PROCEEDINGS THE 4th INTERNATIONAL CONFERENCE ON ECONOMICS, BUSINESS, AND MANAGEMENT RESEARCH (ICEBMR) "Cultural Tourism as a Tool for National Building or Neocolonialism in the Bandung Spirit"
https://e-conf.usd.ac.id/index.php/icebmr/ | ISSN: 3032-596X | Vol 4, 2025

DIGITAL PAYMENT GROWTH AND ITS CONSEQUENCES FOR BANK HEALTH IN EMERGING ECONOMIES

Rafael Christeven Sanjaya[1], Dwitya Aribawa[2]
[1,2]Management Department, Faculty of Business and Economics, Atma Jaya Yogyakarta University
dwitya.aribawa@uajy.ac.id

ABSTRACT

This study investigates the impact of electronic money (e-money) transactions on the financial health of Indonesian banks with variability of size, assessed through the Risk-Based Bank Rating (RBBR) framework. Bank health indicators include Return on Assets (ROA), Return on Equity (ROE), Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), and Loan to Deposit Ratio (LDR). In addition to e-money activity, macroeconomic factors such as inflation and broad money supply (M2) are incorporated as control variables. Using quarterly secondary data from 2021 to 2024 sourced from Bank Indonesia, the Financial Services Authority (OJK), and published bank financial statements, the study employs panel regression with classical assumption testing to ensure model robustness. The results show that e-money transactions significantly enhance bank profitability (ROA and ROE) but negatively affect efficiency, capital adequacy, and liquidity (CIR, CAR, and LDR). Furthermore, money supply (M2) consistently exerts a significant influence across indicators, while inflation demonstrates limited impact, affecting only ROE. These findings highlight the dual role of digital finance: strengthening profitability while simultaneously challenging efficiency and liquidity management. The study contributes to the discourse on digital transformation in banking, providing practical insights for banks in strategic planning, for regulators in safeguarding stability amid innovation, and for academics analyzing the systemic implications of digital finance in emerging markets.

Keywords: *E-money, bank health, RBBR digital finance, Indonesia*

1. Introduction

The rapid expansion of financial technology has significantly transformed Indonesia's banking sector, with electronic money (e-money) becoming one of the most widely adopted innovations. As a digital payment instrument, e-money offers convenience, efficiency, and security in financial transactions, reducing reliance on physical cash. In Indonesia, commercial banks are classified into four categories under the KBMI (Bank Groups by Core Capital) system, as regulated by the Financial Services Authority (OJK) through POJK No.12/POJK.03/2021. KBMI 1 includes banks with core capital below IDR 6 trillion, KBMI 2 between IDR 6–14 trillion, KBMI 3 between IDR 14–70 trillion, and KBMI 4 above IDR 70 trillion.

Major banks in the KBMI 4 category—BCA, Mandiri, BNI, and BRI—along with CIMB Niaga from KBMI 3, play a leading role in providing e-money services, thereby shaping the development of the country's digital financial ecosystem. This study focuses on the 2021–2024 period, during which e-money transactions continued to increase in volume and value, reflecting Indonesia's accelerating digital transformation.

While e-money adoption provides new opportunities for banks through fee-based income and operational efficiency, it also presents potential challenges for capital adequacy, liquidity, and cost management. The Risk-Based Bank Rating (RBBR) framework, applied by the Indonesian Financial Services Authority (OJK), evaluates bank health through indicators such as Return on Assets (ROA), Return on Equity (ROE), Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), and Loan to Deposit Ratio (LDR). However, existing research has not fully addressed how e-money transactions specifically influence these indicators in the Indonesian banking context.

In addition to digital transactions, macroeconomic conditions—particularly broad money supply (M2) and inflation—are also critical in shaping bank performance. Ignoring these factors could bias the results, as both variables affect liquidity, profitability, and stability in the financial system. Thus, analyzing the impact of e-money while controlling for macroeconomic conditions is essential for a comprehensive understanding of digital finance's role in the banking sector.

The objective of this study is to analyze the effect of e-money transactions on the health of KBMI 3 and KBMI 4 banks in Indonesia, using quarterly data from 2021 to 2024. By incorporating M2 and inflation as control variables, this research provides empirical evidence on the dual role of digital finance in enhancing profitability while creating challenges for efficiency and liquidity. The findings are expected to contribute practical insights for banks in strategic planning, assist regulators in balancing innovation and financial stability, and enrich academic literature on the systemic impact of digital finance.

