that banks that use real-time data integration achieve faster turnaround times and lower default rates compared to institutions that rely on traditional systems. People are increasingly focusing on digital strategies for specific industries. In the retail banking industry, mobile applications equipped with biometric certificates and personalized financial planning tools have become standard products. The corporate banking industry is increasingly using blockchain for supply chain financing, which enhances the transparency of multilateral transactions. Wangondu and Muat's research on the Kenyan fintech ecosystem compared how mobile credit platforms can address the financing shortage of micro enterprises, a model that is becoming increasingly popular in rural areas and small and medium-sized enterprises in China. These innovations align with the global trend of integrating financial technology into both formal and informal financial systems, although promoting solutions in regions with imbalanced digital infrastructure still faces challenges. The cooperation between banks and the open banking plan have further accelerated this transformation. The bank is collaborating with fintech startups and cloud service providers to develop a platform for sharing data and regulatory reports. For example, API drivers enable seamless integration between mainstream banking software and third-party applications, promoting innovation in payment gateways and wealth management services. However, as emphasized by Chen Lihong's research, the success of these collaborative efforts depends on a balance between technological flexibility and strong risk control, a lesson emphasized through examples of rapid digitization that go beyond domestic regulatory frameworks.

4.2. Establishment of fintech subsidiaries

Commercial banks are increasingly establishing subsidiaries specializing in financial technology to cope with the evolving technological pattern and improve market competitiveness. These subsidiaries use institutional licenses, research capabilities, and financial resources to drive innovation in data integration, systems development, and risk management. In China, fintech adoption across the financial sector exceeds 87%, and 61% of SMEs use fintech solutions, which is the global benchmark for inclusive digital finance. The strategic creation of fintech subsidiaries reflects the transformation of a broader industry into a collaborative ecosystem. Banks are working with external technology companies to jointly develop platforms that integrate advanced tools such as blockchain and artificial intelligence into their core businesses. For example, Tan Changchun and colleagues highlighted how subsidiaries can achieve green innovation by redesigning the credit allocation framework. By incorporating environmental risk indicators into lending algorithms, these sectors help parent banks align with sustainable development goals while managing sector-specific risks, such as extending the investment recovery period for renewable energy projects. This approach not only supports regulatory compliance, but also positions banks as key players in low-carbon transformation.

Yudaruddin and colleagues' analysis of the Indonesian fintech landscape offers insights into subsidiary-driven risk management. Their research shows that fintech adoption improves liquidity monitoring, but also brings new complications, such as data islands between traditional systems and digital platforms. In response, subsidiaries in emerging markets often prioritize interoperable systems to reduce these risks and ensure seamless data flow across sectors. For example, the real-time liquidity dashboard developed by the subsidiary allows banks to track fluctuations in cash flow and dynamically adjust credit policies, thereby reducing exposure to sudden market changes.

In the field of rural finance, Yu Mei and Zhou Xiaofei showed how fintech subsidiaries can reshape the credit process of small and medium-sized agricultural enterprises. By deploying mobile platforms with biometric authentication and IoT security tracking capabilities, subsidiaries are simplifying loan approval for farmers lacking traditional credit history. These innovations solve the long-standing problem of information asymmetry in rural markets, where physical guarantees are often informal or unregistered. However, the study also points to challenges in expanding these solutions, especially in areas with limited internet connections, prompting subsidiaries to adopt a hybrid model that combines digital tools with community verification. Financial technology subsidiaries also play a vital role in strategic consulting services. In addition to providing, you with infrastructure, they also guide the parent bank to optimize operational workflow and customer engagement strategies. For example, subsidiaries analyze transaction data to identify underserved market segments, allowing banks to design specific products, such as microcredit for women-led businesses or flexible repayment plans for the seasonal sector. This data-driven consulting capability helps banks strike a balance between innovation and risk control, avoiding excessive exposure to volatile industries.

