

Analysis of the Impact of Fintech Investment on the Operating Performance of Commercial Banks

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Abstract. The digital wave has driven a fundamental transformation in the financial service model, with innovative applications such as mobile payment, digital banking, and intelligent investment advice constantly emerging. Based on the resource-based theory, this study selects the financial data of six representative Chinese listed commercial banks from 2022 to 2024 and empirically examines the impact of fintech investment on the operating performance of commercial banks. This paper, through the analysis of the fixed-effect model, finds that in the short term, financial technology investment significantly suppresses return on assets, mainly due to the high-cost pre-effect of technology research and development and system reconstruction. The expansion of asset scale intensifies "diseconomies of scale", and the cost-income ratio is the key variable for regulating profits. In the long term, financial technology investment can release profit potential by optimizing risk control and reducing operating costs. It is suggested that commercial banks establish a phased assessment mechanism for technology investment and coordinate business applications to accelerate the profit turning point.

Keywords: Operating performance of commercial banks, investment in financial technology, performance lag, cost control optimization.

1. Introduction

Under the policy guidance of the state, the digital economy is evolving at an accelerated pace, and the supply-side reform of the financial sector is continuously advancing. As a result, commercial banks are confronted with multiple challenges such as narrowing interest spreads, intensified competition among peers, and upgraded customer demands. According to McKinsey data, global fintech investment has grown from 1.8 billion US dollars in 2010 to 210 billion US dollars in 2022, with a compound annual growth rate of over 50%. Governments around the world are actively promoting the development of fintech. The People's Bank of China has issued the "Fintech Development Plan (2022-2025)", and countries such as Europe and the United States have also successively introduced policies such as opening up banking and regulatory sandboxes. Meanwhile, fintech enterprises such as Alipay, WeChat Pay and MYBank have risen rapidly, posing a huge challenge to traditional banks. Qiao Haishu and Yang Yanning believe that the development of fintech can prompt the traditional financial industry to transform and upgrade towards a more intelligent direction, providing more high-quality and efficient products and services, reducing costs and improving efficiency [1]. Fintech, by reshaping business processes, optimizing risk control models and expanding service scenarios, is increasingly attracting the attention of investors and has become one of the core driving forces for banks' strategic transformation. The innovation of technology not only enhances the operational efficiency and comprehensive business capabilities of banking institutions but also effectively controls costs, thereby achieving cost reduction and efficiency improvement [2]. However, the commercial application of fintech also has corresponding drawbacks. Phan et al. believe that the development of fintech hurts bank performance [3]. The negative impacts brought by fintech include high initial investment costs and long payback periods. To encourage more commercial banks to increase their investment in fintech and accelerate the transformation and upgrading of business processes, it is urgent to empirically test the actual impact of fintech investment on operating performance and provide a basis for the resource allocation decisions of commercial banks [4].

From a theoretical perspective, this paper, based on the resource-based theory, quantifies the causal relationship between fintech investment and performance to fill the gaps in existing research, such as insufficient empirical tests and the lack of the latest research data, thereby deepening the research on the mechanism of fintech empowering the performance of commercial banks. From a practical perspective, it provides decision-making references for commercial banks to balance technological investment with short-term profit pressure, helping them plan resource allocation well and enhance core competitiveness in the digital wave.

By analyzing the causal logic of the application of financial technology in the transformation of financial performance, this paper selects the financial data of six representative banks from 2022 to 2024 as samples. A multiple regression model was constructed, with ROA representing financial performance as the explained variable and fintech investment as the core explanatory variable. The correlation between the two was empirically tested through SPSS software by controlling for asset size, loan-to-deposit ratio, non-performing loan ratio and cost-income ratio, thereby verifying the hypothesis that fintech investment can significantly improve return on assets (ROA).

2. Theoretical Basis and Research Hypotheses

2.1. Core Theory

This article takes the resource-based view as the core theoretical framework, emphasizing that enterprises can obtain sustainable competitive advantages by accumulating scarce and irreplaceable strategic resources. Zhang Xintong mentioned that the application of big data technology in fintech can make banks both efficient and convenient in processing data, which can greatly save the time and human resource costs of banks [5]. Li Yimao believes that in fintech, the use of energy such as artificial intelligence can free up the mechanical and repetitive work of bank employees (such as transferring and remitting funds, applying for credit cards, etc.), thereby achieving the goal of saving labor costs [6]. In addition, Li Lijun proposed that blockchain technology in fintech can help market transaction entities establish effective and transparent operation processes. At the same time, by simplifying transaction business processes, it can reduce the time cost caused by complex information verification and other links, ultimately improving service levels [7]. Financial technology investment, as a strategic digital resource for banks, can reduce transaction costs by reconfiguring business processes. At the same time, it can create new revenue sources through the expansion of scenario ecosystems, such as open banking and digital inclusiveness, and ultimately translate into financial performance improvement [8]. This theory provides theoretical support for explaining the internal mechanism by which fintech empowers bank performance.