2. Literature Review

2.1. Electronic Money (E-Money)

Electronic money (e-money) refers to monetary value stored electronically, issued on receipt of funds, and used for payment transactions with merchants other than the issuer (Bank Indonesia, 2020). E-money plays a critical role in modernizing the payment system by providing secure, fast, and convenient alternatives to cash. Previous studies highlight that digital payments improve financial intermediation efficiency and increase banks' fee-based income (Huang et al., 2024). Chen and Tillmann (2023) also found that the adoption of digital payments strengthens monetary policy transmission and enhances banking efficiency. Therefore, analyzing the effect of e-money on bank performance becomes relevant in the context of Indonesia's financial sector.

2.2. KBMI Banks

The classification of Indonesian banks by Core Capital (KBMI) was established by OJK regulation POJK No.12/POJK.03/2021, dividing banks into four groups based on tier-1 capital. KBMI 4 banks, such as BCA, Mandiri, BNI, and BRI, dominate the market with strong financial capacity and advanced digital infrastructure. KBMI 3 banks, including CIMB Niaga, are medium-sized but remain active in digital innovations. Research indicates that banks with larger core capital are more adaptable to technological changes due to greater investment capacity in digitalization (de Mello Gindri et al., 2023). This study focuses on KBMI 3 and 4 banks, as they are the main providers of e-money services in Indonesia.

2.3. Inflation

Inflation is the sustained increase in the general price level of goods and services over time (Mankiw, 2015). In banking, high inflation can erode profitability, reduce loan repayment capacity, and increase operational costs, thereby negatively affecting ROA and ROE (Ghossoub, 2023). Studies on inflation and bank performance show mixed results: while some find significant negative impacts on profitability and efficiency (Cetin, 2019), others suggest limited or indirect effects. Thus, inflation is considered an important control variable when analyzing the health of banks.

2.4. Broad Money Supply (M2)

M2 represents the total amount of money in circulation, including cash, demand deposits, savings, and time deposits. It reflects the liquidity available in an economy and influences both credit creation and banking stability (Bank Indonesia, 2023). Growth in M2 may enhance banks' ability to mobilize third-party funds and increase profitability, but excessive expansion can generate inflationary pressures that threaten efficiency and capital adequacy. Chen and Tillmann (2023) demonstrated that fluctuations in M2 significantly affect banking liquidity and financial stability in East Asia. Therefore, M2 is included in this study as a macroeconomic control variable.

2.5. Risk-Based Bank Rating (RBBR)

The RBBR framework, introduced by OJK Regulation No.4/POJK.03/2016, evaluates bank health through four main components: risk profile, good corporate governance (GCG), earnings, and capital. Quantitative indicators commonly used to represent these aspects are Return on Assets (ROA), Return

on Equity (ROE), Capital Adequacy Ratio (CAR), Cost to Income Ratio (CIR), and Loan to Deposit Ratio (LDR). Mishkin and Eakins (2018) emphasize that digital transformation in banking creates both opportunities and risks, making it necessary to assess bank health holistically. By applying RBBR, this study measures how e-money transactions influence the soundness of KBMI 3 and 4 banks.

2.6. Research Hyphotheses

Based on the literature reviewed, the following hypotheses are proposed:

H1: E-money transactions positively influence Return on Assets (ROA) of KBMI 3 and KBMI 4 banks.

H2: E-money transactions positively influence Return on Equity (ROE) of KBMI 3 and KBMI 4 banks.

H3: E-money transactions affect Capital Adequacy Ratio (CAR) of KBMI 3 and KBMI 4 banks.

H4: E-money transactions affect Cost to Income Ratio (CIR) of KBMI 3 and KBMI 4 banks.

H5: E-money transactions affect Loan to Deposit Ratio (LDR) of KBMI 3 and KBMI 4 banks.

H6: Macroeconomic controls (M2 and inflation) significantly influence bank health indicators (ROA, ROE, CAR, CIR, LDR).

H7: The effect of e-money differs across the five bank health indicators within the RBBR framework.