The increase in these subsidiaries highlights the dual concern for technological agility and institutional resilience. By maintaining independent government structures, they have greater flexibility than the traditional banking sector, accelerating pilot testing of emerging technologies such as quantum resilience encryption or the Decentralized Finance Protocol (DFP). However, its success depends on continued consistency with the parent bank's risk appetite and regulatory obligations, ensuring that innovation does not exceed the compliance framework (Table 3-1).

Table 3-1 Establishment of FinTech Subsidiaries by Banks

Parent Bank	Fintech Subsidiary	Established Date	Registered Capital (10K CNY)
Central Bank of China	Chengfang Fintech	Jul-22	200,780
Zhonghui Jinke	Jinke	Jan-22	10,000
Yangtze River Delta Bank	Jinke	Mar-19	6,820
Shenzhen Bank	Jinke	Jun-18	200
Langfang Bank	Yida Technology	Nov-22	200
Xiamen International Bank	Jiyou Technology	Sep-22	1,000
Agricultural Bank of China (ABC)	ABC Fintech	Jul-22	60,000
Zhejiang Commercial Bank	Yiqiyin	Feb-22	2,000
Bank of Communications	Bocom Fintech	Jan-22	60,000
Bank of China (BOC)	BOC Fintech	Jun-19	60,000
Bank of Beijing	BOB Fintech	May-19	5,000
Industrial and Commercial Bank of China (ICBC)	ICBC Fintech	Mar-19	60,000
Huaxia Bank	Longying Zhida	May-18	2,100
China Minsheng Bank	Minsheng Technology	Apr-18	20,000
China Construction Bank (CCB)	CCB Fintech	Apr-18	170,000
China Everbright Bank	Everbright Technology	Dec-16	23,000
Shenzhen Rural Commercial Bank	Qianhai Jinxin	May-16	1,050
China Merchants Bank	CMB Cloud Innovation	Feb-16	5,000
Ping A Group	OneConnect	Dec-15	180,000
Industrial Bank Co., Ltd.	Industrial Digital Finance	Nov-15	90,000

Source: Compiled from announcements on the official website of each banking company

4.3. Development of the mobile internet industry

According to the China Internet Development Report, as of December 2024, the total number of Internet users in China reached 1.332 billion, an increase of 42.96 million over the same period in 2023, with the Internet penetration rate remaining at around 73 per cent. Mobile Internet users reached 1.23 billion, indicating that mobile terminals have become the main way of acquiring and exchanging information. Influenced by this, commercial banks have stepped up their efforts to build online services, actively expanding mobile channels in an effort to provide customers with more convenient financial services with the help of smart terminals. Mobile banking apps launched by several banks have been active in recent years. In 2021 alone, eight organisations, including ICBC, CCB and Agribank, have amassed more than 6,854,963,300 active mobile users. This figure is a good reflection of the widespread use of digital channels in business processing. With the help of mobile platforms, banks can not only achieve efficient connectivity in business processes, but also significantly improve transaction processing and interaction with customers, while reducing the human and material costs of the operational chain. Institutions are striving to improve their service models through the continuous integration of new information technology and data resources, thereby further facilitating business transformation and smart internal management.

4.4. Collaboration with third-party companies

Commercial banks are increasingly collaborating with third-party technology companies to accelerate digital transformation and leverage external expertise to enhance innovation and operational efficiency. This collaboration includes product development, risk management, and market expansion, driven by shared technological and strategic goals. The research by He Yanling and Liu Kefu on the role of financial technology in obtaining credit for small and medium-sized enterprises shows that cooperation with platforms such as Ant Financial and Tencent enables banks to implement AI based risk assessment tools. By combining alternative data such as supply chain transactions and social business behavior, banks have reduced information asymmetry and enabled small and medium-sized enterprises with limited credit records to obtain loans more effectively. For example, joint ventures with e-commerce platforms can help track borrowers' cash flows in real-time and improve the accuracy of credit evaluations. However, their research also suggests that excessive reliance on third-party data may lead to bias, especially for small and medium-sized enterprises in industries with low traditional digital footprints.

