Research on Financial Technology Risk Management and Control in the Context of the Big Data Era

Rongjie Zhang, Jiatong Li

University of Jinan, Jinan 250002, China

Abstract. With the rapid development of internet technology in China, the big data era has gradually emerged, bringing new opportunities and challenges to various fields. In recent years, technologies such as cloud computing, artificial intelligence, and computer technology have been applied across industries. In the financial sector, artificial intelligence and cloud computing have spurred the growth of the fintech industry, marking a significant transformation advantage for the traditional financial industry. However, during the development of the fintech industry, characteristics such as fast dissemination, strong concealment, and difficulty in regulation have introduced certain risks. Various issues, including data security, regulatory challenges, and dissemination speed, have surfaced, severely impacting the healthy development of the financial industry. This paper explores the basic connotations, risk characteristics, and control measures of fintech in the context of the big data era, providing a reference for the sustainable development of China's financial industry.

Keywords: Big Data Era, Fintech, Risk Management and Control.

1. Introduction

The widespread application of big data and artificial intelligence technologies has brought new opportunities to the financial sector, but the impact is twofold. On one hand, it improves the convenience of financial transactions, expands the scope of financial services, and promotes rapid growth in the industry. On the other hand, it introduces many technological risks, which are increasingly complex. As a result, the government has established a dedicated Fintech Committee, that is, the Fintech Committee of the People's Bank of China, which was founded in May 2017, to support and guide the planning and development of the financial industry[1-3]. The committee's main goal is to systematically plan and coordinate future fintech development. Therefore, in the course of fintech reforms, special attention should be paid to risks such as insufficient regulation and data security hazards. Based on the characteristics of internet finance, it is crucial to formulate practical and effective control measures to ensure financial security in the big data era.

2. A Brief Explanation of Fintech

Fintech refers to a financial model that emerges from the combination of finance and technology. It can be understood as the process of reforming the financial market, driven by the power of technology, allowing traditional enterprises to quickly capture markets and improve the efficiency of financial services. China is also benefiting from the emergence of fintech under the background of big data. Currently, the development of China's fintech is mainly reflected in the growth of mobile applications like Alipay, WeChat, and Ping An Pocket Bank, which have gradually penetrated into daily life. The core of fintech operations lies in big data, artificial intelligence, and user experience. Big data provides the foundational architecture and storage for fintech, artificial intelligence offers comprehensive processing technology, and user experience provides a significant advantage in capturing the market.

3.   Characteristics of Fintech Risks in the Big Data Era

3.1. Chain Reaction

In the big data era, the rise of internet finance has transformed the financial sector by not only expanding sales channels but also deepening the integration between financial institutions and e-commerce enterprises. However, the risks associated with fintech exhibit a pronounced chain reaction effect. When a problem arises in one part of a financial transaction or service, it can quickly spread throughout the entire system, triggering a cascading series of risks that may escalate in complexity and intensity. For example, a stock market crisis could lead to currency depreciation, which in turn could impact multiple industries, potentially causing widespread economic instability. The highly interconnected nature of financial institutions and other sectors under the big data framework makes controlling these risks particularly challenging, as they can easily spill over into other domains, compounding their impact on social and economic development.

