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Systemic Financial Risk Contagion Effects: An Analysis from the Perspective of FinTech Empowerment

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ABSTRACT The development of FinTech empowers traditional financial institutions with new business models and operation methods. At the same time, it also leads to high risk-taking of financial institutions and poses regulatory challenges to the financial system, threatening financial stability and accumulating potential systemic financial risks. From the perspective of FinTech empowerment, this paper takes Chinese financial market data from 2015 to 2024 as samples, applies the SIRS epidemic model, DCC-GARCH model and network analysis method, and explores the internal mechanism, key paths and heterogeneous characteristics of FinTech affecting systemic financial risk contagion. The study finds that FinTech has a "dual effect" on systemic financial risk contagion: on the one hand, it restrains risk contagion by alleviating information asymmetry, optimizing risk early warning systems and improving resource allocation efficiency through technological empowerment; on the other hand, it intensifies contagion by enhancing the correlation of financial institutions, amplifying technical vulnerability risks and accelerating risk diffusion. Risk contagion shows network-based characteristics across institutions and markets, with the banking industry as the core node of risk contagion, and the securities industry, insurance industry and FinTech companies as important transmission intermediaries. The development level of FinTech, institution type and regulatory intensity significantly affect the risk contagion effect. Finally, this paper puts forward countermeasures from three dimensions: technological innovation, risk prevention and control, and regulatory improvement, providing references for preventing and resolving systemic financial risks.

INDEX TERMS fintech,systemic financial risk,risk contagion,sirs model,financial network

I. INTRODUCTION

A. RESEARCH BACKGROUND

WITH the advancement of information technology and industrial digital transformation, the application of FinTech has gradually deepened worldwide[1,2]. Accordingly, international organizations, financial institutions and regulatory authorities of various countries have paid extensive and close attention to FinTech[3]. The core technologies of FinTech mainly include AI (Artificial Intelligence), B (Blockchain), C (Cloud Computing) and D (Big Data)[4]. On the one hand, a series of innovations and sound development of FinTech have penetrated the financial market, bringing new vitality to traditional financial services and promoting the sustainable development of FinTech itself. On the other hand, FinTech companies use their own technologies to compete for businesses and profits with the traditional financial industry, squeezing the market share of traditional financial institutions[5].

After the global subprime mortgage crisis in 2008, the importance of systemic financial risk has become increasingly prominent, turning into a key supervision object of regulatory authorities and a focus in the field of risk research[6]. The concept of financial regulation has shifted from individual micro-prudential supervision to overall macro-prudential supervision. Systemic financial risk is a macro-level risk with inter-institutional transmission[7]. Once the crisis of one financial institution is triggered, even institutions or industries that performed steadily before the crisis will be affected due to their existence in the social network relationship. In recent years, the increasingly complex and rapidly changing economic and financial environment has brought many unstable factors to economic and social development, and original hidden risks have gradually become explicit, putting forward higher requirements and challenges for China's financial supervision[8]. Against this background, clarifying the internal correlation between FinTech empowerment and systemic financial risk contagion, identifying the key paths and core nodes of risk contagion, and exploring the heterogeneous characteristics of risk contagion are of great practical significance for preventing and resolving systemic financial risks, promoting the healthy development of FinTech, and maintaining financial stability.

B. RESEARCH SIGNIFICANCE

Most existing studies focus on two aspects: the impact of FinTech on individual risks of single financial institutions, and traditional financial risk contagion mechanisms[9-11]. Research on systemic financial risk contagion from the perspective of FinTech empowerment is not in-depth enough.

This paper introduces the SIRS epidemic model and network analysis method, and conducts research combined with the technical characteristics and business models of FinTech. It reveals the dual effect and internal mechanism of FinTech affecting systemic financial risk contagion, enriching the interdisciplinary research field of FinTech and systemic financial risk. Meanwhile, it provides a theoretical framework and research methods for subsequent relevant studies.

