



Journal Homepage: - www.journalijar.com
**INTERNATIONAL JOURNAL OF
ADVANCED RESEARCH (IJAR)**

Article DOI: 10.21474/IJAR01/22790
DOI URL: <http://dx.doi.org/10.21474/IJAR01/22790>



RESEARCH ARTICLE

DO DIGITAL PAYMENT SYSTEMS ENHANCE BANKING PERFORMANCE IN INDIA? EVIDENCE FROM PANEL DATA ANALYSIS

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Manuscript Info

Manuscript History

Received: 8 December 2025
Final Accepted: 10 January 2026
Published: February 2026

Key words:-

Digital payment systems, Banking performance, Return on Assets, Operational efficiency, Panel data analysis, Indian banks.

Abstract

Digital payment systems have become an important part of the Indian banking sector and have changed the way banks operate and serve customers. This study examines whether digital payment systems improve the performance of banks in India. The study uses panel data from 20 scheduled commercial banks for the period 2016–2024. Banking performance is measured using Return on Assets (ROA) to represent financial performance and the cost-to-income ratio to represent operational efficiency. Digital payment adoption is measured through digital payment volume and digital payment value, while bank size, capital adequacy ratio, and asset quality (NPA ratio) are used as control variables. Panel unit root test results show that all variables are stationary at level, making them suitable for panel regression analysis. The results indicate that both digital payment volume and digital payment value have a positive and significant impact on banks' profitability. The fixed effects model is found to be the most appropriate based on the Hausman test. The study also finds that higher digital payment adoption helps banks reduce operating costs and improve efficiency, while higher non-performing assets negatively affect bank performance. Overall, the study concludes that digital payment systems play a key role in enhancing the financial performance and operational efficiency of Indian banks. The findings highlight the importance of continuous investment in digital payment infrastructure to strengthen the banking system in the digital era.

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Introduction:-

The Indian banking sector has undergone a significant transformation over the past decade with the rapid expansion of digital payment systems.

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Technological advancements, supportive regulatory frameworks, and increasing consumer acceptance have accelerated the shift from cash-based transactions to digital modes of payment. Digital payment platforms such as real-time fund transfers, mobile wallets, and Unified Payments Interface (UPI) have become integral to the day-to-day functioning of banks, reshaping their operational and financial dynamics. In India, the promotion of digital payments has been a key policy priority, particularly after major initiatives aimed at enhancing financial inclusion and improving payment system efficiency. Regulatory support and continuous monitoring by the Reserve Bank of India have strengthened the digital payment ecosystem, while the operational management and expansion of retail payment systems by the National Payments Corporation of India have significantly increased transaction volumes and values across the country. As a result, banks are increasingly leveraging digital payment channels to expand their customer base, reduce transaction costs, and generate fee-based income.

From a performance perspective, digital payment systems are expected to influence banks in multiple ways. Increased digital transactions can enhance profitability by lowering operational costs, improving asset utilization, and increasing non-interest income. At the same time, banks that effectively adopt digital payment technologies may achieve greater operational efficiency through automation and scale economies. However, the extent to which digital payment adoption translates into improved banking performance remains an empirical question, particularly in a diverse banking system like India that comprises public and private sector banks with varying levels of technological readiness. Despite the growing importance of digital payments, empirical studies examining their direct impact on banking performance in the Indian context remain limited. Existing literature has largely focused on adoption trends, customer behavior, or financial inclusion, with relatively less attention paid to the performance implications for banks using robust econometric techniques. This gap necessitates a comprehensive empirical investigation using panel data methods that can capture both cross-sectional differences among banks and temporal changes over time.

Against this backdrop, the present study examines whether digital payment systems enhance the financial performance and operational efficiency of Indian banks. Using panel data covering selected banks over the period 2016–2024, the study analyzes the impact of digital payment indicators on key performance measures such as profitability and cost efficiency. By employing panel regression techniques and appropriate diagnostic tests, the study aims to provide empirical evidence on the role of digital payment systems in strengthening the performance of the Indian banking sector. The findings of this study are expected to offer valuable insights for policymakers, regulators, and banking institutions by highlighting the performance implications of digital payment adoption and supporting informed decision-making regarding future investments in digital banking infrastructure.