3.2. High Degree of Harm

Fintech risks have far-reaching and widespread impacts, not only affecting the financial industry but also posing potential threats to national economic security and global stability. In the financial sector, the internet has given rise to third-party payment platforms that, while speeding up transactions, also exponentially increase the volume of transactions. If a third-party platform experiences financial risk, a chain reaction could occur, resulting in severe economic losses for multiple stakeholders. Users who inadvertently click on phishing links could have their bank account or platform balance stolen[4-5]. Unchecked fintech risks may eventually lead to widespread financial crises, causing significant harm to the country's financial industry. While internet transactions improve efficiency, excessive reliance on virtual platforms undermines the foundation of the real economy, and an uncontrolled fintech risk could further weaken economic balance and stability.
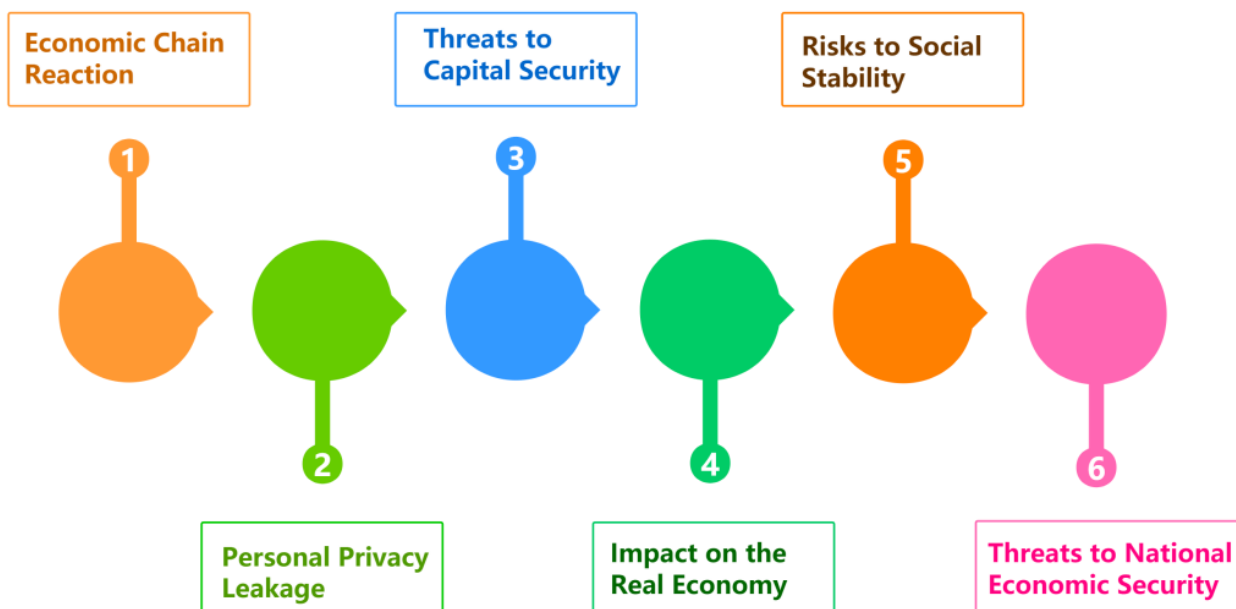

Figure 1. The High Degree of Harm in Fintech Risks

3.3. Concealment

In the big data era, fintech risks are particularly insidious due to their ability to remain concealed, posing substantial challenges to effective risk management. The sheer volume and complexity of data make it difficult to identify hidden risk factors, while the extended latency of these risks often delays timely responses from financial institutions and regulators. Moreover, internet finance relies heavily on advanced computer technology, making it vulnerable to hardware or software malfunctions, which

can result in system crashes and financial risks. Security vulnerabilities in financial software further exacerbate the issue, as hackers or viruses may exploit these weaknesses to steal sensitive client information, leading to significant financial losses. Additionally, risks such as data leakage, human error, and system vulnerabilities compound the difficulty of managing these threats. The interconnected nature of fintech systems intensifies the spread of these risks, making it critical for financial institutions to implement robust risk detection and control mechanisms to mitigate potential harm.