C. RESEARCH STATUS

Ba Shusong believes that FinTech organically integrates finance and technology to optimize financial services to the greatest extent[12]. By sorting out existing studies, Goldstein holds that FinTech brings a revolution to the financial industry through new technologies: the application of big data technology reduces opportunistic transactions, blockchain improves transaction efficiency, and intelligent investment advisors meet diversified and customized demands[13]. Among them, blockchain and intelligent investment advisors create the greatest value[14]. With the popularization of blockchain technology and the improvement of digital capabilities, blockchain will become a more efficient auxiliary financial tool[15]. Its decentralized feature improves the efficiency of payment and settlement, significantly reduces transaction costs and increases returns[16]. The development of FinTech has greatly broadened financing channels beyond banks. Taking regulatory changes as an exogenous shock to bank credit supply, Tang finds that P2P loans can substitute bank loans, especially supplementing bank loans in small-sum financing[17]. Moreover, loans generated via FinTech improve households' risk resilience and serve as an important way to improve financial access[18].

Some scholars emphasize that FinTech intensifies systemic financial risk contagion. For example, FinTech enhances the correlation between financial institutions, making it easy for risks of a single institution to spread rapidly through the network and trigger systemic risks [19]. Gai et al. (2021) find that the wide application of algorithmic trading, smart contracts and other technologies amplifies market fluctuations, triggers extreme risks such as "flash crashes", and accelerates cross-market risk contagion[20].

D. RESEARCH REVIEW

Existing studies have confirmed the dual impact of FinTech on systemic financial risk contagion, but still have deficiencies:

(1) Most focus on a single market or institution, lacking systematic analysis of cross-market and cross-institutional risk contagion.

(2) Research on the dynamic mechanism, network structure and heterogeneous characteristics of risk contagion is not in-depth enough.

(3) Empirical research methods are relatively single, and few combine epidemic models with network analysis.

E. RESEARCH CONTENT AND METHODS

1) Research Content

This paper is divided into six parts:

(1) Introduction: expounds the research background, significance, status, content and methods.

(2) Relevant concepts and theoretical basis: defines core concepts and sorts out relevant theories.

(3) Theoretical analysis of systemic financial risk contagion under FinTech empowerment: explores the dual effect, influence mechanism and contagion paths.

(4) Empirical analysis: constructs models, selects data and analyzes results.

(5) Countermeasures and suggestions: puts forward proposals from the aspects of technology, prevention and control, and supervision.

(6) Conclusion and prospect: summarizes research conclusions and points out research deficiencies and future directions.

2) Research Methods

- Literature Research Method: sorts out domestic and foreign literature on FinTech, systemic financial risk and risk contagion, laying a theoretical foundation and clarifying the research entry point.
- Theoretical Analysis Method: combines the technical characteristics of FinTech and the theory of systemic financial risk contagion to analyze the dual effect, internal mechanism and key paths of FinTech affecting risk contagion.
- Empirical Research Method: based on Chinese financial market data from 2015 to 2024, uses the SIRS epidemic model to simulate the dynamic process of risk contagion, adopts the DCC-GARCH model to measure risk spillover effects, and combines network analysis to identify core nodes and network structure of risk contagion.
- Comparative Analysis Method: compares the differences of risk contagion effects under different types of financial institutions, different FinTech development levels and different regulatory intensities, revealing heterogeneous characteristics.

II. THEORETICAL ANALYSIS OF SYSTEMIC FINANCIAL RISK CONTAGION UNDER FINTECH EMPOWERMENT

A. THE DYNAMIC BALANCING MECHANISM OF THE DUAL EFFECT: A THRESHOLD PERSPECTIVE

The net impact of FinTech on systemic risk is not static but depends on the relative strength of the "efficiency gain" versus "connectivity risk." We define a theoretical threshold based on the "Institutional Substitution

Rate": when the rate of technological adoption outpaces the internal risk-control capacity of traditional institutions, the "Intensifying Effect" (driven by hyper-connectivity) overpowers the "Inhibitory Effect" (driven by information symmetry), leading to a net increase in systemic vulnerability. Specifically, in the early stages of FinTech penetration, information gains dominate; however, as network density reaches a critical saturation point, the amplification of technical shocks becomes the primary driver of contagion.

B. INHIBITORY EFFECT: TECHNOLOGICAL EMPOWERMENT MITIGATES RISK CONTAGION

Through technological innovation and model optimization, FinTech restrains systemic financial risk contagion from three dimensions: information, risk early warning and resource allocation.

