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Fintech and Operational Efficiency: Empirical Evidence from Indonesia's Banking Sector

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Abstract: *This study investigates the impact of financial technology (Fintech) adoption on the operational efficiency of commercial banks listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023. Employing a quantitative causal-associative method and panel data regression analysis, the research explores how Fintech-driven digital transactions influence banks' cost structures and efficiency ratios. Data were drawn from annual financial statements and digital transaction reports of four major banks: PT Bank Rakyat Indonesia, PT Bank Negara Indonesia, PT Bank Mandiri, and PT Bank Central Asia. The results reveal that Fintech adoption has a significant and negative effect on both Operating Cost to Operating Income (OCOI) and Cost-to-Income Ratio (CIR), indicating that increased digital transaction activity leads to lower operational costs and improved efficiency. These findings demonstrate that Fintech plays a pivotal role in enhancing banking performance by reducing transaction expenses, optimizing resource allocation, and promoting service accessibility. The study contributes to academic discourse and provides strategic insights for banking practitioners and regulators to strengthen digital transformation policies and foster inclusive Fintech adoption in Indonesia's financial ecosystem.*
Keywords: *Fintech Adoption, Operational Efficiency, Banking Performance, Digital Transformation, Indonesia Stock Exchange*

INTRODUCTION

Digital technology has revolutionized different businesses, and the financial industry is no exception (Thottoli et al., 2023). Technology-driven innovations termed Financial Technology (Fintech) have changed how people get, use, and keep financial services. Fintech offers speed, efficiency, as well as competitiveness that are also cheaper, which incentivises the digital transformation in the banking sector (Philippon, 2016). In Indonesia, the rise of Fintech has been swift, driven by a rising Internet penetration, supported by mobile phone adoption, and supporting regulations put in place by the Financial Services Authority (OJK) (Otoritas Jasa Keuangan, 2023) and Bank Indonesia (BI). According to OJK data, digital transactions are growing significantly every year, in response banks have expedited their strategies around digital transformation (Otoritas Jasa Keuangan, 2023).

Operational efficiency is considered to be a determinant of banking performance as it pertains to how well an institution is able to control its costs, improve effectiveness, and provide superior services to its customers (Maryunita & Nugroho, 2022a). Fintech adoption is expected to help banks automate operations, reduce transaction costs, and expand service reach (Pramudito et al., 2025). However, only a few empirical studies focusing on how far the Fintech adoption actually enhances the bank operational efficiency in Indonesia-particularly of operating cost productivity and profitability (Hartini & Jakaria, 2020).

Based on this background, this research has a main problem that aims to examine the impact of Fintech adoption on operational efficiency among Indonesia-Stock Exchange–listed banks (IDX). In order to address this problem, our study adopts a quantitative-based, panel data regression method, which would allow us to examine the relationship between Fintech variables and operational efficiency over time. The operational efficiency is assessed using the operating cost to operating income (OCOI) and Cost-to-Income Ratio (CIR). In addition, this study also investigates the long-run profitability effects of Fintech adoption in the banking industry.

This research is expected to contribute to both academic literature and banking practice, providing strategic recommendations for regulators to strengthen digital transformation policies within Indonesia's banking industry.

METHOD

The causal-associative method, which is used in this study's quantitative approach, attempts to determine the influence and relationship between two or more variables (Bougie & Sekaran, 2019; Sugiyono, 2013). In particular, the study aims to quantify the degree to which financial technology (Fintech) leads to observable and measurable gains in operational efficiency in addition to analysing the relationship between Fintech adoption and banks' operational efficiency (Maryunita & Nugroho, 2022b). All commercial banks that were listed on the Indonesia Stock Exchange (IDX) between 2019 and 2023 and that released yearly financial statements and publicly available digital transaction data make up the research topics.

Four significant banks—PT Bank Rakyat Indonesia (Persero) Tbk, PT Bank Negara Indonesia (Persero) Tbk, PT Bank Mandiri (Persero) Tbk, and PT Bank Central Asia Tbk—were

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chosen from this population for the sample based on the accessibility of financial data throughout the study period. The study makes use of secondary data from yearly financial reports that are posted on the official websites of the banks and IDX, as well as annual, management, and operational reports that offer details on the use of Fintech (Maryunita & Nugroho, 2022b).

Descriptive statistical analysis is used to describe the characteristics of each variable (Fintech, operating cost to operating income (OCOI) and Cost-to-Income Ratio (CIR); traditional assumption tests (normality, multicollinearity, heteroscedasticity, and autocorrelation) are used to ensure the validity of the regression model; panel data regression analysis is used to test the impact of Fintech adoption on banks' operational efficiency using fixed effect or random effect models; significance testing (t-test and F-test) is used to determine both partial and simultaneous effects of Fintech on operational efficiency; and coefficient of determination (R2) analysis is used to gauge how much variation in operational efficiency can be explained by the Fintech variable. This analytical framework offers a thorough quantitative basis for assessing how Fintech adoption affects Indonesian banks' operational effectiveness.

