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The Impact of Inclusion Digital Finance on the Operating Performance of Listed Commercial Banks in China

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Abstract: In the context of the national "do a good job in five articles and promote high-quality financial development", this paper empirically examines the impact of the development of inclusion digital finance on the financial performance of commercial banks based on the Inclusive Digital Finance Index of Peking University and the unbalanced panel data of 42 listed commercial banks in China. The results prove that the depth of use of inclusion digital finance is positively related to bank operating performance; the breadth of coverage brings negative impact on commercial bank performance, while compared with state-owned commercial banks, non-state-controlled commercial banks have been relatively less. In order to better enhance the level of bank business performance, based on the findings, this paper puts forward the following recommendations: use financial resources to support the development of scientific and technological innovation, guide commercial banks to strengthen digital transformation, and encourage commercial banks to explore differentiated development.

Key words: Inclusion Digital Finance; Commercial Banks; Financial Performance; Fintech; Financial Innovation and Risk Management

1. Introduction

Digital economy has become a crucial force in restructuring global factor resources, reshaping the global economic structure, and altering the global competitive landscape. As a product of inclusive finance combined with digital technology, inclusion digital finance not only expands the coverage of financial services but also enhances their efficiency and convenience. [1-3] The development of inclusion digital finance has emerged as an influential factor that cannot be overlooked in assessing the performance of commercial banks.

Domestic research on the impact of inclusion digital finance on commercial bank performance primarily focuses on aspects such as its definition, characteristics, and development models. Furthermore, it explores its effects on commercial banks' profitability, risk management, and business innovation [4].

Foreign scholars have been studying inclusion digital finance for a longer period. They found how digital finance technologies could influence traditional SME-bank relationships and have important policy and managerial implications. [5]

While previous research has laid down a solid theoretical foundation along with some empirical studies conducted to date; there is still room for improvement regarding differentiated research into how inclusion digital finance impacts commercial banks. This paper aims to empirically examine how inclusion digital finance affects the financial performance of state-owned holding commercial banks versus non-state-owned holding ones alongside considering the industry as a whole.

2. Theoretical Analysis and Hypothesis Proposal

2.1 Theoretical Analysis

2.1.1 Technological spillover effect

The technological spillover effect refers to instances where technical knowledge is transferred from one economic entity to another without requiring payment by the latter party involved.[6] In relation to inclusion digital finance specifically denotes how fintech companies and innovative financial solutions affect traditional business processes and products within conventional commercial

banking operations.[7]

2.1.2 Competition and cooperation mechanisms

The provision of alternative financial services by fintech companies has compelled commercial banks to enhance their service quality and efficiency. Simultaneously, there are opportunities for collaboration between these two types of institutions. Commercial banks can leverage the technological advantages of fintech companies to rapidly achieve digital transformation and jointly develop new financial products and services. This coexisting mechanism of competition and cooperation contributes to driving innovation and development within the entire financial industry and among commercial banks.

2.1.3 Optimization of risk management

Inclusion Digital Finance utilizes advanced data analysis technology to assist commercial banks in more accurately identifying and evaluating the risks associated with loans and other financial products. Digital technology also enables real-time monitoring of financial transactions and market dynamics, facilitating timely identification of potential risk points, as well as the implementation of preventive or responsive measures. Furthermore, it aids banks in better compliance with regulatory requirements through the use of automated and intelligent tools to ensure the conformity of business operations.