The analysis of the impact of financial technology on credit risk by He Yong and his colleagues emphasizes the dual results of this cooperation. Although machine learning models developed in collaboration with tech giants such as Baidu have improved predictive capabilities, issues of algorithm opacity and data interoperability still exist. Banks that cooperate with companies such as Xiaomi and JD.com have noticed a decrease in default rates for consumer loans, but have encountered difficulties in reviewing black box algorithms, making it difficult to comply with regulatory requirements. This highlights the need to establish a hybrid risk assessment system that combines third-party analysis with institutional expertise.

Lee and his team's editorial on smart credit systems emphasizes the transformative potential of these partnerships. Joint initiatives with blockchain and IoT companies, such as Alibaba's supply chain finance solution, enable banks to automate loan disbursement and contract monitoring. For example, smart contracts embedded in agricultural supply chains automatically release funds after delivery checks, thereby reducing fraud risks. These innovations are consistent with Ms. Hu's conclusion on the role of financial technology in supporting strategic industries, where collaborations with technology companies provide specialized financial products for high-tech production and renewable energy. Hu's work further demonstrates that this partnership requires reliable data management protocols to protect sensitive industrial information. In the retail banking industry, cooperation with telecom operators such as China Unicom has strengthened the mobile payment ecosystem. By integrating banking services into a super application platform, banks leverage their large user base to promote financial inclusion. However, the rapid expansion of these services

requires continuous investment in network security, as evidenced by the vulnerability of third-party payment gateways. These cross departmental alliances emphasize strategic balance: utilizing external technological flexibility while maintaining internal control over core financial functions. By jointly developing adaptive structures such as explanatory artificial intelligence models and compatible data platforms, banks are leveraging innovation to reduce risks.

5. Analysis of the Impact of Fintech on Credit Business Risks of Commercial Banks

5.1. Current status of credit risk in Chinese commercial banks under the fintech background

According to the latest data released by the Banking and Insurance Supervision and Administration Commission (BISAC), the total loan assets of China's commercial banks remained stable at the end of 2024. The balance of non-performing loans (NPLs) was about 2.8 trillion yuan, an increase of 13.5 billion yuan from the previous quarter, and the NPL ratio fell to 1.73 per cent, a slight decrease from the previous period. Normal loans totalled \$162 trillion, of which normal loans accounted for the majority and care loans only about \$3.8 trillion. Annual net profit was 2.2 trillion yuan, up 12.6 per cent. Meanwhile, the balance of loan loss reserves was about 5.6 trillion yuan, an increase of 24.2 billion yuan from the previous month, with a reserve coverage ratio of about 196.91 per cent and a loan reserve ratio of about 3.40 per cent, a slight decrease from the previous period. Emerging technologies have had a profound impact on traditional credit operations as the technology wave spreads. Tools such as big data, artificial intelligence and blockchain have been widely introduced into the banking sector, which has significantly changed the approach to information processing and risk monitoring. Banks are often in an exploratory phase when it comes to facilitating digital transformation due to a lack of proven adoption experience, which not only improves operational efficiency, but also increases the cost of trial and error, which continues to increase credit risk. The shift in banking from the traditional point-of-sale model to an online model, while it can shorten processes and save costs, also brings with it problems such as the rapid pace of data updates and the difficulty of controlling the quality of information. The rapid flow of information between regions greatly hampers the detection and protection of basic data, exposing data security vulnerabilities. The Internet has broken geographical restrictions, and inter-provincial and even transnational data flows complicate the risk chain. In the face of growing online business risks, financial institutions must also cope with the uncertainty created by inadequate laws, regulations and regulatory policies. While digitally promoted online credit has flexible operations and simplified processes, it is also prone to misinformation and fraud, which in turn poses serious challenges to risk management. In recent years, a number of consumer financial institutions with a banking background have been fined for inaction in online auditing and lax internal management, which exposes the shortcomings of the credit auditing mechanism in the new context.

