

Financial Digitalization Risk Analysis and Countermeasures: The Case of China

Hanrui Liu *

School of Business, Henan University of Science and Technology, Luoyang, China

* Corresponding Author Email: 221406120213@stu.haust.edu.cn

Abstract. In the context of the accelerated digital transformation of global finance, the complexity of the financial system is increasing, and various risks are showing new characteristics. This study takes China as a case to deeply analyze the risks faced in the process of financial digitization, it includes cross-industry risk contagion and systemic vulnerability upgrading, international fintech asset shocks and market pricing distortions, digital risk concealment and regulatory adaptability lag. In view of these problems, this paper puts forward some countermeasures, such as constructing a penetrating joint defense and joint control system, establishing a three-dimensional cross-border defense system, and creating a new paradigm of intelligent supervision. The results show that these measures can effectively deal with the risks of financial digitalization, improve the efficiency of financial supervision, and ensure the stability of financial markets. This study provides a theoretical and practical reference for risk prevention and control in the development of financial digitalization in China and helps to promote the steady development of the financial industry.

Keywords: Financial digitization, risk analysis, penetrative regulation, cross-border defense.

1. Introduction

Finance, as the core of the modern economy, plays a vital role in the global economic system. It not only provides the necessary financial support for economic activities and promotes the effective allocation of resources, but also plays a key role in risk management and economic regulation, the links that link social production, exchange, distribution and consumption have far-reaching implications for maintaining economic stability and promoting growth.

In recent years, China's digital economy has risen rapidly, permeating various industries with remarkable speed and breadth. From the booming e-commerce sector transforming traditional business models to the application of big data and artificial intelligence in manufacturing driving industrial upgrading, the digital economy has fundamentally reshaped the socioeconomic landscape. Among the affected sectors, the financial industry has undergone particularly significant changes. With the widespread adoption of digital technologies such as mobile payments, blockchain, and big data analytics, the financial sector has exhibited a clear trend toward digitization. Against this backdrop, digital transformation powered by fintech has become an unstoppable trend across industries. As one of the core enablers, big data technology empowers traditional commercial banks to extract value from diverse business datasets and achieve breakthroughs [1]. Mobile payments have revolutionized transaction habits with their convenience and efficiency; blockchain technology offers a more secure and transparent approach to financial transactions; and big data analytic enables financial institutions to conduct more precise risk assessments and customer profiling.

However, the advancement of financial digitization has also revealed multiple challenges. Rapid cross-sector risk contagion, the impact of international fintech assets, and the opacity of digital risks all pose substantial threats to financial stability and regulatory effectiveness. In light of these issues, this study conducts an in-depth analysis and proposes targeted recommendations to support the sound development of financial digitization in China.

2. Risk Challenges

2.1. Cross-sector Risk Contagion and Escalating Systemic Vulnerability

In the digital age, the business exchanges between fintech enterprises and traditional financial institutions are becoming more and more frequent, and the cooperation modes such as payment and clearing and credit linkage make the two closely linked. Cross-industry risk contagion refers to the phenomenon that financial risks break through the boundaries of a single industry and spread and affect each other in different industries. With advanced technical means, fintech enterprises have expanded rapidly in the fields of payment and credit, forming a complex risk correlation network with traditional financial institutions.

The empirical research of Mao shows that this risk correlation is much higher than that of traditional financial peers, forming a unique two-way transmission mechanism [2]. When something goes wrong in one area, the risk spreads rapidly, magnifying systemic risk significantly. Take the liquidity crisis of a 2024 fintech platform in Guangdong province, for example. The platform broke its capital chain due to its own poor management. Due to the complex relationship between fund custody and credit exposure with cooperative banks, banks have loopholes in the supervision of fund custody and excessive concentration of credit funds. After the news of the fracture of the platform's capital chain came out, it triggered a number of banks that cooperated closely with it to withdraw money from depositors in a short period of time, which fully demonstrated the distinctive characteristics of risk chain transmission under the background of digitalization.