2.2 Hypothesis Development

The provision of inclusion digital finance services by banks through internet platforms is hypothesized to reduce operational costs at physical branches, expand the reach of financial institutions to a broader customer base, foster innovation in financial products and services, enhance customer satisfaction, bolster customer loyalty and word-of-mouth marketing, and increase revenue from banking operations. [8] Furthermore, it is expected that digital technology will enable banks to conduct more effective risk assessment and management, thereby enhancing the scientific basis of credit decision-making. The impact of inclusion digital finance on the performance of different types of commercial banks exhibits significant heterogeneity: state-owned banks (hereinafter referred to as state-owned banks) are subject to relatively strict regulatory constraints in business operations and may lack motivation to provide inclusion digital finance services; non-state-owned banks (hereinafter referred to as non-state-owned banks), on the other hand, face greater market competition pressure, operate more flexibly, tend to be more innovative, and focus on small and micro enterprises as well as individual customers who stand to benefit significantly from inclusion digital finance.[9]

Based on these considerations, this paper proposes two hypotheses:

H1: The depth of usage of inclusion digital finance is positively correlated with bank operating performance;

H2: Relative to state-owned banks, the negative impact of the breadth of coverage for inclusion digital finance on non-state-owned bank operating performance is smaller.

3. Research Design

3.1 Research Sample and Data Sources

This study selects operating data from listed commercial banks in China spanning from 2011 to 2021 while excluding those with incomplete financial data. Ultimately, a sample comprising 42 listed commercial banks was obtained for analysis. Relevant financial data were sourced from Wind Database, China Stock Market & Accounting Research Databas, and annual reports issued by individual banks.

3.2 Construction of Indicator System

3.2.1 Selection of dependent variables

This study selects three financial indicators, namely total asset return, net asset return, and capital adequacy ratio. Principal component analysis is employed to derive a composite factor representing the operational performance of commercial banks. This approach enhances the representativeness of operational performance indicators for commercial banks.

3.2.2 Selection of independent variables

The "Inclusion Digital Finance Index" released by Peking University's Digital Finance Research Center for the years 2011-2022 is chosen as the independent variable in this study. The index comprises 33 indicators categorized into three primary dimensions: inclusion digital finance coverage (FD), depth (SD), and degree of digital support services (CD), along with 11 secondary dimensions.

3.2.3 Selection of control variables

Bank asset size (ZA), deposit-to-loan ratio (CA), and equity multiplier (QA) are selected as control variables in this study.

The growth in bank asset size can enhance service capacity, improve market competitiveness, and serve as an important reflection of profitability and risk management capabilities within banking operations. The deposit-to-loan ratio directly impacts a bank's net interest income and profitability; it constitutes a primary source contributing to net interest margin and plays a crucial role in overall bank performance assessment. The equity multiplier serves as a significant indicator for evaluating financial leverage within enterprises; given their high leverage characteristic, banks typically utilize minimal self-owned capital to support substantial assets and loans, thus emphasizing the critical importance of the equity multiplier.

3.3 Model Design

Based on the selected variables,[10] this paper constructs the following econometric models:

$$Per_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 SD_{it} + \alpha_3 CD_{it} + \alpha_4 ZA_{it} + \alpha_5 CA_{it} + \alpha_6 QA_{it} + \mu_{it} \quad (1)$$

3.4 Descriptive Statistics

The specific definitions and symbolic representations of each variable indicator are summarized in **Table 1**. The standard deviation of total asset return is 0.25, indicating significant differences in financial performance among listed commercial banks; the mean net asset return suggests that banks, on average, can generate a return of 14.81% for shareholders; the mean capital adequacy ratio indicates that banks have an average capital level of 13.40% to absorb potential losses. The means of coverage breadth (FD) and the mean usage depth (SD) are fairly close, both falling within the range of 242-271, while the degree of digital support services (CD) is significantly higher than the other two at 303.7137. The standard deviations of coverage breadth (FD), usage depth (SD) , and digital support services (CD) increase sequentially.