2.2. Research Hypotheses

Based on existing empirical research, Jiang found that the use of information technology investment significantly developed the banking service by enhancing operational efficiency [9]. Further verification shows that the marginal contribution rate of digital technology to the profitability of banks can reach 1.2 to 1.8%. Dapp T has found through research that fintech can bring about systematic transformation and improvement for banks, driving profitability and operational management efficiency [10]. The above-mentioned research confirms that there is a significant positive correlation between technological input and financial performance. Based on foreign research results, this paper proposes a hypothesis for the development of Chinese commercial banks that the level of financial technology is significantly positively correlated with the ROA of commercial banks.

3. Empirical Investigation

3.1. Data Sources

By analyzing the period from 2022 to 2024, this paper selects six samples from listed commercial banks in China, including Industrial and Commercial Bank of China, China Construction Bank, China Merchants Bank, Ping An Bank, Shanghai Pudong Development Bank, and Ningbo Bank. From the data, it is found that the investment in financial technology shows a differentiated trend. The average annual investment of major state-owned banks exceeds 3% of their revenue, while joint-stock banks focus on intelligent risk control and scene ecology. City commercial banks, on the other hand, focus on digital customer acquisition. The ROA of leading commercial banks in terms of technology investment intensity, such as China Merchants Bank and Ping An Bank, has shown a trend of growth against the trend, with an increasing rate exceeding 0.15%. Judging from the data, financial technology may become a key variable for profit differentiation.

3.2. Model Design

In terms of model research, this paper constructs the basic database for analysis by selecting the financial data of six banks from 2022 to 2024. All the data are sourced from the publicly disclosed annual report information on the Juchao Information Network. The variables explained in Table 1 are as follows: the explained variable: Return on total assets (ROA), the explanatory variable: fintech investment (FT), and the control variable: natural logarithm of asset size (TA), loan-to-deposit ratio (LDR), non-performing loan ratio (NPLR), and cost-income ratio (CIR). The specific calculation criteria for each variable are as follows:

Table 1. Variable definition

Variable type	Variable name	Symbol	Measurement method
The explained variable	Return on assets	ROA	Net profit / average total assets × 100%
Core explanatory variable	Investment in financial technology	FT	Financial technology investment/operating income × 100%
	Bank size	TA	Natural logarithm of total assets
Control variable	Loan-to-deposit ratio	LDR	Loan balance/risk-weighted assets × 100%
	Non-performing loan ratio	NPLR	Non-performing loan balance/total loan balance × 100%
	Cost-income ratio	CIR	Business cost/operating income × 100%

By constructing a fixed effects model and conducting regression analysis with SPSS software:

$$ROA = \alpha + \beta_1 FT_{it} + \beta_2 TA_{it} + \beta_3 LDR_{it} + \beta_4 NPLR_{it} + \beta_5 CIR_{it} + \varepsilon_i \quad (1)$$

4. Result Analysis

4.1. Descriptive Statistics

Table 2 presents the descriptive statistical results of a total of 18 observations from 2022 to 2024 of the 6 commercial banks covered by the sample in this study. Among them, the mean value of the explained variable ROA was 0.7539% (standard deviation 0.12339%), reflecting that the overall profit level of the sample banks was stable, but there were significant individual differences. The average value of the core explanatory variable FT (Intensity of fintech investment) was 3.7139%, with a range of 2.81%, indicating a prominent differentiation in the technology investment of banks. Among the control variables, the mean of TA (logarithm of asset size) is 3.321 (standard deviation 0.477), with a uniform distribution. The average LDR (loan-to-deposit ratio) is 80.41% (standard deviation 11.77%), with significant fluctuations (56.73% - 97.21%), indicating differences in implied

liquidity risk. The mean NPLR (defect rate) is 1.2539% (standard deviation 0.18658%), and the overall risk is controllable. The average CIR (Cost-income ratio) is 35.21%, but the standard deviation is as high as 13.21%, and the extreme value difference is 38.77%, highlighting the significant disparity in operational efficiency.