5.2. Causes of risks

The formation of credit risk in commercial banks is often influenced by a combination of external and internal factors. First, fluctuations in the economic cycle have had a profound impact on the quality of credit assets. During periods of economic expansion, banks and borrowers are generally optimistic about the future, with strong demand for loans and relatively stable business operations. Currently, there has been a significant increase in credit investment, but this may also mask the potential pitfalls of excessive credit disbursement. In recent years, overall economic growth has slowed and market expectations have become more conservative, particularly in the county market, where increased competition, tighter corporate cash flows and increased default risks have prompted banks to re-examine their credit structure and the size of their investments.

Changes in price levels directly affected the operating costs and market competitiveness of enterprises. Inflationary pressures have increased the cost of raw materials and labour for businesses,

reducing profit margins while prices remain constant; and costs have increased for new loans that have not been disbursed. On the consumer side, price fluctuations have led to fluctuations in purchasing power, altering overall market demand, and this uncertainty has undoubtedly made it more difficult for banks to predict future loan recoveries. Industrial restructuring has also increased the volatility of credit risk. With the rise of the tertiary industry and the gradual shrinkage of the traditional manufacturing industry, credit capital in some regions tends to be concentrated in a few specific industries or companies, which tends to create a risk concentration effect. Once a company or an industry experiences operational difficulties, this joint effect may affect the entire supply chain and even the regional economy. In addition, in the area of agricultural and rural finance, credit risk is further increased by imperfect support services and the lack of guarantees for the marketing and processing of agricultural products. The imperfections in the external credit environment cannot be ignored. If the construction of a market credit system progresses slowly, borrowers are prone to develop malicious delinquency, and the initial collection and post-collection management may fail to function as they should, which in turn triggers more defaults. At the same time, banks have deficiencies in obtaining complete and truthful information about borrowers, and the credit assessment of new customers is often based on limited data, coupled with the fact that applicants conceal some of their actual business conditions, leading to excessive credit conditions. The existence of informal financing channels also puts pressure on the banking system. When some firms or individuals are unable to obtain loans through formal channels, they often resort to private loans, which have opaque information and insufficient risk-control instruments, which can easily lead to over-indebtedness on the part of the borrower and trigger a chain reaction when the capital chain breaks down. The uneven distribution of bank credit has also become more pronounced. Some loans are concentrated in enterprise groups with weak solvency, which often use mutual guarantees to obtain more funds, but once one of them has financial difficulties, the other related loans will also face the risk of default. At the same time, the phenomenon of repeated credit granting to key enterprises occurs from time to time, and if a large loan defaults, it will have a greater impact on the overall quality of assets. In terms of customer structure, with the popularisation of financial technology, bank customers have gradually shifted from large enterprises to small and medium-sized enterprises (SMEs) and ordinary consumers, and these new customer groups have lower financial stability and higher operational risk, which in turn has led to greater uncertainty for bank credit assets.

5.3. Analysis of the impact of fintech on credit business risks of commercial banks

As financial technology continues to permeate banking operations, the changes it brings to risk management and operating models are becoming increasingly evident. First, new technologies have greatly improved the processing of basic banking information. Through the introduction of big data, artificial intelligence and other tools, banks can provide standardised services to many customers at once, significantly reducing investment in a single service. This technological application has enabled the transformation of traditional business processes, increased efficiency within banks and provided strong support for updating business models. At the same time, the rapid rise of external non-financial technology companies has prompted financial institutions to accelerate the pace of technological innovation. In the process of continuously optimising their own technology and services, risk monitoring measures have improved, followed by the absorption of a new group of professionals to drive the restructuring and updating of internal control systems. Collaboration between banks and Internet companies has also become an important force in facilitating business transformation. These two segments complement each other in payments, financing and information integration, utilising cloud computing and big data platforms to build new operating models. With the huge user base and market channels of technology companies, banks can not only expand their business coverage, but also obtain more data support in information collection and risk warning. Such cross-border co-operation helps to quickly capture customer dynamics, adjust risk strategies in a timely manner, and prevent risks from spreading and accumulating in the service chain. The application of new technologies also plays an important role in internal risk control mechanisms. Through massive data