- Alleviate information asymmetry and reduce the probability of risk contagion Big data technology integrates multi-dimensional market information, and artificial intelligence technology accurately processes and analyzes various information. The two technologies break inter-industry information barriers and improve the accuracy of financial risk pricing.
- Optimize risk early warning system and block risk contagion paths Artificial intelligence and machine learning technologies can monitor financial market trends and risk changes of various financial institutions in real time. Researchers can build intelligent risk early warning models based on these technologies. The models can identify hidden risks in advance, and relevant institutions can introduce risk control measures timely.
- Improve resource allocation efficiency and enhance risk resistance FinTech broadens the coverage of financial services, improves capital allocation efficiency, promotes diversified operation of financial institutions, enhances the risk resistance of individual institutions, and reduces the possibility of risk contagion. For example, supply chain finance platforms optimize financing channels for small and medium-sized enterprises by integrating capital flow, information flow and logistics in the industrial chain, reducing enterprise operational risks and indirectly restraining financial risk contagion.

C. INTENSIFYING EFFECT: TECHNICAL CHARACTERISTICS AMPLIFY RISK CONTAGION

The technical characteristics and business model defects of FinTech intensify systemic financial risk contagion from three dimensions: network connection, technical risk and risk diffusion.

- Enhance financial network correlation and expand the scope of risk contagion FinTech breaks the original boundaries between institutions, markets and regions; builds a cross-institutional, cross-market and cross-regional financial interconnection network; and significantly enhances the correlation between various financial institutions.

Once a single financial institution encounters risks, the risks tend to spread rapidly through the interconnection network to the entire financial system, further expanding the coverage of risk contagion.

- FinTech-specific technical vulnerabilities and the evolution of algorithmic risks increase hidden dangers of risk contagion The operation of FinTech relies on core technologies such as big data, artificial intelligence and blockchain.

While algorithmic trading and high-frequency volatility predate the modern FinTech era, the integration of deep learning AI and decentralized blockchain protocols introduces novel dimensions of risk. Unlike traditional quantitative models, AI-driven FinTech models can exhibit "black-box" behaviors and pro-cyclicality through autonomous learning, while decentralized systems may lack centralized circuit breakers. These modern technical risks—characterized by algorithmic opacity and cross-platform synchronization—interact with traditional automated trading risks to accelerate the spread of risks. Technical risks are characterized by suddenness and contagion, which can quickly transmit from the technical level to the actual financial business level, induce conventional financial risks and accelerate the spread of risks.

- Accelerate risk diffusion speed and enhance risk contagion intensity FinTech turns financial transactions into digital and real-time operation modes. Risk information can spread instantaneously via the network, greatly accelerating the overall contagion speed of risks. Meanwhile, algorithmic trading, high-frequency trading and other technologies are widely used in the market, amplifying price fluctuations in financial markets. The market is prone to risk resonance, further raising the intensity of risk contagion.

D. INTERNAL MECHANISM OF FINTECH AFFECTING SYSTEMIC FINANCIAL RISK CONTAGION

1) Information Mechanism: Distortion and Amplification of Information Asymmetry

FinTech changes the mode and quality of information dissemination through big data and algorithmic technologies, distorts the degree of information asymmetry, and further affects risk contagion.

- Positive information effect: FinTech expands the scope of information collection, improves information processing efficiency, alleviates information asymmetry, and reduces the probability of risk contagion.
- Negative information effect: Algorithmic bias, data monopoly, information leakage, false information dissemination and other problems aggravate information asymmetry, leading to distorted risk pricing and market panic.

2) Network Connection Mechanism: Reconstruction and Strengthening of Financial Network Structure

FinTech reconstructs the financial network structure, enhances network correlation and complexity, and changes the paths and intensity of risk contagion.

- Increased network density: FinTech breaks industry barriers. Banks, securities companies, insurance companies, FinTech companies, real enterprises and other entities form a dense network through business cooperation, data sharing and capital transactions, increasing risk contagion paths.
- Enhanced network strength: FinTech deepens business cooperation and capital transactions between entities, strengthening network connection intensity, making risk contagion faster and more intense.
- Prominent core nodes: Large banks and leading FinTech companies become core network nodes by virtue of capital, technology and data advantages, exerting greater influence on risk contagion and easily triggering systemic risks.

3) Technical Risk Transmission Mechanism: Transformation and Diffusion of Technical Risks to Financial Risks

Technical risks of FinTech transform into financial risks and spread through business connection, data sharing, system docking and other channels.

- Operational-Technical nexus to Transactional Risk: Specifically, systemic technical vulnerabilities or synchronized API failures lead to the degradation of high-frequency execution capabilities and settlement latency.

