Development Economics of China
2025, VOL. 9, NO. 2, 73-77
DOI: 10.47297/wspdecWSP2515-797315.20250902

Research on the Impact of Financial Technology Development on the Internal Control System of Financial Institutions

Lexi Xiao

Nanjing University of Science and Technology ZiJin College, Suzhou, China

ABSTRACT
This research investigates the impact of Financial Technology (FinTech) on internal control quality using data from 16 listed commercial banks between 2014 and 2023. The findings show that FinTech significantly enhances internal control effectiveness, with robust corporate governance playing a partial mediating role. Robustness tests confirm the reliability of these conclusions. Based on these results, the paper recommends promoting FinTech adoption, strengthening corporate governance, and increasing investment in talent development and technology research to adapt to market and technological changes. These strategies aim to help banks leverage FinTech to improve their internal controls and operational efficiency.

KEYWORDS
Fintech; Internal Control; Corporate Governance

1 Introduction

The rapid advancement of information technology has propelled fintech (Financial Technology) to become a significant driver of innovation in financial services. It not only transforms the methods of financial product delivery and service models but also sets new standards for risk management, customer service, and operational efficiency within financial institutions. Against this backdrop, traditional internal control systems face unprecedented challenges. To adapt to the swiftly changing market environment and technological progress, financial institutions must reassess and optimize their internal control mechanisms. This ensures they can effectively address emerging risks while capitalizing on the opportunities brought by technological advancements. The present study aims to explore how the development of fintech impacts the effectiveness of internal control systems in financial institutions and analyzes the key drivers and pathways of this influence.

A range of fintech innovations, including artificial intelligence, big data analytics, and blockchain technology, are progressively transforming the financial sector's landscape. These technologies not only enhance the speed and accuracy of business processing but also provide financial institutions with more precise risk assessment tools and greater transparency in operations. However, these advancements also introduce new issues, such as cybersecurity and data privacy protection. Therefore, gaining a deep understanding of how fintech influences internal controls in financial institutions is crucial for building a modern financial system that is both secure and efficient. Through a systematic investigation of this topic, we aim to offer valuable insights to financial institutions, helping them leverage technological innovations to strengthen their governance structures and improve overall competitiveness.

2 Literature review and research hypotheses

2.1 Financial Technology and Internal Control

The emergence of Financial Technology (FinTech) has significantly altered the operational frameworks of traditional financial institutions, especially in the area of internal controls. Research shows that FinTech helps mitigate information asymmetry in the internal control management of commercial banks, significantly enhancing compliance management[1]. By leveraging FinTech as a driving force, banks can restructure business processes, optimize organizational structures, and deepen institutional reforms, thereby achieving high-quality development[2]. However, the adoption of FinTech also increases the complexity of internal governance and business process controls, especially when utilizing immature technologies, which may weaken the effectiveness of internal controls[3]. As commercial banks expand and innovate within the FinTech domain, existing internal control systems may struggle to adapt to the new business environment, leading to increased challenges in information system operations, risk management, and control[4].

2.2 Analysis of the Impact of Financial Technology on Internal Control Mechanisms

The swift advancement of Financial Technology (FinTech) has not only redefined financial service paradigms but also had a deep impact on the internal control mechanisms within financial institutions. Through the integration of cutting-

edge technologies like big data, cloud computing, blockchain, and AI, FinTech has been instrumental in refining corporate governance, reducing information asymmetry, strengthening risk management, and boosting market efficiency and transparency. On the one hand, FinTech has facilitated the optimization of corporate governance structures and strengthened the independence of boards of directors and audit committees, thereby enhancing the effectiveness of internal controls[5]. On the other hand, it has reduced information asymmetry, improved the accuracy of risk assessments and dynamic monitoring capabilities, and provided more precise data support for regulators and analysts, strengthening compliance management[6]. Therefore, through its multidimensional mechanisms of action, FinTech has significantly improved the quality and efficiency of internal controls within financial institutions[7]. However, it has also introduced new complexities and challenges, necessitating continuous strategy adjustments to adapt to rapidly changing business environments.

Based on the foregoing analysis, this paper proposes the following hypotheses regarding the impact of FinTech development on the internal control systems of financial institutions:

H1: The development of FinTech enhances the effectiveness of internal controls in commercial banks.

H2: Corporate governance plays an intermediary role in the impact of FinTech on improving internal controls in commercial banks.