4. The Role of Big Data in Fintech Risk Management

4.1. Enhancing Risk Identification

To ensure the sustainable growth of fintech, it is crucial to enhance risk identification capabilities in the big data era. Big data, with its advanced data processing and analytical prowess, offers unprecedented opportunities for early risk detection[6-7]. Through deep analysis of vast and multidimensional financial datasets, big data can swiftly identify potential risk signals, such as fluctuations in market dynamics, abnormal transaction patterns, and unusual financial activities. This not only improves the timeliness and precision of risk identification but also enables financial institutions to uncover hidden risks that traditional methods might overlook. By detecting these warning signs early, institutions can take proactive preventive measures, mitigating risks before they escalate. Moreover, big data's predictive analytics can help forecast future risk trends, allowing institutions to adjust their strategies accordingly. This capability is essential in maintaining the stability and security of financial systems, supporting the continued development of fintech while safeguarding against emerging threats in a highly interconnected digital environment. Ultimately, leveraging big data enhances risk management, ensuring fintech's stable and sustainable growth.

4.2. Improving Risk Assessment Accuracy

In today's rapidly evolving fintech landscape, ensuring financial stability hinges on the ability to enhance the accuracy of risk assessments. Big data plays a critical role in this process, offering a robust foundation for developing more precise and efficient risk assessment models (Figure 2). By integrating data from various sources—such as customer behavior, market trends, and transactional records—and applying complex algorithms for in-depth analysis, financial institutions can generate comprehensive, real-time evaluations of potential risks. This holistic approach ensures that risk assessments account for a wide range of factors, delivering a more objective and reliable picture of the financial landscape.

Compared to traditional methods, which often rely heavily on human experience, intuition, and subjective judgment, big data-driven models minimize human bias and reduce the likelihood of errors. These models can process vast amounts of data quickly and accurately, identifying patterns and correlations that humans might overlook. As a result, financial institutions can make better-informed decisions, enhancing their ability to mitigate risks while optimizing resource allocation. Ultimately, the use of big data in risk assessments provides a more data-driven, systematic approach to managing the complexities of the fintech industry, fostering greater financial stability.

Figure 2. Importance of Improving Risk Assessment Accuracy

4.3. Increasing Risk Monitoring Efficiency

The quality and efficiency of risk monitoring directly impact the stability of the financial system. Proper use of big data can significantly improve risk monitoring capabilities. Leveraging real-time analysis and processing capabilities, financial institutions can monitor transaction data in real-time, quickly capturing abnormal behaviors. This real-time monitoring ensures that once a risk event occurs, the warning system can be triggered immediately, providing valuable time for quick responses and effective containment. Furthermore, big data can mine historical transaction data, uncover potential risk patterns, and offer precise predictions, enhancing future risk monitoring efforts.

5. Risk Management and Control Measures in the Big Data Era Fintech

5.1. Strengthening Supervision and Regulation

With the widespread application of big data technology, the internet finance industry has ushered in new development opportunities. However, many fintech risks evolve rapidly, pose significant social harm, and are difficult to remedy afterward. In response to this situation, relevant authorities must enhance their supervision of the internet finance industry, adopting a proactive approach to prevent various fintech risks before they arise[8]. Regulatory efforts in the internet finance industry should prioritize the safety of people's assets, constantly improving the security of funds, user information, and transactions within internet finance. Practical and feasible regulatory rules must be established, with clear industry regulatory agencies and a comprehensive regulatory system to ensure the stable development of the internet finance industry. As the core force of regulation, the government should ensure the scientific and effective decision-making, guiding the healthy development of the market through macro-control measures and enhancing the financial system's overall risk resistance capabilities.

5.2. Strengthening Internal Corporate Management

In the internet finance industry, fintech companies play a crucial role, and to ensure the security of the sector, they must improve their internal management practices (see Table 1). Companies need to optimize product designs, quickly addressing product vulnerabilities and improving their own risk prevention capabilities. Fintech companies should also design robust defense systems to prevent financial products from being attacked by hackers. For investment-related products, companies should clearly define their investment directions to avoid high-risk products and refrain from excessive profit-seeking. In terms of financial risk prevention, companies need to establish dedicated risk prevention departments to continuously enhance their ability to identify and control fintech risks, allowing early detection and resolution of risks. Additionally, fintech companies should build risk defense systems to comprehensively manage the company's funds—whether they are incoming, outgoing, or payment-related—and conduct risk assessments for all financial resources.