These disruptions manifest as liquidity-driven transactional risks, where service interruptions prevent the timely fulfillment of margin calls or clearing obligations, thereby cascading into broader business risks.

- Business risk → institutional risk: Accumulated business risks result in deteriorated asset quality, declining profitability and liquidity shortage of financial institutions, triggering institutional risks.
- Institutional risk → systemic risk: Institutional risks spread to other institutions through the financial network, triggering risk resonance and eventually evolving into systemic financial risks.

E. CONTAGION PATHS OF SYSTEMIC FINANCIAL RISK UNDER FINTECH EMPOWERMENT

1) Cross-Institutional Contagion Paths

- Bank → FinTech company → other institutions: Banks cooperate with FinTech companies in joint loans, fund depository and other businesses. Bank risks spread to FinTech companies through capital transactions and business cooperation, and then to securities companies, insurance companies, real enterprises and other affiliated institutions via FinTech companies.
- FinTech company → bank → other financial institutions: Leading FinTech companies establish cooperation with multiple banks through payment, wealth management, credit and other businesses. Risks of FinTech companies spread to cooperative banks through data sharing, system docking, fund clearing and other channels, and then to other banks and non-bank financial institutions via banks through interbank lending and credit businesses.

2) Cross-Market Contagion Paths

- Money market → capital market → foreign exchange market: FinTech improves the efficiency of cross- market capital flow. Liquidity risks in the money market spread to the capital market (stocks, bonds, etc.) through capital flow, triggering asset price fluctuations, and then to the foreign exchange market through exchange rate transmission, forming a cross-market risk closed loop.
- FinTech market → traditional financial market: Risks in the FinTech market (e.g., digital currency, online lending) spread to traditional financial markets such as banking, securities and insurance through investor sentiment, capital linkage, business connection and other channels, triggering fluctuations in traditional financial markets.

3) Cross-Regional Contagion Paths

FinTech breaks geographical restrictions, realizing online and globalized financial services and transactions. Risks can spread rapidly across regions via the network.

- Domestic inter-regional contagion: Risks in financially developed eastern regions spread to financially underdeveloped central and western regions through FinTech networks (e.g., national payment platforms, online credit platforms), triggering regional financial risks.
- International contagion: Global FinTech interconnection enables risks in international financial markets to spread to China's financial market through digital currency, cross-border payment, cross-border wealth management and other businesses, importing systemic financial risks.

F. ANALYSIS OF HETEROGENEOUS CHARACTERISTICS OF RISK CONTAGION

1) Institutional Type Heterogeneity

- Banking industry: As the core of the financial system, banks have large asset scale, extensive business connections and strong risk contagion influence, serving as the core node of systemic financial risk contagion. FinTech has the most significant impact on banking risk contagion. Local commercial banks and small and medium-sized banks are more affected by the intensifying effect of FinTech due to weak technical foundation and insufficient risk control capacity.
- Securities industry: The securities market has large fluctuations and strong risk contagion. FinTech am-

plifies market fluctuations through algorithmic trading, intelligent investment advisory and other businesses, intensifying risk contagion.

- Insurance industry: The risk contagion of the insurance industry is relatively weak, but FinTech promotes insurance product innovation (e.g., internet insurance), enhances the correlation between the insurance industry and other financial institutions, and gradually shows risk contagion effects.
- FinTech companies: FinTech companies have high technical risks, complex business models and close connections with traditional financial institutions, acting as important transmission intermediaries of risk contagion. Leading FinTech companies tend to become sources of risk contagion.

2) FinTech Development Level Heterogeneity

- High-development-level regions: With sound FinTech infrastructure, mature technology application and a complete regulatory system, the inhibitory effect of FinTech dominates, with low probability and intensity of risk contagion.
- Low-development-level regions: With weak FinTech technical foundation, insufficient risk control capacity and lagging supervision, the intensifying effect of FinTech dominates, with high probability and intensity of risk contagion.

3) Regulatory Intensity Heterogeneity

- Strong supervision environment: Strict financial regulation can standardize the development of FinTech businesses, strengthen risk prevention and control, block risk contagion paths, weaken the intensifying effect of FinTech and enhance the inhibitory effect.
- Weak supervision environment: Lagging supervision and regulatory gaps easily lead to disorderly development of FinTech businesses and invalid risk control, amplifying the intensifying effect of FinTech and causing more serious risk contagion.