Table 1. Sample Descriptive Statistical Analysis

		PER	FD	SD	CD	LNZA	CA	QA
Mean	Full Sample	10.84534	247.6719	270.1615	303.7137	9.07181	71.15991	14.77545
	State-owned banks	11.1918	250.6919	270.44	304.71	9.52	70.78427	15.16236
	Non-state-owned banks	10.28234	242.7643	269.7161	302.0944	8.337316	71.77034	14.14672
Median	Full Sample	10.34347	251.97	259.81	329.9	8.75534	70.98	14.1553
	State-owned banks	10.64299	260.135	259.81	329.90	9.34	70.585	14.61265
	Non-state-owned banks	9.668785	240.27	253.08	324.69	7.846563	71.35	13.68355
Maximum	Full Sample	20.76834	433.42	510.69	462.23	12.77057	116.235	46.0109
	State-owned banks	20.76834	433.42	510.69	462.23	12.77	116.235	46.0109
	Non-state-owned banks	17.6169	432.93	474.3	440.83	11.43486	107.149	26.6823
Minimum	Full Sample	4.655172	3.06	12.76	7.58	6.235702	26.43	6.05
	State-owned banks	4.655172	3.06	12.76	7.58	6.24	26.43	9.6779
	Non-state-owned banks	5.259491	33.67	47.16	15.71	6.241215	29.47	6.05
Std. Dev.	Full Sample	2.957299	106.1013	115.5204	128.2862	1.766997	14.20074	3.645631
	State-owned banks	4.655172	3.06	12.76	7.58	6.24	26.43	9.6779
	Non-state-owned banks	2.792067	103.4739	109.1666	127.5286	1.595973	12.87869	2.934519
)bservatior	Full Sample	462	462	462	462	462	462	462
	State-owned banks	286	286	286	286	286	286	286
	Non-state-owned banks	176	176	176	176	176	176	176

4. Empirical Testing and Results Analysis

4.1 Empirical Testing

4.1.1 Formulation of performance indicators

(1) Bartlett's Test

As in **Table 2.**, Bartlett's test p-value is 0.000, which is less than 0.05, indicating that there is a correlation between the variables, making factor analysis an appropriate method to apply.

(2) The factor loading matrix

The factor load after rotation is shown in **Table 3.**

Table 2. Bartlett's Test

Bartlett's Sphericity Test	Bartlett's K-squared	580.240
	Degrees of Freedom	3
	Significance	.000

Table 3. Rotation Component Matrix A[a] and Component Score Coefficient Matrix

	Rotational Component Matrix		Component Score Coefficient Matrix	
	Component 1(F1)	Component 2(F2)	Component 1(F1)	Component 2(F2)
ROA	.961	.131	.858	.452

ROE	.894	-.359	.963	-.031
Capital adequacy ratio		.990	-.394	.910

Note:1. Extraction Method: Principal Component Analysis.
2. a indicates that two factors were extracted.

Common factor F_1 is explained by Return on Total Assets and Return on Equity, while common factor F_2 is explained by Return on Total Assets and Capital Adequacy Ratio. The results yield the following coefficient expressions:

$$F_1 = 0.853X_1 + 0.963X_2 - 0.394X_3 \quad (2)$$

$$F_2 = 0.452X_1 - 0.031X_2 + 0.910X_3 \quad (3)$$

Assigning weight values to each factor, the weighting results are as follows:

$$W_1 = \frac{60.630}{60.630 + 34.457} = 0.638$$

$$W_2 = \frac{34.457}{60.630 + 34.457} = 0.362$$

The expression of operational performance of commercial banks in our country is:

$$Per = 0.638F_1 + 0.363F_2 \quad (4)$$

4.1.2 Descriptive statistics and correlation analysis

In order to measure whether there is heterogeneity in the impact of inclusion digital finance on the operational performance of commercial banks, this paper conducts descriptive statistical analysis of the whole sample, state-owned banks, and non-state-owned banks, and the results are shown in Table 1. [11]

Comparing the analysis results of the three categories in Table 1, it can be found that the average operational performance of all sample banks is 10.84534, which fully reflects the significant differences in the operational performance of the 42 commercial banks in the sample. Moreover, the maximum operational performance of 20.76834 and the minimum of 4.655172 in the entire sample are both found in state-owned banks, indicating that the performance standard deviation is large, which means that the performance values of state-owned banks are more dispersed and the gap is larger. The explanatory variables are sub-indicators under a unified indicator, and the analysis results show that the correlation is high. After correcting for multicollinearity, the correlation between CD (digital support service degree) was excluded, the highest correlation coefficient between the variables was around 0.5, and the control variables were not highly correlated with each other, so there was no need to deal with the problem of multicollinearity separately.