Review Of Literature:-

Recent empirical studies provide strong evidence on the role of digital payment systems in improving banking performance and efficiency. Saroy et al. (2023) examined Indian commercial banks using Data Envelopment Analysis and dynamic panel models and found that digital payment adoption significantly enhances cost efficiency, primarily through reduced operational costs and improved process automation. Extending the discussion beyond efficiency, Mostafa and Arumugasamy (2025) highlighted that increased digital payment usage in India strengthened banking competitiveness and indirectly improved performance by enhancing monetary policy transmission and reducing lending costs. Evidence from other emerging economies also supports these findings; Zuo, Li, and Xia (2023), using panel data from Chinese banks, reported that digital finance—including digital payments—positively influenced bank productivity through technological innovation and scale effects. Focusing on the Indian context, Pandey (2025) observed that digitalization initiatives in banks led to notable improvements in operational efficiency and service delivery, which translated into better overall performance. Similarly, Digambar (2025) empirically demonstrated that digital payment systems positively affect the financial performance of Indian banks by increasing non-interest income and reducing administrative expenses. Collectively, these studies confirm that digital payment adoption plays a significant role in enhancing both profitability and efficiency of banks; however, they also indicate the need for further panel-based empirical analysis linking digital payment indicators directly with banking performance measures over a recent period, which the present study seeks to address.

Statement Of The Problem:-

The rapid expansion of digital payment systems has significantly transformed the operational landscape of the Indian banking sector. With increasing adoption of digital platforms such as real-time payments and mobile-based transactions, banks are investing heavily in digital infrastructure to improve service delivery and operational efficiency. Regulatory support from the Reserve Bank of India and the growing role of the National Payments

Corporation of India have accelerated the growth of digital payments across the country. Despite this widespread adoption, the actual impact of digital payment systems on the financial performance and operational efficiency of banks remains a matter of empirical investigation. While digital payments are expected to enhance profitability by reducing transaction costs, improving asset utilization, and increasing fee-based income, Indian banks continue to face challenges such as rising non-performing assets, cost pressures, and variations in performance across public and private sector banks. Existing studies have largely focused on digital payment adoption, customer usage behavior, or financial inclusion outcomes, with limited attention given to examining how digital payment systems directly influence key banking performance indicators using robust econometric techniques.

Moreover, the heterogeneity among Indian banks in terms of size, ownership, and technological readiness suggests that the performance impact of digital payments may not be uniform. The absence of comprehensive panel data studies analyzing both profitability and operational efficiency over a recent period creates a research gap. Therefore, there is a need to systematically examine whether the increasing adoption of digital payment systems has translated into measurable improvements in banking performance in India. In this context, the problem addressed by the present study is to empirically assess the extent to which digital payment systems enhance the financial performance and operational efficiency of Indian banks. By employing panel data analysis over a recent time period, the study seeks to provide evidence-based insights into the performance implications of digital payment adoption, thereby contributing to informed decision-making by banks, regulators, and policymakers.

Objectives Of The Study:-

1. To examine the impact of digital payment systems on the financial performance of Indian banks.
2. To analyze the relationship between digital payment adoption and operational efficiency of Indian banks.

Hypothesis Of The Study:-

1. H₀₁: There is no significant impact of digital payment systems on the financial performance (Return on Assets) of Indian banks.
2. H₀₂: There is no significant relationship between digital payment adoption and the operational efficiency (Cost-to-Income Ratio) of Indian banks.

Research Methodology:-

The present study adopts a quantitative and empirical research design to examine the impact of digital payment systems on the financial performance and operational efficiency of Indian banks. The study is based entirely on secondary data, ensuring objectivity and reliability of analysis.

Nature and Sources of Data:-

Secondary data were collected from authentic and publicly available sources. Data on digital payment indicators were obtained from publications and databases of the Reserve Bank of India and the National Payments Corporation of India. Bank-specific financial data were collected from annual reports of selected banks and stock exchange disclosures.

Sample Selection and Study Period:-

The sample consists of 20 scheduled commercial banks in India, including both public and private sector banks. The study covers a nine-year period from 2016 to 2024, a phase marked by rapid growth in digital payment adoption.

Variables Used:-

Dependent Variables:

- Financial Performance: Return on Assets (ROA)
- Operational Efficiency: Cost-to-Income Ratio
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Independent Variables:

- Digital Payment Volume
- Digital Payment Value

Control Variables:

1. Bank Size
2. Capital Adequacy Ratio

3. Asset Quality (NPA Ratio)

Analytical Tools and Techniques:-

The study employs descriptive statistics and correlation analysis for preliminary understanding. Stationarity of data is tested using panel unit root tests (Levin–Lin–Chu and Im–Pesaran–Shin). To analyze the impact of digital payment systems, panel regression models Pooled OLS, Fixed Effects Model, and Random Effects Model are applied. The Hausman specification test is used to select the appropriate panel model.

Software Used:-

Statistical analysis was carried out using standard econometric software such as EViews, while MS Excel was used for data compilation. Overall, this methodology enables a robust examination of the relationship between digital payment systems and banking performance in India by capturing both cross-sectional and time-series variations.

Analysis And Interpretation:-

Objective 1: To examine the impact of digital payment systems on the financial performance of Indian banks.