III. EMPIRICAL ANALYSIS

A. MODEL CONSTRUCTION

1) SIRS Risk Contagion Model

Referring to epidemic theory, this paper constructs a SIRS model to depict the dynamic contagion process of systemic financial risks under the background of FinTech. Financial institutions are divided into three categories: Susceptible (S) – institutions not infected but vulnerable to risks; Infected (I) – institutions infected and contagious; Recovered (R) – institutions recovered after infection with temporary immunity. Basic assumptions of the model:

(1) The total number of financial institutions $N = S + I + R$ remains unchanged.

(2) After contact with infected institutions, susceptible institutions turn into infected ones at the infection rate λ.

(3) Infected institutions turn into recovered ones at the recovery rate μ.

(4) Recovered institutions may return to a susceptible state at the rate ω, which represents the "Risk Re-exposure Rate" rather than a natural loss of biological immunity. This transition is economically driven by the "forgetting" effect in market memory or the erosion of institutional prudence over time; as institutions seek higher yields in a stabilized environment, they may gradually relax the stringent risk control measures adopted during the recovery phase, thereby becoming vulnerable to new waves of contagion or secondary shocks.

Based on the above assumptions, the differential equations of the SIRS model are constructed:

$$\begin{aligned} \frac{dS}{dt} &= -\lambda SI + \omega R, \\ \frac{dI}{dt} &= \lambda SI - \mu I, \\ \frac{dR}{dt} &= \mu I - \omega R. \end{aligned} \tag{1}$$

Where $\frac{dS}{dt}$, $\frac{dI}{dt}$, and $\frac{dR}{dt}$ are the change rates of the number of susceptible, infected and recovered institutions respectively; λ is the risk infection rate reflecting risk contagion speed; μ is the risk recovery rate reflecting risk prevention and control capacity; ω is the risk re-exposure rate, reflecting the cyclical nature of financial vulnerability where post-crisis institutional behavior eventually reverts to profit-seeking patterns that lower protective barriers.

2) DCC-GARCH Risk Spillover Model

To accurately measure the risk spillover effects between different financial markets under the background of FinTech, this paper constructs a DCC-GARCH model. Let the financial market return series be $r_t = (r_{1t}, r_{2t}, \ldots, r_{nt})'$, satisfying:

$$r_t = \mu_t + \epsilon_t, \quad \epsilon_t \mid F_{t-1} \sim N(0, H_t) \tag{2}$$

Where μ_t is the mean return; ϵ_t is the residual term; F_{t-1} is the information set of period $t-1$; H_t is the conditional covariance matrix, decomposed as:

$$H_t = D_t R_t D_t \tag{3}$$

$$D_t = \mathrm{diag}(\sqrt{h_{1t}}, \sqrt{h_{2t}}, \ldots, \sqrt{h_{nt}})$$

is a diagonal matrix, h_{it} is the conditional variance of the univariate GARCH model; R_t is the dynamic conditional correlation matrix reflecting the intensity of inter-market risk spillovers.

B. VARIABLE SELECTION AND DATA DESCRIPTION

1) Variable Selection

- FinTech development level (FinTech): While institutional-level infrastructure data is preferred, this study utilizes the Digital Inclusive Finance Index as a primary proxy, supplemented by a "FinTech Infrastructure Intensity" weighting based on regional investments in financial patents and data center density.

Although the index captures retail-oriented coverage and usage depth, its high correlation with institutional technological adoption makes it a viable macro-proxy. To address data granularity concerns, we interpret the "usage depth" and "digital service level" dimensions specifically as indicators of the underlying digital interconnectedness between the retail interface and the institutional clearing/settlement backends that facilitate risk transmission. The data interval is from January 2015 to December 2024, using monthly frequency data to ensure a sufficient sample size (N=120) for complex model estimation.

- Systemic financial risk (Risk): Measured by the Financial Stress Index (FSI). Core indicators are selected from the banking, securities, insurance, money and foreign exchange markets, including bank non-performing loan ratio, stock market volatility, insurance payout ratio, interbank lending rate and exchange rate volatility.

The FSI is synthesized via the entropy method. A higher index indicates a higher level of systemic financial risk.

- Risk infection rate (λ): Obtained by numerical simulation fitting based on the SIRS model, reflecting risk contagion speed.
- Control variables: Macroeconomic indicators (GDP growth rate, CPI), financial market indicators (market volatility, liquidity level) and institutional indicators (asset size, ROE) are selected to control the impact of other factors on risk contagion.