Table 1. Internal Management Measures

Key Points of internal Management	Specific measures
Product design and optimization	Conduct product security audit regularly to find and fix vulnerabilities in time
	User feedback mechanism is introduced to adjust product functions according to market demand
	Strengthen the cooperation with the third party safety agency to carry out product safety testing
Security defense system construction	Design a multi-level security protection system, including firewall, intrusion detection, data encryption and so on
	Conduct regular safety drills and emergency response training
	Security monitoring tools were introduced to monitor the network security situation in real time
Investment and financial risk management	Clarify the investment direction and risk preference of enterprises, and formulate investment strategies
	Conduct rigorous due diligence on investment projects and assess risks and benefits
	A risk early warning mechanism is set up to dynamically monitor high-risk projects
Set up a risk prevention and control department	Establish an independent risk prevention and control department responsible for overall risk management
	Recruitment of risk management personnel with professional background and practical experience
	Develop and improve the risk management process and system to ensure the standardization and effectiveness of risk prevention and control work

5.3. Emphasizing Risk Disclosure

Currently, although China's fintech industry is thriving, the development process has exposed an unequal relationship between consumers and financial institutions. In the digital wave, consumers often find themselves at an informational disadvantage, making it difficult to access key data promptly and comprehensively, leading to an imbalance in their relationship with financial institutions. To address this risk, changes must be made in information disclosure and related risk notification practices. On the one hand, in the context of fintech development in the big data era, relevant authorities and financial institutions should strengthen consumer education and training, encouraging rational decision-making when choosing financial institutions, investment projects, and consumption options, thus avoiding the pitfalls of new technologies. On the other hand, relevant authorities should rigorously design financial regulations, based on the principle of institutional suitability, and develop detailed requirements for fintech companies' obligations, such as disclosure obligations, to ensure data symmetry and traceability between both parties in transactions.

5.4. Ensuring Data and Information Security

In today's rapidly growing fintech landscape, data is key to enhancing a company's competitiveness, and data security directly affects user privacy protection, corporate reputation, and even social stability. As big data and cloud computing technologies become more widespread, the risks of data breaches and illegal usage also increase. Therefore, it is essential to ensure data security in the fintech industry. To effectively prevent data security risks, financial institutions and related companies must strengthen their data security management, utilizing advanced data encryption technologies to ensure confidentiality during data transmission and storage. Additionally, they should establish comprehensive access control mechanisms to strictly limit data access permissions,

preventing unauthorized access and tampering. Implementing these technical measures will significantly improve data security, safeguarding user privacy and protecting corporate interests[9].

5.5. Building a Comprehensive Risk Supervision System

In today's social context, a single department or industry-specific regulatory model is no longer sufficient to meet the demands of fintech development. Due to the rapid growth of fintech, the financial industry exhibits significant cross-industry and cross-regional characteristics. In this context, a comprehensive risk supervision system must be established. Big data technology should be reasonably applied, promoting cross-departmental and cross-industry information-sharing mechanisms to achieve connectivity and communication of regulatory data. This will help regulatory authorities gain a comprehensive understanding of market dynamics and risk conditions, fostering collaboration among institutions and forming a joint regulatory effort[10]. By enhancing information sharing, regulatory authorities can more accurately identify risk points and formulate targeted regulatory policies, collectively addressing the challenges posed by fintech and ensuring its healthy development.

6. Case Study of Risk Management Using Financial Technology

In the context of the big data era, the application of financial technology in the field of risk management has become increasingly sophisticated, providing strong support for the stability and development of the financial industry. As a leading figure in international financial technology, Goldman Sachs has demonstrated exceptional capabilities in risk management. In 2016, Goldman Sachs began extensively using machine learning algorithms to optimize its credit risk assessment models. By analyzing vast amounts of data, they were able to predict default probabilities more accurately, significantly improving the efficiency and accuracy of risk management. Additionally, Goldman Sachs has actively invested in blockchain technology, exploring its applications in transaction transparency and fraud prevention, further strengthening its risk defenses.