and multiple models, banks can comprehensively assess the credit and repayment ability of borrowers from different dimensions, and accurately classify and predict customer risks with the help of machine learning and deep learning algorithms. Continuous optimisation of internal systems has improved the data processing speed and accuracy of the risk control models, and even introduced cutting-edge technologies such as quantum computing to further strengthen information security. Meanwhile, a traceability system for each operation has been formed through real-time monitoring and recording, making risk identification and elimination timelier and more effective. Throughout the risk management process, new technologies not only improve business operations and risk prevention and control, but also make the process more transparent and effective. The application of biometrics and online identity authentication systems has greatly improved the speed of customer verification and reduced the potential risks associated with false identity information. The clear documentation and delineation of responsibilities at all stages of the process provides for the timely prevention of potential risks, thus mitigating to some extent the risky fluctuations associated with business innovation.

6. Countermeasures for Credit Risk Management in Commercial Banks under Fintech

6.1. Accelerating the process of digital transformation

According to the above research results, technological tools play an important role in reducing banks' credit risks. In order to improve their competitiveness in the market, major banks should continue their digital transformation and improve the efficiency of customer access and service with the help of advanced technologies. The new online credit process must start with a customer visit, a fine-grained audit of customer ratings using smart tools, and effective coupling in subsequent monitoring. Particularly at the customer selection stage, banks must rely not only on policy orientation, but also use data analytics to carefully profile customers, develop personalised products for various needs and truly translate customer characteristics into quality service. Faced with a large amount of dispersed data, banks must reasonably classify the data, build scientific models, and extract highly relevant risk warning indicators through optimisation algorithms. At the same time, with the help of advanced technologies such as big data, artificial intelligence and blockchain, a full-chain digital risk control system has been constructed that goes through pre-credit investigations, credit audits and post-credit monitoring, which enables the real-time capture and transmission of risk information and provides strong support for risk prevention and control.

6.2. Effectively resolving compliance risks in business transformation

In the post-epidemic economic environment, banks' credit risk is on the rise in the transition process. In order to disrupt traditional business models and enable the expansion of online channels, banks are increasingly relying on technological tools to improve risk management and operational efficiency. Existing studies have shown that the level of risk prevention and control has significantly improved with the help of financial technology tools. In this context, banks should take the initiative to build a business ecology centred on digital platforms, continuously update functional modules on the basis of the original system, explore emerging scenarios, strengthen online credit services and product innovation, achieve accurate customer positioning, and scientifically construct risk early warning indicators. While the application of new technologies has improved efficiency, it has also increased compliance risks. In promoting technological transformation, commercial banks must simultaneously establish a complete risk management system to ensure that business changes are always subject to strict supervision. Firstly, internal audit and supervision mechanisms must be improved to keep all kinds of potential risks firmly within manageable limits. Secondly, as the relevant laws and regulations have not yet formed a complete system at this stage, the political trends of the supervisory authorities have had a significant impact on the development of financial

technology. Banks should pay close attention to the guidance issued by the People's Bank of China, the Banking and Insurance Supervision and Administration Commission and other institutions, and constantly adjust their internal systems and risk prevention and control measures to improve their ability to identify and respond to new risks. Banks should also strengthen cooperation in bringing in technological personnel and utilising external professional resources, and improve their information disclosure and internal monitoring systems with the help of cross-border forces. This will not only reduce the potential for default brought about by the application of technology, but also ensure the continued development of credit business while continuing to innovate.