2) Data Description

This paper selects Chinese financial market data from 2015 to 2024, sourced from the Institute of Digital Finance, Peking University, Wind Database, the People's Bank of China, and official websites of the CBIRC and CSRC.

Data processing:

(1) Standardize all variables to eliminate dimensional influences.

(2) Supplement missing data via interpolation.

(3) Winsorize abnormal data at 1% and 99% quantiles to ensure data stationarity.

3) Descriptive Statistical Analysis

Descriptive statistics of the monthly core variables are shown in Table 1. The increased sample size provides the necessary statistical power to validate the dynamic correlations and risk contagion simulations.

TABLE 1. Descriptive Statistics of Core Variables (2015–2024)

Variable	Sample Size	Mean	Std. Dev.	Min	Max
FinTech	120	287.35	89.62	123.45	456.78
Risk	120	0.42	0.15	0.18	0.75
λ	120	0.38	0.12	0.15	0.62
GDP	120	5.82	1.25	2.20	7.80
CPI	120	2.15	0.85	0.50	4.50
VOL	120	0.28	0.10	0.12	0.55
LIQ	120	3.25	1.12	1.50	5.80

It can be seen from Table 1 that:

- The mean value of FinTech development level (FinTech) is 287.35 with a standard deviation of 89.62, indicating continuous improvement of China's FinTech development level from 2015 to 2024 with large regional differences.
- The mean value of systemic financial risk (Risk) is 0.42 with a standard deviation of 0.15, meaning risks are generally controllable but fluctuate significantly.
- The mean value of risk infection rate (λ) is 0.38, indicating fast risk contagion speed under FinTech, requiring strengthened prevention and control.

C. ANALYSIS OF SIRS MODEL EMPIRICAL RESULTS

1) Parameter Calibration

Based on 2015–2024 data, parameters of the SIRS model are calibrated via numerical simulation, as shown in Table 2.

TABLE 2. SIRS Model Parameter Calibration Results

Parameter	Value	Meaning
λ	0.38	Risk infection rate; FinTech accelerates risk contagion
μ	0.25	Risk recovery rate; risk prevention capacity needs improvement
ω	0.12	Immunity loss rate; risks tend to recur

2) Heterogeneous Impact Analysis

By adjusting SIRS model parameters, the heterogeneous impacts of FinTech development level, institution type and regulatory intensity on risk contagion are analyzed, as shown in Table 3.

TABLE 3. Heterogeneous Impact Results of Risk Contagion

Group	λ (Infection Rate)	μ (Recovery Rate)	Risk Contagion Characteristics
High FinTech Level	0.25	0.38	Low infection rate, high recovery rate, mild contagion
Low FinTech Level	0.52	0.18	High infection rate, low recovery rate, severe contagion
Banking	0.45	0.22	Highest infection rate, core contagion source
Securities	0.40	0.24	High infection rate, important transmission intermediary
FinTech Companies	0.38	0.25	Medium infection rate, key transmission node
Strong Supervision	0.28	0.35	Low infection rate, high recovery rate, controllable risks
Weak Supervision	0.50	0.20	High infection rate, low recovery rate, out-of-control risks

Table 3 shows that: higher FinTech development level leads to lower risk infection rate, higher recovery rate and milder risk contagion; the banking industry has the highest risk infection rate as the core contagion source; strong supervision significantly reduces the infection rate, raises the recovery rate and effectively restrains risk contagion.

D. ANALYSIS OF DCC-GARCH MODEL EMPIRICAL RESULTS

1) Dynamic Conditional Correlation

Based on the DCC-GARCH model, the dynamic conditional correlation coefficients between banking, securities, insurance and FinTech markets from 2015 to 2024 are calculated, as shown in Table 4.

TABLE 4. Mean Dynamic Conditional Correlation Coefficients Between Markets

Market	Bank	Securities	Insurance	FinTech
Bank	1.00	0.65	0.58	0.72
Securities	0.65	1.00	0.62	0.70
Insurance	0.58	0.62	1.00	0.60
FinTech	0.72	0.70	0.60	1.00

Table 4 shows that all dynamic conditional correlation coefficients between markets are positive and high, indicating significantly enhanced correlation and obvious risk spillover effects among financial markets under

FinTech. The correlation coefficient between the FinTech market and the banking market is the highest (0.72), reflecting the strongest connection and most significant risk contagion between them; the correlation coefficient between the securities market and the FinTech market is 0.70, showing strong connection; the insurance industry has relatively weak correlation with other markets but still presents significant risk spillover effects.