The success of the United States in this field lies in its strong financial technology infrastructure, comprehensive legal and regulatory support, and an innovation-friendly cultural environment. The government has implemented a series of policies to promote the development of financial technology, and regulatory bodies have timely updated the regulatory framework to ensure that while innovation is encouraged, risks are effectively controlled. This balanced development model has provided strong support for financial technology risk management.

The success of Goldman Sachs and the United States offers valuable lessons for China. China should accelerate the construction of its financial technology infrastructure, enhance its data collection, processing, and analysis capabilities. At the same time, it should improve relevant laws and regulations to provide legal protection for the development of financial technology. Finally, an innovation-friendly cultural environment should be cultivated, supporting collaboration and innovation between financial institutions and technology companies in the field of risk management. By implementing these measures, China can learn from and absorb advanced international experiences to enhance its own financial technology risk management capabilities.

7. Conclusion

In conclusion, the big data era has provided new opportunities for the development of internet finance, allowing people to engage in activities such as lending, payments, and wealth management through the internet, making transactions convenient and fast. However, the internet has also brought numerous risks to the financial industry, such as financial fraud and malicious market competition. Fintech is not simply a combination of finance and technology; the application of new technologies introduces significant risks to the financial industry that cannot be ignored. Therefore, in future developments, it is essential to focus on information symmetry in financial institutions, prioritize

upgrading and innovating data security protection measures, and safeguard the sustainable development of China's fintech industry. This will provide strong support for the stable growth of China's financial market and various industries.

References

[1] He, W., Hung, J. L., and Liu, L. (2023). Impact of big data analytics on banking: a case study. J. Enterp. Inf. Manag. 36, 459–479.

[2] Oh, T., Kwon, K., and Sung, H. (2023). Motivations and intentions for equity and reward-based crowdfunding in professional sports. Sport Bus. Manag. 13, 417–430.

[3] Dehnert, M., and Schumann, J. (2022). Uncovering the digitalization impact on consumer decision-making for checking accounts in banking. Electron. Mark. 32, 1503–1528. doi: 10.1007/s12525-022-00524-4

[4] Ennouri, M. F., and Mezghani, K. (2021). "Big data management in the era of FinTech: insights from a literature review," in Influence of FinTech on Management Transformation, eds. A. Sghari, and K. Mezghani (Hershey, PA: IGI Global), 102–120. doi: 10.4018/978-1-7998-7110-1.ch005

[5] Kovács, T., Ko, A., and Asemi, A. (2021). Exploration of the investment patterns of potential retail banking customers using two-stage cluster analysis. J. Big Data 8, 1–25. doi: 10.1186/s40537-021-00529-4

[6] Aho, B., and Duffield, R. (2020). Beyond surveillance capitalism: privacy, regulation and big data in Europe and China. Econ. Soc. 49, 187–212. doi: 10.1080/03085147.2019.1690275

[7] Johnson, M., Jain, R., Brennan-Tonetta, P., Swartz, E., Silver, D., Paolini, J., et al. (2021). Impact of big data and artificial intelligence on industry: developing a workforce roadmap for a data driven economy. Glob. J. Flex. Syst. Manag. 22, 197–217. doi: 10.1007/s40171-021-00272-y

[8] Ferdiana, A. M. K., and Darma, G. S. (2019). Understanding fintech through go-pay. Int. J. Innov. Sci. Res. Technol. 4, 257–260.

[9] Agarwal, S., Alok, S., Ghosh, P., and Gupta, S. (2020). "Financial inclusion and alternate credit scoring for the millennials: role of big data and machine learning in fintech," in Business School, National University of Singapore Working Paper, SSRN, 3507827.

[10] Kijkasiwat, P. (2021). Opportunities and challenges for Fintech startups: the case study of Thailand. ABAC J. 41, 41–60.