4.2 Measurement Construction and Recommendations

4.2.1 Hausman test

Hausman test was conducted before model selection to determine whether the individual effect is related to the explanatory variable. The results of the Hausman test are shown in **Table 4.** The p-value is 0.0.

Table 4. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.2404	3	0.0105

4.2.2 F test

The F test was conducted through the F test analysis, and the F value of the slope-varying intercept model's F test was 42.8959, with a corresponding P value of 0.0000. The slope-varying intercept model was ultimately selected, and three variables were excluded based on the t test. The independent variables selected were FD and SD, and the controlled variable was QA.

4.2.3 Regression analysis

Regression analysis was conducted using a fixed-effects regression model,[12] and the results of the full sample regression analysis for commercial banks are shown in **Table 5.**[13]

Table 5. Full Sample and Subsample Regression Results

	Full Sample			State-owned Commercial Banks			Non-state-owned commercial banks		
Variable	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
C	11.28998	20.42429	0	10.92549	17.21531	0	10.10865	8.768802	0
FD?	-0.024625	-10.61029	0	-0.02287	-8.700405	0	-0.02153	-4.500202	0
SD?	0.006406	2.973573	0.0031	0.00521	2.191857	0.0293	0.006499	1.506219	0.134

QA?	0.265015	9.107762	0	0.30883	9.672329	0	0.251814	3.781805	0.0002
Fixed Effects (Cross)									
_LZ--C	-2.238965			-2.687964					
_CS--C	-0.21664			-0.503918					
_QD--C	-2.46234						-0.977209		
_QN--C	-0.928126						0.876893		
……	……			……			……		
R-squared	0.819044			0.852995			0.638035		
rob(F-statistic	0.000000			0.000000			0.000000		

According to the regression results, the P-value is less than 0.005, indicating that at the 95% confidence level, the model can explain 81.90% of the changes in commercial bank operational performance. The deep positive coefficients indicate that they have a positive impact on commercial bank performance, consistent with Hypothesis H1. According to the 42 straight lines, there are significant differences in performance between banks even if they do not implement inclusion digital finance.

The impact on state-owned banks is shown in Table 5, where both the explanatory and control variables are significant at the 95% confidence level. The regression results show that the explanatory variable FD has a negative coefficient, indicating that coverage breadth has a negative impact on the operational performance of state-owned banks.

The impact on non-state-owned banks is shown in Table 5, where the explanatory variable SD has a coefficient of 0.006499, which is greater than the coefficient of 0.00521 for state-owned banks, indicating that the positive impact of usage depth on the operational performance of non-state-owned banks is greater. The coefficient of FD is -0.02153, which is greater than the coefficient of -0.02287 for state-owned banks, indicating that the negative impact of coverage breadth on the operational performance of non-state-owned banks is smaller, consistent with Hypothesis H2.

5. Research Conclusions and Policy Implications

5.1 Research Conclusions

Based on the empirical study, the following conclusions were drawn: Inclusion digital finance, with its high efficiency, convenience, and low-cost features, greatly expanded the service scope of commercial banks and boosted the overall performance of commercial banks; The impact of inclusion digital finance on the performance of commercial banks is heterogeneous, and the degree of performance improvement of different types of commercial banks is clearly different.