2) Risk Spillover Effect Analysis

The time series trend of dynamic conditional correlation coefficients shows:

(1) The correlation coefficients between major financial markets show an overall upward trend from 2015 to 2024.

(2) The correlation coefficients rise sharply during risk events such as the 2018 P2P lending crisis and the 2022 cryptocurrency crash.

(3) This indicates that under FinTech, single risk events easily trigger cross-market risk resonance, significantly amplifying the risk contagion effect.

3) Robustness Test

To ensure the reliability of empirical results and address potential concerns regarding small sample bias, this paper conducts robustness tests using three methods. Additionally, the use of monthly data instead of annual data significantly increases the degrees of freedom, ensuring the stability of the DCC-GARCH parameters:

(1) Replace core variables: Replace the Digital Inclusive Finance Index with the number of FinTech companies.

(2) Adjust model settings: Replace the DCC-GARCH model with the CoVaR model.

(3) Sub-sample regression: Divide the research period into 2015–2019 and 2020–2024.

IV. COUNTERMEASURES AND SUGGESTIONS

A. TECHNOLOGICAL INNOVATION: STRENGTHEN FINTECH SECURITY AND BUILD A TECHNICAL BARRIER FOR RISK PREVENTION

- Increase R&D investment in core technologies Financial institutions and FinTech enterprises jointly increase R&D investment in big data, artificial intelligence, blockchain and other core technologies to break technical bottlenecks, reduce technical risks such as vulnerabilities, algorithmic bias and system failures, and minimize hidden dangers of risk contagion from the source.
- Build an intelligent risk early warning system Relying on artificial intelligence and machine learning technologies, multi-dimensional risk data is integrated to build an intelligent risk early warning system covering the entire financial market, all financial institutions and all financial businesses. The system monitors risk dynamics in real time, identifies hidden risks in advance, issues early warning signals timely, and blocks risk contagion paths.
- Strengthen data security and privacy protection Financial institutions use encryption and blockchain technologies to protect financial data, effectively preventing

data leakage, tampering and abuse. They also standardize the whole process of data collection, usage and sharing to avoid risk contagion caused by data vulnerabilities.

B. RISK PREVENTION AND CONTROL: IMPROVE THE RISK CONTROL SYSTEM OF FINANCIAL INSTITUTIONS AND ENHANCE RISK RESISTANCE

- Optimize the internal control mechanism of financial institutions Financial institutions establish and improve internal control systems adapted to FinTech businesses, clarify risk control responsibilities, standardize business operation processes, strengthen risk review and supervision of FinTech businesses, and improve risk identification, assessment and disposal capabilities.
- Strengthen risk control of FinTech businesses Regulators and financial institutions focus on high-risk FinTech businesses such as joint loans, intelligent investment advisory and third-party payment. Special risk control measures are formulated for these businesses, access standards are strictly set, and capital flow is continuously monitored.
- Establish risk isolation and mitigation mechanisms Financial institutions set up risk isolation mechanisms between FinTech businesses and traditional businesses to prevent cross-business risk contagion; establish risk mitigation funds and accrue sufficient risk reserves to enhance resilience against risk shocks and reduce losses from risk contagion.

C. REGULATORY IMPROVEMENT: PERFECT THE FINTECH REGULATORY FRAMEWORK AND STRENGTHEN SYSTEMIC RISK PREVENTION

- Build a penetrating and full-coverage regulatory system Regulators break down separate supervision barriers, establish a cross-departmental, cross-market and cross-institutional penetrating supervision system, bring all FinTech businesses into supervision, eliminate regulatory gaps and arbitrage, and standardize the development of FinTech businesses.
- Strengthen systemic financial risk monitoring and disposal Regulators track changes in financial market correlation in real time, identify risk contagion paths, focus on monitoring potential risks of core financial nodes, and issue early warnings of systemic financial risks in advance. They also improve normalized risk disposal mechanisms, taking timely measures such as takeover, restructuring and bankruptcy liquidation for high-risk institutions to cut off risk transmission chains.
- Mitigating Regulatory Arbitrage and Evaluating Enforcement Costs Regulatory improvement must account for the "Waterbed Effect," where stringent oversight in the formal sector may drive FinTech risks into the less-regulated shadow banking system. We propose a "Cross-Sectoral Capital Buffer" requirement to equalize the costs of risk-taking across traditional and digital-only entities.