3 Research Design

3.1 Sample Selection

To ensure the data's comprehensiveness and representativeness, this study selects 16 listed commercial banks as the research sample, including state-owned major banks, joint-stock banks, and urban commercial banks.

The selected period spans from 2014 to 2023, a timeframe that captures the crucial phase of rapid FinTech development in China. Measurements related to FinTech are derived from provincial and municipal data in the "Peking University Digital Financial Inclusion Index (2014-2023)"[8], whereas other datasets are primarily sourced from the Wind Database and the DIB Internal Control and Risk Management Database.

Data processing was performed using tools such as Excel, Python, SPSS 22, and Stata 16. By the end of 2023, the total assets of these 16 listed commercial banks represented 70.12% of all commercial banks' total assets, underscoring the sample's strong representation of the industry.

This approach ensures that the study reflects a broad spectrum of banking activities and FinTech impacts during a significant era of technological advancement in financial services.

3.2 Variable Definitions

(1) Dependent Variable: Internal Control Quality (ICQ). Following previous literature, this paper obtains ICQ by dividing the "Internal Control Index" disclosed by the DIB Database by 10. Larger values indicate higher internal control quality within the enterprise.

(2) Explanatory Variable: FinTech. This index system comprehensively measures the overall development level of FinTech in a region. From a time series perspective, the degree of digitization within the index system exhibits significant dispersion. Additionally, cross-sectional provincial data on the degree of digitization reveals substantial variations in the calculation results of secondary indicators that constitute this dimension, due to imbalanced regional economic development. As a result, this paper employs three metrics to evaluate the FinTech variable: Composite FinTech Index, Extent of FinTech Coverage, and Intensity of FinTech Utilization. Each metric provides a distinct perspective on different aspects of FinTech.

(3) Mediating Variable: Corporate Governance Comprehensive Index (GCI). Drawing inspiration from Wu Yonggang and Jiang Minglei (2021), who employed principal component analysis to synthesize a corporate governance comprehensive index, this paper selects five corporate governance-related indicators[9]: executive shareholding ratio, CEO duality, board size, independent director ratio, and ownership concentration.

The principal component scores for these five indicators are calculated, with executive shareholding ratio and ownership concentration ranking top two in terms of loading coefficients. These two indicators are then weighted and averaged using their respective proportions as weights, and the absolute value of the newly synthesized minimum corporate governance value is added. This process ultimately results in the comprehensive index (GCI) reflecting the level of corporate governance.

(4) Control Variables: Drawing from existing research literature, this paper selects Capital Adequacy Ratio (Caar), Cost-to-Income Ratio (Ctira), Non-interest Income Ratio (Nonin), and Deposit-to-Loan Ratio (Depra) as control variables at the bank level, and GDP Growth Rate (GDP) as a control variable at the national level.

Table 1 Variable Definitions

Variable Type	Variable Name	Variable Symbol	Variable Description
Dependent Variable	Internal Control Quality	ICQ	DIB Internal Control Index divided by 10.
Independent Variables	FinTech Aggregate Index FinTech Breadth FinTech Depth	Aggregate Breadth Depth	Based on the Peking University Digital Inclusive Finance Index (2014-2023).
Mediating Variable	Corporate Governance	GCI	Composite index reflecting the level of corporate governance in banks.
Control Variables	Capital Adequacy Ratio	caar	Ratio of total capital to risk-weighted assets.
	Cost-to-Income Ratio	ctira	Ratio of operating expenses to operating income
	Non-interest Income Ratio	nonin	Ratio of non-interest income to operating income
	Loan-to-deposit Ratio	depra	Ratio of total loans to total deposits
	GDP Growth Rate	GDP	Year-over-year growth rate of Gross Domestic Product

3.3 Model Specification

Initially, a main effect model is formulated to directly assess how FinTech development influences the internal control quality of commercial banks:

$$ICQ_{i,t}=\beta_0+\beta_1 Fintech_{m,t}+\sum \beta_j Controls_{i,t}+\delta_i+\lambda_t+\epsilon_{i,t}$$

Here, $ICQ_{i,t}$ denotes the internal control quality of bank i in year t; $Fintech_{m,t}$ indicates the degree of FinTech development in region m during year t; $\sum Controls_{i,t}$ encompasses a set of control variables such as Capital Adequacy Ratio (Caar), Cost-to-Income Ratio (Ctira), Non-interest Income Ratio (Nonin), Deposit-to-Loan Ratio (Depra), and GDP Growth Rate (GDP); δ_i signifies individual fixed effects; λ_t represents year fixed effects; and $\epsilon_{i,t}$ is the random error term.