RESULT AND DISCUSSION

RESULT

Descriptive Statistics

Data about the numerical dimensions of sample data, such as the minimum, maximum, average (mean), and standard deviation, are obtained using descriptive statistics. Information about data attributes is provided by the data. Profitability, capital structure, company value, and dividend policy are the four factors used in this analysis. Table 1 displays the outcomes of descriptive statistics that were analysed with SPSS 25.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
OCOI	20	43.70	93.30	69.1190	13.85272
CIR	20	34.10	45.68	40.9810	3.99487

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Transaction	20	1.83	10109.00	2749.8495	3098.03442
Valid N (listwise)	20				

Source: Processed data, 2025

It is clear from the above table 1 that a sample size of 20 was chosen for the descriptive statistics. OCOI and CIR are the indicators utilised in the firm efficiency variable. BOPO ranges from a minimum of 43.70 to a maximum of 93.30. Out of the 20 samples, the average BOPO was 69.1190. BOPO has a standard deviation of 13.85272, which is greater than the mean. The data deviation in BOPO might be seen as unfavourable since the standard deviation is higher than the mean, indicating that BOPO has a wide spread.

The CIR indicator shows that another firm efficiency characteristic has a minimum value of 34.10 and a maximum value of 45.68. 40.9810 is the average CIR value. The CIR has a standard deviation of 3.99487, which is greater than the mean. Given that the standard deviation is higher than the mean, this suggests a wide spread. As a result, the CIR's data deviation is regarded as poor.

Using the quantity of transactions as an indicator, the fintech implementation variable has a minimum value of 1.83 and a maximum value of 10,109.00. Fintech implementation has an average value of 2,749.8495. Fintech implementation has a standard deviation of 3,098.03442, which is greater than the mean. Given that the standard deviation is higher than the mean, this suggests a wide spread. Data variation in fintech implementation is therefore seen as subpar.

Operating Cost To Operating Income (OCOI)

To ascertain if an independent variable, dependent variable, or both are regularly distributed, a normality test is conducted. The Monte Carlo test, a non-parametric statistical test, was utilised in this study's statistical analysis to ascertain whether the residuals were normally distributed. The table 1 below displays the Monte Carlo test results.

Table 2. One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		20
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2.75957208
Most Extreme Differences	Absolute	.194
	Positive	.067
	Negative	-.194
Test Statistic		.194
Asymp. Sig. (2-tailed)		.047[c]
Monte Carlo Sig. (2-tailed)	Sig.	.390[d]

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	99% Confidence Interval	Lower Bound	.378
		Upper Bound	.403
a. Test distribution is Normal.			
b. Calculated from data.			
c. Lilliefors Significance Correction.			
d. Based on 10000 sampled tables with starting seed 2000000.			

Source: Processed data, 2025

The significance level, as seen in the above table, is 0.390. Given that the significance level is higher than 0.05, or 5%, this suggests that the residual data is regularly distributed. This indicates that the data is usable and regularly supplied.

Table 3. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	77.221	3.238		23.851	.000
	Transaction	-.003	.001	-.659	-3.717	.002
a. Dependent Variable: BOPO						

Source: Processed data, 2025

According to the above table, the application coefficient value is 0.003 and the significance value is less than 0.05 (0.002 < 0.005), indicating a negative direction. This means that, assuming all other regression model assumptions stay the same, every 1% decline in banking will result in a -0.003 reduction in the value of banking operations during the 2019–2023 period. We may conclude that operational expenses are significantly impacted by the use of fintech.

Cost-to-Income Ratio (CIR)

To ascertain if an independent variable, dependent variable, or both are regularly distributed, a normality test is conducted. The Monte Carlo test, a non-parametric statistical test, was utilised in this study's statistical analysis to ascertain whether the residuals were normally distributed. The table below displays the Monte Carlo test results.

Table 4. One-Sample Kolmogorov-Smirnov Test

			Unstandardized Residual
N			20
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		10.41982546
Most Extreme Differences	Absolute		.129
	Positive		.129
	Negative		-.085
Test Statistic			.129
Asymp. Sig. (2-tailed)			.200[c,d]
Monte Carlo Sig. (2-tailed)	Sig.		.858[e]
	99% Confidence Interval	Lower Bound	.849

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		Upper Bound	.867
a. Test distribution is Normal.			
b. Calculated from data.			
c. Lilliefors Significance Correction.			
d. This is a lower bound of the true significance.			
e.Based on 10000 sampled tables with starting seed 299883525.			

Source: Processed data, 2025

The significance level, as seen in the preceding table, is 0.200. Given that the significance level is higher than 0.05, or 5%, this suggests that the residual data is regularly distributed. This indicates that the data is usable and regularly supplied.

Table 5. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	43.545	.857		50.784	.000
	JUMLAHTRANSAKSI	-.001	.000	-.723	-4.441	.000
a. Dependent Variable: CIR						

Source: Processed data, 2025

According to the above table, the application coefficient value is -0.001 and the significance value is less than 0.05 (0.000 < 0.005), indicating a negative direction. This means that, assuming all other regression model assumptions stay the same, every 1% decline in banking will result in a -0.001 reduction in the value of banking operations during the 2019–2023 period. We may conclude that the cost to income ratio is significantly impacted by the use of fintech.