3. Research Methods

3.1 Types of Research

This research employs a quantitative approach to analyze the effect of e-money transactions on the health of Indonesian banks classified as KBMI 3 and KBMI 4 during the 2021–2024 period. A quantitative method is appropriate when the data collected is numerical and can be processed using statistical techniques (Yusuf, 2017). The data collection technique in this study uses documentation, where data are obtained from official secondary sources. Secondary data refers to information not directly provided by respondents but through documents or publications (Sugiyono, 2013). The dataset includes quarterly data on e-money transactions, bank financial indicators (ROA, ROE, CAR, CIR, LDR), inflation, and broad money supply (M2). These data were retrieved from Bank Indonesia, the Financial Services Authority (OJK), and Statistics Indonesia (BPS).

3.2 Data Analysis Methods

This study applies multiple linear regression on panel data, since it involves more than one independent variable and repeated observations across different banks and time periods. Panel data analysis provides stronger statistical power by combining cross-sectional and time-series dimensions. The regression model is specified as follows:

$$Y\_it = \alpha + \beta1(E\text{-}Money\_it) + \beta2(M2\_t) + \beta3(Inflation\_t) + \varepsilon\_it$$

Where Y_it represents each bank health indicator (ROA, ROE, CAR, CIR, LDR) for bank i at time t. According to Yusuf (2017), multiple regression is suitable to measure the extent of influence of several independent variables on a dependent variable simultaneously.

3.3 Significance Test of Regression Model

The significance of the regression model was assessed through t-tests, F-tests, and the coefficient of determination (R^2). The t-test examines the partial effect of each independent variable, where a significance value < 0.05 indicates a significant influence (Ghozali, 2018). The F-test evaluates the joint effect of all independent variables, where the model is deemed significant if the F-statistic is greater than the F-table value or the significance of F < 0.05. Meanwhile, the R^2 statistic measures the explanatory power of the independent variables on the dependent variable. According to Hair et al. (2019), an R^2 value above 0.75 indicates a substantial model, around 0.50 a moderate model, and around 0.25 a weak model.

3.4 Classical Assumptions

To ensure that the regression satisfies the Best Linear Unbiased Estimator (BLUE) criteria, several classical assumption tests were conducted. The normality test examines whether the residuals are normally distributed, using both graphical methods (histograms, Normal P-P Plots) and statistical tests

of skewness and kurtosis. The heteroscedasticity test checks for unequal variance across residuals, where a significance value > 0.05 indicates no heteroscedasticity. The autocorrelation test evaluates whether residuals in period t are correlated with residuals in period t-1, typically using the Durbin-Watson statistic. A value close to 2 indicates no autocorrelation. Finally, the multicollinearity test identifies correlations among independent variables by observing Variance Inflation Factor (VIF) and tolerance values. If VIF < 10 and tolerance > 0.1, the model is free from multicollinearity (Ghozali, 2018).

4. Research Findings and Discussion

The partial test results provide a nuanced understanding of how e-money transactions, broad money supply (M2), and inflation interact with the financial health of Indonesian banks. Importantly, the results reveal both expected outcomes and paradoxical patterns that require deeper interpretation.

4.1. E-Money and Bank Health

The findings show that e-money exerts a positive and highly significant effect on profitability, as reflected in ROA and ROE. This outcome underscores the capacity of digital transactions to create new streams of fee-based income, reduce reliance on interest income, and expand customer bases through seamless digital services. This aligns with Awwad (2021) and Wang et al. (2025), who emphasized the role of digital payments in strengthening banks' revenue models. However, the negative and significant effects of e-money on CAR, CIR, and LDR reveal a structural trade-off: while digitalization strengthens profitability, it simultaneously weakens stability and efficiency. One possible explanation is that the rapid expansion of digital infrastructure requires heavy upfront investments, increasing operating expenses and raising CIR in the short run. In addition, higher transaction velocity associated with e-money may destabilize liquidity positions (reflected in LDR) and dilute capital adequacy (CAR), especially when growth in digital deposits outpaces capital expansion. These results challenge the simplistic narrative that digital innovation is unambiguously positive for banking; instead, they point to a dual role of e-money as both an enabler of profitability and a stressor for prudential metrics.