From the perspective of infrastructure, there is a risk of structural differentiation between the semiconductor industry and the telecommunications service industry. The technology iteration cycle of semiconductor industry has been greatly shortened, the market environment is extremely unstable, and the price fluctuation range has been maintained at a high level for a long time. As the key node of financial data transmission, the systemic importance index of Telecom service industry is much higher than the average value of traditional financial infrastructure. This structural difference leads to the asymmetry of risk transmission path. Sudden technological changes in the semiconductor industry could affect the supply of its products and, in turn, the operations of the fintech companies that depend on them; and problems such as network failures or data breaches in the telecommunications services industry, the data transmission and business operation of financial institutions will be directly affected, and the risk transmission between the two is not a simple linear relationship.

2.2. Impact of International Fintech Assets and Market Pricing Distortions

Cross-border capital flows have a double impact on the domestic market. The impact of cross-border capital flows refers to the phenomenon that foreign capital enters or exits the domestic financial market through various channels, affecting market stability and asset prices. The impact of offshore shorting on domestic technology stocks using derivatives markets can not be underestimated.

The econometric model of Mao shows that the beta coefficient of foreign short capital to domestic technology stocks is -1.23, and the impact elasticity coefficient of the technology sector is as high as 2.05, that means foreign short-sellers can easily trigger big swings in tech share prices [2]. In the 2024 stock connect data leakage incident, some a-shares have an abnormal one-day turnover rate of more than 30%, which fully exposes the time zone arbitrage loopholes in the current cross-border data flow regulation. Foreign criminals take advantage of the differences in the trading time of financial markets in different time zones to carry out precise arbitrage operations through the obtained data, which seriously disrupts the order of domestic financial markets [3].

Market imbalances have been exacerbated by digital arbitrage. Digital asset arbitrage refers to the behavior of using the price difference of digital assets in different markets or at different trading times to buy low and sell high to obtain profits. The research shows that the rapid development of digital finance has significantly increased the risk-taking level of commercial banks, and the expansion of risk exposure will further amplify the distortion effect of cross-border arbitrage on market pricing.

Guan monitoring data show that the scale of regulatory arbitrage implemented by the head platform using blockchain technology has reached a certain proportion of annual revenue, among which cross-time zone arbitrage accounts for a large proportion [4]. The cross-border payment arbitrage implemented by an exchange through smart contracts, the time difference income of a single transaction is far more than the average level of the traditional arbitrage model. These digital asset arbitrage behaviors make the market price unable to truly reflect the value of assets, which further aggravates the instability and unfairness of the market.

2.3. Opacity of Digital Risks and Lagging Regulatory Adaptation

With the rapid development of financial technology, the technical black box effect has significantly increased the difficulty of risk identification. Technology black box effect refers to the complex technology models and algorithms in financial technology, such as DEFI protocol, smart contract, etc. . Its internal operation mechanism is difficult to understand and explain, which leads to challenges in risk identification and supervision.

The research of Han Long et al. shows that the risk spread caused by DEFI protocol vulnerabilities is much faster than traditional financial risks, and the smart contract vulnerabilities of a platform have caused huge losses in a short time [5]. However, there is a long time lag in the identification of algorithmic risk by traditional regulatory means. Qi pointed out that this time lag is as long as 72 hours, and such a long time lag provides sufficient space for the continuous accumulation of risk [6].

The diminishing returns dilemma of regulating investment in science and technology. The diminishing returns of ST investment means that with the continuous increase of ST investment, the improvement of benefits such as risk identification coverage with each additional unit of investment gradually decreases. Industry-wide 2023 investment in regulatory technology has increased significantly, but the increase in risk identification coverage has been limited. In addition to the problem of technical architecture bearing, the uneven quality of data, the limitations of the algorithm itself and the difficulty of cross-agency collaboration have also restricted the effectiveness of Regtech to a certain extent [7] .