Discussion

The study's conclusions provide convincing evidence of the connection between Fintech adoption and the effectiveness of banking operations (Berisha & Rayfield, 2025). According to the descriptive analysis, there is a significant amount of diversity among banks, with the average OCOI (Operating Expenses to Operating Income) standing at 69.11. This variance shows that the studied banks' operating efficiency levels varied from 2019 to 2023. Likewise, the average value of the Cost-to-Income Ratio (CIR), another measure of efficiency, was 40.98, indicating that the majority of banks continue to operate at a moderate level of efficiency (Shahbaz et al., 2020).

Additional regression analysis shows that Fintech adoption significantly and negatively affects both Operating Expenses to Operating Income (OCOI) and Cost-to-Income Ratio (CIR), as indicated by the volume of digital transactions (Berisha & Rayfield, 2025; Cho & Chen, 2021). Stated differently, increased use of Fintech services results in lower operating expenses and lower

cost-to-income ratios. This finding is consistent with other research indicating that the digitisation of banking services improves efficiency by lowering operating costs, speeding up service delivery, and reaching a wider audience without incurring extra costs for physical infrastructure like branch growth (P. L. & L., 2025; Saroy et al., 2023).

For banking management, the steady drop in OCOI and CIR combined with the rise in digital transactions is encouraging. It suggests that financial investments in Fintech infrastructure result in observable increases in efficiency (Chhaidar et al., 2023). The wide range of data, however, also suggests that not all institutions have made the best use of Fintech. The extent to which Fintech is used across institutions may be significantly influenced by elements like clients' digital literacy, digital transformation tactics, and technological preparedness (Adhikari et al., 2024; M. Anwarul Islam & Saifuddin Khan, 2024) .

There are strategic ramifications for the banking sector from these results. To promote wider Fintech adoption, financial institutions must constantly improve transaction security, provide cutting-edge digital goods, and educate consumers in order to fortify their digital ecosystems (Jafri et al., 2024; Nugraha et al., 2022). By making these efforts, banks can save operating expenses while simultaneously improving service quality and competitiveness in the increasingly digitised financial market (Davey et al., 2024).

This study does, however, recognise several limitations. The conclusions' generalisability is limited by the comparatively small sample size and the dependence on a single measure of Fintech implementation—the quantity of digital transactions. By including variables like transaction value, the variety of Fintech services used, and direct measurements of profitability, future study could expand the analytical reach. Such expansions would provide a more thorough comprehension of how digitalisation affects the banking industry's long-term viability and financial performance.

CONCLUSION

This analysis emphasises how crucial Fintech adoption is to improving the banking industry's operational effectiveness in Indonesia between 2019 and 2023. The OCOI (Operating Expenses to Operating Income) and the Cost-to-Income Ratio (CIR) are both significantly and negatively impacted by the volume of digital transactions, according to the regression study.

According to this research, more digital transactions translate into lower operating costs and lower cost-to-income ratios, which suggests that banking operations are more efficient.

By lowering operating costs, enhancing service speed and convenience, and fortifying banks' competitive positions in an increasingly digitalised financial world, these findings confirm that Fintech's digitalisation of banking services offers real advantages. There is potential for more optimisation and wider acceptance, though, given the significant variation in the data, which indicates that the level of Fintech usage is still uneven across institutions.

As a result, this study offers useful advice for banking management, highlighting the necessity of ongoing investments in digital infrastructure, the expansion of consumer education initiatives, and the encouragement of inclusive technology adoption. By doing this, banks can improve their operational efficiency while also having longer-term, more significant effects on their financial performance.

Suggestion

Several important recommendations might be put forth as strategic references for different stakeholders based on the study's results and conclusions. Increasing financial technology investment is crucial for bank management, especially in the fields of cybersecurity, application integration, and digital product creation. Programs for customer education and awareness should also be regularly improved in order to promote a wider use of digital services and increase operational effectiveness. The advancement of data-driven business strategies also depends on the efficient use of digital transaction data, which enables banks to create and provide services that are more in line with the requirements and preferences of their clients.

From a regulatory standpoint, rules that encourage cooperation between banks and technology providers are necessary to strengthen the Fintech ecosystem, especially for the Financial Services Authority (OJK) and Bank Indonesia. To guarantee uniformity and preserve public confidence in the financial system, regulators should also create uniform policies and security protocols for online transactions.

To improve the generalisability of the findings, it is advised that future researchers broaden the scope of their investigation by using a larger sample size and a longer observation period. The analysis would be further enhanced by including other variables including profitability, bank size, client digital literacy, and the kinds of Fintech services used. Furthermore, the use of sophisticated

analytical methods, like panel data models or structural equation modelling (SEM), may offer a more thorough grasp of how Fintech adoption affects banking performance in the digital age by shedding light on the intricate relationships between variables.

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