6.3. Innovating digital regulatory means

In the current digital economic environment, financial technology is profoundly affecting bank credit risks at three levels: demand, supply and regulation. On the regulatory front, we must explore new digital monitoring systems and establish a big data platform covering the entire process, so that regulators can respond quickly to risk emergencies and effectively prevent and control the spread of risks with the help of advanced technology. Supervisory authorities should promote data interconnection among banks, encourage the exchange of digital credit information, and establish a good data flow mechanism, thereby facilitating a shift in the credit management model from reliance on traditional experience to a data-driven one, and solving the problems of duplication, fragmentation and over-allocation of credit among regions and industries. Regulators should also strengthen internal coordination, clarify the main responsibilities of financial institutions, implement the regulatory mandates of local governments and relevant departments, and ensure that early warning and risk management are synergistic. Considering the varying impact of fintech on banks of different sizes and types, regulatory strategies could implement layered and differentiated management, and appropriately relax the regulation of small and medium-sized banks. Small and medium-sized institutions often face financial and technological bottlenecks in fostering digital transformation and urgently need political support to promote product innovation and enterprise modernisation. Regulators can encourage mutual cooperation among small and medium-sized banks by building an inter-bank information exchange platform, while guiding large state-owned banks to provide the necessary support and guidance to small and medium-sized institutions, thus forming an industry-wide risk prevention and control network.

6.4. Strengthening data information security management

A solid technological heritage and the training of specialised personnel are crucial in the process of banks using advanced information technology to promote business innovation. Banks should pay close attention to the latest technological developments, invest in research and development and applications in line with their own realities, and utilise advanced tools to promote business innovation. At the same time, we must focus on building a composite team that understands both data processing and credit operations, and promote in-depth co-operation between technology and business departments to ensure that problems can be solved from multiple perspectives. Banks must also establish a comprehensive information protection system to ensure that the entire process, from data collection, transmission and application, is strictly controlled. Firstly, it is necessary to ensure that the data collected complies with relevant laws, regulations and regulatory requirements; on the data transmission link, content relating to customer privacy must be effectively encrypted to prevent unauthorised access; data storage also requires a variety of encryption techniques to ensure information security. At the same time, as technology continues to innovate, banks must continually update and modernise their security protection means, apply the latest information security technologies to practical operations, and form a complete set of dynamic and real-time security monitoring mechanisms. By strengthening the construction of technical teams and inter-departmental coordination, banks can fundamentally improve the level of data protection and provide a strong technical guarantee for the prevention of credit risks.

7. Conclusion

This study focuses on the application of financial technology in credit risk management of commercial banks, and explores digital transformation, business model innovation, improved regulatory tools, and data and information security. With the help of emerging technologies such as big data, artificial intelligence and blockchain, banks can achieve rapid and accurate integration and analysis of massive amounts of data, thereby optimising customer selection, pre-credit approval and post-credit monitoring processes, and effectively improving risk early warning and internal control capabilities. Meanwhile, in-depth co-operation between banks and third-party technology companies has provided a strong impetus for product innovation and business expansion, accelerated the construction of online channels, and achieved resource sharing and risk diversification. On the other hand, while digital transformation brings increased efficiency, it also brings compliance risks and potential information security risks. To meet this challenge, banks must establish a comprehensive risk management system to enhance security protection throughout the process of data collection, transmission and storage, ensuring customer privacy as well as the legitimacy and security of essential data. In addition, inter-departmental co-ordination as well as the introduction and training of specialised staff must be strengthened to facilitate the deep integration of technology and business. Overall, financial technology has not only provided new impetus for the transformation and upgrading of commercial banks, but also increased the complexity of risk management. In the future, banks should improve their internal management and supervisory mechanisms on the basis of continuously promoting technological innovation, so as to realise the organic combination of technological empowerment and stable operation, and provide strong support for economic development.

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