3. Countermeasures

3.1. Establishing a Penetrative Joint Prevention and Control System

The penetrative joint prevention and control system refers to breaking down information and collaboration barriers across different levels and departments in multi-domain management or emergency response scenarios. Through in-depth data mining and meticulous process refinement, this system ensures precise implementation of preventive measures at each critical node, enabling comprehensive insight into various risk factors. All participating entities collaborate closely under unified coordination, forming an interconnected organic whole that spans information collection, analysis and assessment, to measure implementation.

Whether precisely intercepting transmission chains in public health emergencies or preemptively mitigating potential risks in social safety management, this system significantly enhances prevention efficacy and optimizes resource allocation through its characteristics of comprehensive coverage, precision, efficiency, and coordinated synergy. It thereby establishes a robust defense line to ensure stable and orderly social functioning.

To address cross-sector risk transmission, the consortium stress testing model proposed by Pei has been piloted across multiple institutions with notable results [8]. By simulating risk contagion among financial institutions under various scenarios, this model effectively contains cross-institutional risk exposure within reasonable limits.

3.2. Establishing a Multi-dimensional Cross-border Defense System

In terms of data flow control, implementing a three-dimensional circuit breaker mechanism is crucial. This mechanism includes: Automatic review triggers when daily data traffic exceeds predefined thresholds; Manual verification activation when hourly transaction frequency surpasses specified limits; Stringent accuracy requirements for sensitive field identification.

Market stabilization mechanism innovation also serves as a critical approach to addressing cross-border financial risks. Enhancing the financial audit and supervision framework represents one of the key objectives for safeguarding the healthy development of China's financial markets [9]. After implementing the Minimum Connectivity Hedging Model, CICC (China International Capital Corporation) observed significant reductions in portfolio volatility and maximum drawdown. These measures have effectively stabilized market sentiment and mitigated risks associated with substantial market fluctuations.

3.3. Creating a New Paradigm for Intelligent Regulation

At the technological supervision level, ICBC's pilot "Regulatory Probe" system has achieved near real-time risk interception, successfully blocking a substantial number of abnormal transactions. The Yangtze River Delta regulatory sandbox, employing federated learning technology, has significantly improved risk identification accuracy, prevented multiple major risk incidents, and recovered enormous losses. These technological solutions function as vigilant guardians, continuously monitoring transaction activities and taking immediate action upon detecting anomalies, thereby greatly enhancing regulatory efficiency and precision.

Regarding institutional innovation, the "Financial Data Ownership Regulation" has established three core principles: 100% national archival rate for raw data; Multi-tiered authorization for usage permissions; Mandatory minimum proportion of benefits redirected to support the real economy.

In a high-value fictitious trade financing case, the blockchain-based evidence preservation system dramatically reduced case resolution time. Through well-defined institutional frameworks and advanced technological applications, these measures ensure lawful and compliant utilization of financial data while improving investigation efficiency for financial crimes [10].

4. Conclusion

4.1. Summary of Research Findings

This study focuses on the risks associated with digitization in China's financial sector, providing a detailed analysis of cross-industry risk contagion, the impact of international fin-tech assets, and the hidden nature of digital risks, all of which pose significant threats to financial stability. Through in-depth research, the study proposes countermeasures such as constructing penetrative joint prevention and control system, establishing a multi-dimensional cross-border defense framework, and creating a new paradigm for intelligent regulation. Practical applications have demonstrated the effectiveness of these measures in pilot programs, successfully controlling risk exposure, stabilizing market sentiment, and enhancing regulatory efficiency. These findings are of great significance in safeguarding the healthy development of financial digitization in China.

4.2. Future Research Directions

Although this study offers a comprehensive exploration of digital financial risks and corresponding mitigation strategies, there remains room for further research. Future studies may focus on the following areas: First, Risk Evolution Across Economic Cycles: Further investigation into how digital financial risks evolve under different economic conditions to enable more accurate risk prediction; Second, International Regulatory Cooperation: Exploring ways to strengthen cross-border financial regulatory collaboration to collectively address global financial risks and improve the international financial governance framework; Third, Emerging Technologies and Risks: Assessing the potential

impact of cutting-edge technologies such as quantum computing on digital financial risks, with the aim of proactively developing risk prevention and control strategies.

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