Table 1: Panel Unit Root Test Results

Variable	Levin–Lin–Chu (LLC) Statistic	p-value	Im–Pesaran–Shin (IPS) Statistic	p-value	Order of Integration
Return on Assets (ROA)	-3.24	0.001	-2.89	0.00	I(0)
Return on Equity (ROE)	-2.97	0.002	-2.54	0.01	I(0)
Digital Payment Volume	-1.88	0.030	-2.11	0.02	I(0)
Digital Payment Value	-2.46	0.007	-2.63	0.00	I(0)
Bank Size	-3.61	0.000	-3.14	0.00	I(0)
Capital Adequacy Ratio	-2.72	0.003	-2.38	0.01	I(0)
Asset Quality (NPA Ratio)	-3.09	0.001	-2.95	0.00	I(0)

Source: Calculated

Table 1 presents the results of the Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) panel unit root tests conducted to examine the stationarity properties of the variables. The test results indicate that the LLC and IPS statistics for all variables—Return on Assets (ROA), Return on Equity (ROE), Digital Payment Volume, Digital Payment Value, Bank Size, Capital Adequacy Ratio, and Asset Quality (NPA Ratio)—are statistically significant at the 5 per cent level. Consequently, the null hypothesis of the presence of a unit root is rejected for all variables. The findings confirm that all variables are stationary at level, i.e., integrated of order zero [I(0)]. This ensures that the panel data does not suffer from non-stationarity problems and validates the application of panel regression techniques for further analysis.

Table 2: Panel Regression Results – Impact of Digital Payment Systems on Banking Performance
Dependent Variable: Return on Assets (ROA)

Variables	Pooled OLS	Fixed Effects Model	Random Effects Model
Digital Payment Volume	0.028** (2.41)	0.031*** (3.12)	0.029** (2.56)
Digital Payment Value	0.022** (2.08)	0.026*** (2.87)	0.024** (2.19)
Bank Size	0.015* (1.89)	0.012* (1.76)	0.014* (1.83)

Capital Adequacy Ratio	0.021** (2.34)	0.019** (2.11)	0.020** (2.26)
Asset Quality (NPA Ratio)	-0.034*** (-3.46)	-0.031*** (-3.18)	-0.033*** (-3.39)
Constant	0.112	0.097	0.105
No. of Banks	20	20	20
Time Period	2016–2024	2016–2024	2016–2024
Observations	180	180	180
R ²	0.42	0.48	0.45

Values in parentheses indicate t-statistics

***, **, * indicate significance at 1%, 5%, and 10% levels respectively

Table 2 reports the results of pooled OLS, fixed effects, and random effects panel regression models examining the impact of digital payment systems on the financial performance of Indian banks, measured by Return on Assets (ROA), over the period 2016–2024. The results indicate that Digital Payment Volume has a positive and statistically significant coefficient across all three models, implying that an increase in the volume of digital transactions enhances bank profitability. Similarly, Digital Payment Value also shows a positive and significant impact on ROA, suggesting that higher digital transaction values contribute to improved financial performance through increased fee-based income and transaction efficiency. The control variables further strengthen the model. Bank Size exhibits a positive and marginally significant relationship with ROA, indicating that larger banks benefit from economies of scale and better utilization of digital infrastructure. The Capital Adequacy Ratio is positively and significantly related to ROA, reflecting that well-capitalized banks are more resilient and capable of generating higher returns. In contrast, Asset Quality, measured by the NPA ratio, shows a negative and highly significant coefficient in all models, confirming that higher non-performing assets adversely affect profitability by increasing credit risk and provisioning costs. Among the three estimation techniques, the fixed effects model demonstrates the highest explanatory power with an R² value of 0.48, indicating that bank-specific characteristics play a crucial role in explaining variations in financial performance. In line with these results, the null hypothesis stating that there is no significant impact of digital payment systems on the financial performance (ROA) of Indian banks is rejected, as both digital payment indicators are statistically significant at conventional levels. Consequently, the alternative hypothesis is accepted, confirming that digital payment systems have a significant and positive impact on the financial performance of Indian banks. Overall, the findings provide strong empirical evidence that the expansion of digital payment systems enhances bank profitability, while sound capitalization and scale further support performance, and poor asset quality undermines it.

Table 3: Hausman Test Result

Test	Chi-square Value	Probability	Decision
Hausman Test	12.64	0.027	Fixed Effects Model Preferred

Source: Calculated

Table 3 presents the Hausman specification test results used to choose between the fixed effects and random effects models. The test statistic is significant at the 5 per cent level ($p = 0.027$), leading to the rejection of the null hypothesis that the random effects estimator is consistent. Accordingly, the fixed effects model is preferred, indicating that unobserved bank-specific characteristics significantly influence banking performance. This justifies controlling for individual bank heterogeneity while assessing the impact of digital payment systems on financial performance.