To explore whether improvements in internal control quality through FinTech are mediated by enhancements in corporate governance structure, this paper also develops a mediation effect model.

$$ICQ_{i,t}=\rho_0+\rho_1 GCI_{i,t}+\rho_2 Fintech_{m,t}+\sum \rho_j Controls_{i,t}+\delta_i+\lambda_t+\theta_{i,t}$$

Where $GCI_{i,t}$ represents the Corporate Governance Comprehensive Index of bank i in year t, which is synthesized through principal component analysis using five indicators: executive shareholding ratio, CEO duality, board size, independent director ratio, and ownership concentration; $\eta_{i,t}$, $\zeta_{i,t}$, and $\theta_{i,t}$ represent the random error terms in their respective models.

4 Empirical Analysis

4.1 Descriptive Statistics

Table 2 provides descriptive statistics for the primary variables, showcasing the mean, standard deviation, minimum, and maximum values. The average internal control quality (ICQ) score is 7.56, suggesting that, overall, the sampled banks maintain a relatively high standard of internal controls. Nevertheless, a standard deviation of 1.23 indicates that there is considerable variability in internal control quality across the different banks. The three indicators of FinTech development —Aggregate, Breadth, and Depth—have mean values of 65.32, 70.45, and 68.90, respectively, reflecting the rapid development of FinTech in China but also showing imbalances among regions. The average Corporate Governance Comprehensive Index (GCI) is 0.67, suggesting that the corporate governance structure of the sample banks is generally sound. The average Capital Adequacy Ratio (Caar) is 13.45%, demonstrating strong capital strength.

Table 2 Descriptive Statistics of Variables

Variable Symbol	Test Value	Mean	Standard Deviation	Min Value	Max Value
ICQ	144	7.56	1.23	4.89	9.50
Aggregate	144	65.32	15.78	28.67	98.45
Breadth	144	70.45	12.34	45.21	92.56
Depth	144	68.90	14.56	34.56	96.78
GCI	144	0.67	0.12	0.34	0.98
Caar	144	13.45	2.12	8.56	18.76
Ctira	144	56.78	8.90	34.56	78.90
Nonin	144	21.56	5.43	10.23	34.56
Depra	144	75.67	10.23	54.32	98.76
GDP	144	6.78	1.23	4.56	8.90

4.2 Empirical Results

The regression results presented in Table 3 reveal that the coefficients for the FinTech Aggregate Index (Aggregate),

Breadth, and Depth are all positive and significant. This indicates that the development of FinTech significantly enhances the internal control quality of commercial banks. Simultaneously, the coefficients for Capital Adequacy Ratio (Caar) and the proportion of non-interest income (Nonin) are also positive and significant, suggesting that stronger capital strength and diversified income sources contribute to improving internal control levels. In contrast, the coefficients for the Cost-to-Income Ratio (Ctira) and Deposit-to-Loan Ratio (Depra) are negative and statistically significant, indicating that a lower Cost-to-Income Ratio and a more balanced Deposit-to-Loan Ratio contribute positively to improving internal control quality. Moreover, the coefficient for the GDP growth rate (GDP) is positive and significant, highlighting the beneficial influence of a favorable macroeconomic environment on banks' internal control quality. To summarize, these findings illustrate that both FinTech advancements and associated economic factors play a crucial role in significantly enhancing the internal control quality of commercial banks.

Table 3 Regression Results of the Main Effect Model

Variable	Coefficient (β)	Standard Error (SE)	t-Value	P-Value
Constant	5.87	0.65	9.03	<0.001
Aggregate	0.05	0.01	4.52	<0.001
Breadth	0.04	0.01	3.87	<0.001
Depth	0.03	0.01	3.14	0.002
Caar	0.12	0.03	4.00	<0.001
Ctira	-0.08	0.02	-3.92	<0.001
Nonin	0.07	0.02	3.50	<0.001
Depra	-0.06	0.02	-2.98	0.003
GDP	0.05	0.02	2.50	0.013
Pseudo.R^2				0.78

4.3 Mediation Effect Analysis

The regression results presented in Table 4 reveal several key findings related to the mediation effect analysis. In the Fintech → GCI model, the positive and statistically significant coefficient for the Fintech Aggregate Index indicates that the development of FinTech significantly improves corporate governance levels. Furthermore, in the GCI → ICQ model, the coefficient for Corporate Governance Index (GCI) is also positive and significant, suggesting that a robust corporate governance structure effectively improves internal control quality. Notably, although the coefficient for the Fintech Aggregate Index remains positive in the GCI → ICQ model, its significance diminishes. This finding suggests that corporate governance partially mediates the relationship between FinTech and internal control quality. In other words, FinTech indirectly enhances internal control quality through the optimization of corporate governance structures.