Table 2. Descriptive statistical results

Indicator	Sample size	Minimum value	Maximum value	Average value	Standard deviation
ROA	18	0.53%	1.00%	0.75%	0.12%
FT	18	2.83%	5.64%	3.71%	0.83%
LDR	18	56.73%	97.21%	80.41%	11.77%
NPLR	18	0.83%	1.38%	1.25%	0.19%
CIR	18	26.05%	64.82%	35.21%	13.21%
TA	18	2.5641	3.8881	3.3212	0.4767
Number of valid cases (listed)	18				

4.2. Regression Result Analysis

The results of the regression model, it shows that the overall effect of the model is significant and has strong explanatory power as shown in Table 3. Analysis of Variance (ANOVA) analysis showed that the model's F value was 37.330 ($p < 0.001$), rejecting all null hypotheses with zero coefficients and confirming that the independent variable system performance explained the ROA variation. The R-squared value was adjusted to 0.914, indicating that the five predictor variables (FT, LDR, NPLR, CIR, TA) could explain 91.4% of the variation in ROA.

Table 3. ANOVA results

		ANOVA ^a				
Model	Sum of squares	Degree of freedom	Equal square	F	Significance	
Return	.243	5	.049	37.330	.000b	
1 Residual	.016	12	.001			
Total	.259	17				

a. Dependent variable: ROA
b. Predictor variables: (constants), TA, LDR, FT, NPLR, CIR

Table 4. Results of regression analysis

		Coefficient ^a				
Model	Unstandardized coefficient		Standardization coefficient	t	Significance	
	B	Standard error	Beta			
(Constant)	2.763	.521		5.299	.000	
1 FT	-.186	.027	-1.250	-6.925	.000	
LDR	-.001	.003	-.052	-.194	.850	
NPLR	.094	.208	.143	.453	.659	
CIR	-.013	.004	-1.438	-3.373	.006	
TA	-.276	.045	-1.068	-6.169	.000	

a. Dependent variable: ROA

Fintech investment (FT) has a significant negative impact on ROA ($\beta = -0.186$, $p < 0.001$), with a standardized coefficient Beta of -1.250. This means that for every 1-unit increase in FT, ROA will decrease by 1.25 standard deviations, indicating that there may be a "cost lead, benefit lag" effect in banks' technology investment. Similar to FT, asset size (TA) also significantly suppresses ROA ($\beta = -0.276$, $p < 0.001$), reflecting the "diseconomies of scale" predicament of large banks. The negative effect of the cost-income ratio (CIR) ($\beta = -0.013$, $p = 0.006$) is in line with the cost control theory. It is worth noting that the loan-to-deposit ratio (LDR) and the non-performing loan ratio (NPLR) failed

the significance test ($p > 0.6$), possibly since regulatory intervention during the sample period weakened their risk transmission mechanism as shown in Table 4.

5. Conclusion

Through empirical results, this paper finds that in the short term, financial technology investment significantly inhibits the ROA of commercial banks ($\beta = -0.186$, $p < 0.001$), mainly due to the cost lead effect. It reflects the impact of the early stage of fintech development on the profit model of traditional banks. The initial investment in digital transformation costs, the accelerated marketization of interest rates, and the competitive pressure from Internet finance have jointly compressed the profit margins of banks. The expansion of asset size also exacerbates "diseconomies of scale" ($\beta = -0.276$), but cost control ability is a key moderating variable for maintaining profitability, most directly reflecting the impact of fintech on the operational efficiency of banks and demonstrating that the banking industry is in a "painful period" of digital transformation. The costs of early technological investment, system upgrades, personnel training, etc. have not yet been fully converted into efficiency improvements. However, the loan-to-deposit ratio and the non-performing loan ratio did not show significant effects during the sample period.

From the overall data perspective, risk control and cost management are the core factors influencing the performance of banks, which points out the key directions for the application of fintech in the banking industry. Different types of banks exhibit differentiated characteristics, and it is necessary to formulate targeted fintech development strategies. Through research, this paper holds that banks can establish a phased assessment mechanism for technology investment, incorporate fintech expenditures into the long-term performance evaluation throughout 3 to 5 years, and allow cost allocation to alleviate short-term profit pressure. Promote the application of technology and business collaboration, prioritize the deployment of intelligent risk control to reduce NPLR, and use automated operations to lower CIR. Offset investment costs through "cost reduction and efficiency improvement" to accelerate the arrival of the profit turning point.

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