Objective 2: To analyze the relationship between digital payment adoption and operational efficiency of Indian banks.

Table 4: Impact of Digital Payment Adoption on Operational Efficiency of Indian Banks
Dependent Variable: Cost-to-Income Ratio

Variables	Correlation Coefficient	Fixed Effects Model
Digital Payment Volume	-0.42**	-0.037*** (-3.41)

Digital Payment Value	-0.39**	-0.031** (-2.76)
Bank Size	-0.28*	-0.018* (-1.94)
Asset Quality (NPA Ratio)	0.46***	0.044*** (3.88)
Constant	—	0.612
No. of Banks	—	20
Time Period	—	2016–2024
Observations	—	180
R ²	—	0.51

***, **, * indicate significance at 1%, 5%, and 10% levels respectively

Table 4 presents the results of correlation analysis and the fixed effects panel regression model examining the relationship between digital payment adoption and the operational efficiency of Indian banks, measured by the cost-to-income ratio, during the period 2016–2024. The correlation coefficients reveal a negative and statistically significant relationship between digital payment indicators and the cost-to-income ratio. Specifically, Digital Payment Volume (-0.42) and Digital Payment Value (-0.39) indicate that higher digital payment adoption is associated with lower operating costs relative to income, reflecting improved efficiency. The fixed effects regression results further substantiate this relationship. Digital Payment Volume shows a negative and highly significant coefficient (-0.037), while Digital Payment Value also exhibits a negative and significant impact (-0.031). These findings suggest that increased usage and higher value of digital transactions reduce operational costs through automation, faster processing, and reduced dependence on manual banking operations. Bank Size also has a negative and marginally significant effect on the cost-to-income ratio, implying that larger banks benefit from economies of scale in adopting digital technologies. In contrast, Asset Quality, measured by the NPA ratio, has a positive and statistically significant coefficient (0.044), indicating that higher levels of non-performing assets increase operational costs and reduce efficiency. The model demonstrates strong explanatory power with an R² value of 0.51, indicating that more than half of the variation in operational efficiency is explained by the included variables. In line with these empirical results, the null hypothesis stating that there is no significant relationship between digital payment adoption and the operational efficiency of Indian banks is rejected, while the alternative hypothesis is accepted. Overall, the findings confirm that digital payment adoption significantly enhances the operational efficiency of Indian banks by lowering the cost-to-income ratio, whereas poor asset quality undermines efficiency gains.

Table 5: Hausman Test Result

Test	Chi-Square Value	Probability	Decision
Hausman Test	10.87	0.031	Fixed Effects Model Preferred

Source: Calculated

Table 5 reports the Hausman test results for the operational efficiency model. The chi-square statistic is statistically significant at the 5 per cent level (p = 0.031), leading to the rejection of the null hypothesis. This confirms that the fixed effects model is more appropriate than the random effects model. The result highlights the importance of accounting for unobserved, bank-specific factors when analyzing the relationship between digital payment adoption and operational efficiency.

Limitations Of The Study:-

1. The study relies entirely on secondary data, which may be affected by reporting inconsistencies and accounting policy differences across banks.
2. The analysis is limited to selected Indian scheduled commercial banks, and therefore the findings may not be fully generalizable to cooperative banks, small finance banks, or non-banking financial companies.
3. Digital payment indicators are measured in terms of volume and value, which may not fully capture qualitative aspects such as customer experience, cybersecurity risks, or technological sophistication.
4. The study uses a fixed time period, and hence short-term shocks such as regulatory changes or economic disruptions may influence the results.

5. Although control variables are included, the possibility of omitted variable bias cannot be completely ruled out, as other factors like management quality and market competition are difficult to quantify.

Conclusion:-

The study examines whether the expansion of digital payment systems has contributed to improvements in the financial performance and operational efficiency of banks in India. Using panel data analysis, the findings indicate that increased digital payment activity, measured through transaction volume and value, has a significant influence on banking performance. The results suggest that greater adoption of digital payments is associated with improved Return on Assets (ROA), reflecting enhanced income generation and better utilization of banking resources. At the same time, the study finds that digital payment systems contribute to better operational efficiency, as reflected in a reduction in the cost-to-income ratio over time. This indicates that digital channels help banks lower transaction costs, streamline processes, and improve service delivery. Control variables such as bank size, capital adequacy, and asset quality also play an important role in shaping bank performance, highlighting the need for balanced growth and prudent risk management. Overall, the study concludes that digital payment systems act as a key driver of banking performance in India. The findings support the policy initiatives of institutions such as the Reserve Bank of India and the National Payments Corporation of India in promoting digital transactions. The study provides empirical evidence that continued investment in digital payment infrastructure can strengthen bank profitability and efficiency, thereby contributing to the long-term stability and competitiveness of the Indian banking sector.

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