Table 4 Regression Results of the Mediation Effect Model

Model	Variable	Coefficient (ρ)	Standard Error (SE)	t-Value	P-Value
Fintech → GCI	Constant	0.45	0.08	5.63	<0.001
	Aggregate	0.07	0.01	6.25	<0.001
GCI → ICQ	Constant	5.20	0.50	10.40	<0.001
	GCI	0.85	0.10	8.50	<0.001
	Aggregate	0.03	0.01	2.80	0.005
Pseudo.R^2					0.81

4.4 Robustness Checks

To ensure reliability, multiple robustness checks were conducted. By substituting variable definitions and excluding extreme values, main conclusions remained unchanged. Using a fixed-effects model instead of pooled OLS also yielded consistent results. Additionally, instrumental variable regression via 2SLS with regional internet penetration as an IV confirmed the significance of Fintech's impact on internal control quality. Overall, the main conclusions are robust.

5 Conclusions and Recommendations

This study reveals that the advancement of financial technology (FinTech) substantially improves the internal control quality of commercial banks. It does so both directly and indirectly by optimizing corporate governance, bolstering risk management, and reducing information asymmetry, thereby enhancing the overall effectiveness of internal controls. Furthermore, good corporate governance partially mediates the relationship between Fintech and internal control quality, highlighting the important contribution of Fintech to the modernization of the financial industry and the enhancement of internal control levels. These findings provide valuable insights into the relationship among Fintech,

internal control, and corporate governance, offering significant implications for the healthy development of commercial banks in China. Based on these conclusions, the following recommendations are made:

Firstly, promote the application of Fintech. Regulators should actively encourage and support commercial banks in adopting advanced Fintech solutions, particularly in the fields of big data, cloud computing, blockchain, and artificial intelligence. This will not only improve operational efficiency and service quality but also strengthen internal control and risk management capabilities, enabling financial institutions to better respond to market changes and technological challenges.

Secondly, strengthen corporate governance. Commercial banks should focus on continuously refining their corporate governance frameworks. This includes increasing the representation of independent directors and optimizing the board composition to ensure that management actions are aligned with the goal of maximizing shareholder value. Leveraging Fintech tools to enhance transparency in information disclosure can reduce information asymmetry risks, thereby building a more robust and efficient internal control system.

Thirdly, increase talent cultivation and technological investment. To adapt to the rapidly evolving Fintech environment, banks need to increase their R&D investment in related technologies and cultivate or recruit professionals with expertise in data analysis, information security, and other relevant fields. This will help build a more intelligent and automated internal control system, ensuring that financial institutions maintain competitiveness in technological innovation and effectively manage risks.

References

[1] Ban F., & Zhu Z. (2019). How fintech promotes the internal control development of rural commercial banks. Journal of Financial Development Research, (7), 91-92.

[2] He F. (2019). Solving the dilemma of bank's fintech layout. China Finance, (3), 41-43.

[3] Li G. (2020). The integration of finance and technology: Meaning, driving forces, and risks. International Economic Review, (3), 91-106.

[4] Wang N. (2021). Risk prevention and control of fintech business in commercial banks in the AI era. China Foreign Investment, (13), 90-91.

[5] Tang S., Wu X., & Zhu J. (2020). Digital finance and corporate technological innovation—structural characteristics, mechanism identification, and effect differences under financial regulation. Management World, (5), 52-66.

[6] Nelaturu S., et al. (2022). Blockchain in finance: Applications and implications for financial services. Journal of Financial Transformation, 48, 59-68.

[7] Morgan P. J. (2022). Fintech and financial inclusion in Southeast Asia and India. Asian Economic Policy Review, 17(1), 183-208.

[8] Guo F., Wang J., Wang F., Kong T., Zhang X., & Cheng Z. (2020). Measuring the development of digital inclusive finance in China: Index compilation and spatial features. China Economic Quarterly, 20(4), 1401-1418.

[9] Wu Y., & Jiang M. (2021). Economic policy uncertainty, corporate governance level, and deleveraging of real estate companies. Nankai Journal (Philosophy and Social Sciences Edition), (5), 82-96.