5.2 Policy Implications

5.2.1 Utilizing financial resources to support scientific and technological innovation

Development The government should increase its support for the financial system and scientific and technological innovation and promote the integration of inclusion digital finance and scientific and technological innovation. It should also issue relevant policies to encourage cooperation between commercial banks and tech enterprises. [14]Commercial banks should actively explore service systems for small and micro-sized science and technology enterprises based on the Notice on Providing Full-Life-Cycle Financial Services for Science and Technology Enterprises issued by the National Financial Supervision and Management Bureau. They should also strengthen pre-loan comprehensive evaluation of science and technology enterprises and launch a series of financing products for science and technology enterprises to enable inclusion digital finance to develop in a wider field and at a deeper level.

5.2.2 Guiding commercial banks to strengthen digital transformation

To encourage commercial banks to accelerate their digital transformation, the government can provide relevant tax and financial incentives to reduce the economic pressure during the digital transformation process. Commercial banks should guide themselves to optimize business processes and improve service efficiency by enhancing digital transformation from the perspective of

deepening the use of inclusion digital finance services. They should also innovate in providing inclusion digital finance services to enhance business performance.

5.2.3 Encouraging commercial banks to explore differentiated development strategies

Commercial banks should explore differentiated development strategies and business models based on their own characteristics and advantages to meet the needs of different customer groups and enhance market competitiveness. Considering the impact of coverage breadth on the differentiation of commercial banks, non-state-owned commercial banks should try to minimize the negative impact of financial technology companies such as Ant Group on themselves by strengthening cooperation.

References

[1] Huang Yiping. Several Viewpoints on the Innovation and Development of China's Digital Finance. Finance Forum, 2021, 26(11): 3-5+36.

[2] Zhou Lvyao. Review on the Development of Digital Inclusive Finance. Finance and Accounting Monthly, 2022, (01): 147-153.

[3] Xie Xuanli, Wang Shihui. Digital Transformation of Commercial Banks in China: Measurement, Progress and Impact. China Economic Quarterly, 2022, 22(6): 1937-1956.

[4] Huang Yiping, Huang Zhou. The Development of Digital Finance in China: Present and Future. China Economic Quarterly, 2018, 17(4): 1489-1502.

[5] Lu Zhiqiang, Wu Junjie, Li Hongyu, Nguyen Duc Khuong. Local Bank, Digital Financial Inclusion and SME Financing Constraints: Empirical Evidence from China. Emerging Markets Finance and Trade, 2022, 58(8): 1712-1725.

[6] Zhao Tingchen, Feng Tianzhen. Developing Inclusive Finance and Stringently Controlling Credit Risk - A Summary of the Symposium on "The Development of Inclusive Finance and Credit Risk Control in China". International Finance, 2020, (10): 75-80.

[7] Zhang Hongkai. Research on the Impact of Digital Inclusive Financial Services on the Business Performance of Commercial Banks. Shanghai University of Finance and Economics, 2023.

[8] Guo Feng, Xiong Yunjun. Measurement and Impact of Digital Financial Inclusion in China: A Literature Review. Chinese Review of Financial Studies, 2021, 13(6): 12-23+117-118.

[9] Shang Guan, Xu Ming, LI Jianlan. Digital Finance: Context, Framework and Prospect: Literature Review from the business function perspective. Journal of Henan University of Technology (Social Science Edition), 2022, 38(01): 1-11.

[10] Xu Guihong, Shen Rui. Evaluation system of commercial banks' business performance in the context of digital inclusion. Rental and sale information, 2023(2): 44-46.

[11] Shen Rui. The Impact of Development of Digital Financial Inclusion on Business Performance of Commercial Banks. Shenyang University of Technology, 2023.

[12] Jia Ruan, Ruishi Jiang. Does digital inclusive finance affect the credit risk of commercial banks Finance Research Letters, 2024, 62(5): 105-153.

[13] Cui Haitao. A Study of the Impact of Fintech on the Performance of Commercial Banks Enterprise. Reform and Management, 2024, (6): 111-113.

[14] Xu Jingwei. Research on the Impact of Inclusive Finance on the Performance of Commercial. Liaoning University, 2023.