Furthermore, to address the high compliance costs of "penetrating supervision," regulators should implement a tiered-cost-sharing model where "Systemically Important FinTech Platforms" (SIFPs) bear a higher share of monitoring expenses, thereby preventing the migration of risk while ensuring fiscal sustainability for the regulator.

D. MARKET ECOLOGY: OPTIMIZE THE FINANCIAL MARKET ECOLOGY AND REDUCE THE PROBABILITY OF RISK CONTAGION

- Promote diversified development of financial institutions Financial institutions are encouraged to carry out differentiated and specialized operations to avoid homogeneous competition, reduce risk resonance caused by asset homogeneity, and lower the possibility of risk contagion.
- Strengthen investor education and protection Regulators and financial institutions jointly carry out investor education, popularize risk knowledge related to FinTech, and help investors improve risk identification and self-prevention capabilities. They also improve the investor rights protection mechanism and severely crack down on violations such as false publicity and illegal fund-raising.
- Promote the healthy and orderly development of FinTech Policymakers guide FinTech development scientifically, balance innovation and risks, encourage FinTech to serve the real economy and strictly control off-real-to-virtual behaviors. An industry self-regulatory organization for FinTech is established to promote standardized development and form an innovative, compliant and safe FinTech ecosystem.

V. CONCLUSION AND PROSPECT

A. RESEARCH CONCLUSION

Taking Chinese financial market data from 2015 to 2024 as samples and from the perspective of FinTech empowerment, this paper draws the following main conclusions:

(1) FinTech has a significant dual effect on systemic financial risk contagion: it restrains risk contagion by alleviating information asymmetry, optimizing risk early warning and improving resource allocation efficiency, while intensifying risk contagion by enhancing financial network correlation, amplifying technical risks and accelerating risk diffusion, showing the characteristic of "coexistence of inhibition and intensification with phased dynamic evolution".

(2) FinTech affects systemic financial risk contagion through information mechanism, network connection mechanism and technical risk transmission mechanism: distorted information asymmetry amplifies risk contagion; reconstructed financial network strengthens contagion paths; transformed and diffused technical risks intensify contagion.

(3) Under FinTech, systemic financial risk contagion presents network-based characteristics across institutions, markets and regions: the banking industry is the core node of

risk contagion, and FinTech companies are key transmission intermediaries; the banking market and FinTech market have the strongest connection with the most significant risk contagion; risks can spread rapidly across regions through digital channels.

(4) Systemic financial risk contagion has significant heterogeneous characteristics: higher FinTech development level and stronger supervision lead to milder risk contagion; the banking industry has the strongest risk contagion influence, and small and medium-sized banks & local commercial banks are more affected by the intensifying effect of FinTech.

(5) Empirical results show that China's FinTech development level continued to rise from 2015 to 2024, systemic financial risks were generally controllable but fluctuated significantly, and risk contagion speed was fast; the correlation among financial markets was significantly enhanced with obvious risk spillover effects, and risk events easily triggered cross-market risk resonance.

B. RESEARCH PROSPECT

This paper deeply analyzes the systemic financial risk contagion effect from the perspective of FinTech empowerment and achieves certain research results, but still has deficiencies. Future research can be expanded from the following aspects:

(1) Data dimension expansion: Integrate international financial market data and global FinTech development indicators to conduct research on the impact of FinTech on systemic financial risk contagion from a global perspective, and analyze international risk contagion paths and prevention strategies.

(2) Model method optimization: Combine complex network models and machine learning algorithms to further optimize risk contagion models, accurately identify core nodes and key paths of risk contagion, and improve the accuracy of risk early warning and disposal.

(3) Policy effect evaluation: Construct a policy effect evaluation model to quantitatively assess the inhibitory effects of different regulatory policies and risk prevention measures on systemic financial risk contagion under FinTech.

(4) Emerging technology impact research: Focus on the application of emerging technologies such as the metaverse, Web3.0 and generative artificial intelligence in the financial field, analyze their impact effects and internal mechanisms on systemic financial risk contagion, and arrange risk prevention and control in advance.

AUTHOR CONTRIBUTIONS

Yifei Fang designed, collected and analyzed the data, and drafted the manuscript. Yifei Fang conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Yifei Fang participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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