4.2. Broad Money Supply (M2) and Bank Performance

M2 consistently demonstrates significance across most indicators, with positive impacts on ROA, ROE, and LDR, but negative effects on CAR and CIR. This duality is theoretically consistent with liquidity theories in banking. Greater money supply expands banks' intermediation capacity, boosting profitability and lending activities. Yet, it also erodes efficiency (CIR) by encouraging excessive cost structures and challenges capital adequacy (CAR) as banks take on more risk exposure relative to their capital buffers. The findings resonate with Chen & Tillmann (2023), who noted that liquidity expansion in emerging markets is a double-edged sword: it fuels short-term profitability but heightens vulnerability to shocks. In Indonesia, this pattern may reflect the government's liquidity injections during the pandemic recovery, which temporarily improved lending capacity but simultaneously stretched efficiency and capital adequacy ratios. The critical implication is that M2 must be managed carefully; without prudent oversight, liquidity-driven growth may amplify systemic risks rather than sustain resilience.

4.3. Inflation and Its Limited Role

The insignificance of inflation across most indicators, with the sole exception of ROE, is particularly striking. In theory, inflation affects profitability through interest rate adjustments, cost structures, and credit risk. However, during the study period, Indonesia experienced relatively moderate and well-anchored inflation, which limited its impact on banking outcomes. The positive effect on ROE may reflect banks' ability to reprice loans faster than deposit costs during mild inflationary periods, temporarily boosting returns. Yet, the broader lack of significance suggests that inflation's role is context-dependent: when stable, it ceases to be a primary driver of bank health. This finding challenges conventional assumptions that inflation universally undermines banking stability, instead pointing toward a conditional relationship shaped by monetary credibility and inflation expectations (Ghossoub, 2023).

4.4. Critical Synthesis

Taken together, these results highlight the asymmetry of digital finance's impact on banking health. E-money's dual role illustrates that profitability gains come at the cost of efficiency and stability, while M2 reflects a liquidity paradox—supporting growth yet undermining prudential indicators. Inflation's muted role indicates that in stable macroeconomic environments, traditional risk factors may fade in importance, giving way to structural shifts such as digital adoption and liquidity expansion.

4.5. Theoretical and Practical Implications

Theoretically, this study challenges linear models of financial innovation, suggesting instead a trade-off framework where digital finance enhances some dimensions of bank performance while weakening others. Practically, banks must acknowledge that digital transformation requires not only revenue strategies but also capital strengthening, cost rationalization, and liquidity safeguards. Regulators, in turn, face the task of balancing innovation incentives with prudential oversight, particularly in monitoring CAR and CIR. Without such balance, the benefits of digital finance may erode long-term stability.

In conclusion, the findings emphasize that the future of banking in Indonesia will be shaped less by traditional macroeconomic variables like inflation, and more by structural forces such as digitalization and liquidity management. The policy challenge is thus twofold: to harness the profitability potential of e-money while mitigating the systemic risks it introduces.

Second, broad money supply (M2) demonstrates consistent significance across most indicators. M2 shows a positive effect on ROA, ROE, and LDR, indicating that liquidity expansion improves profitability and strengthens intermediation capacity. These results are consistent with Chen & Tillmann (2023), who emphasize the role of liquidity in financial stability. However, M2 has a negative impact on CAR and CIR, implying that excessive liquidity can pressure capital requirements and efficiency, requiring banks to exercise prudent management.

Third, inflation was not found to have a significant impact on most indicators, except for ROE where a positive relationship was detected (sig. 0.005). This finding resonates with Ghossoub (2023), who noted that moderate inflation may allow banks to adjust lending rates and maintain profitability. However, its insignificant effect on ROA, CAR, CIR, and LDR suggests that inflation during the study period was relatively stable and anticipated by banks, thus limiting its overall impact on financial performance.

Overall, these findings highlight a dual role of e-money: enhancing profitability while imposing pressure on efficiency, capital, and liquidity. The results also confirm that macroeconomic conditions, particularly money supply, play a crucial role in shaping bank health, while inflation shows limited relevance in the Indonesian context.

5. Conclusions

This study found that electronic money (e-money) transactions significantly influenced the financial health of Indonesian banks classified as KBMI 3 and KBMI 4 during the 2021–2024 period. First, e-money had a significant positive effect on profitability, as reflected in ROA and ROE, showing that digital payments contribute to banks' ability to generate returns through fee-based income and improved service efficiency. Second, e-money exhibited a significant negative effect on CAR, CIR, and LDR, suggesting that while digital adoption enhances profitability, it places pressure on capital adequacy, operational efficiency, and liquidity management. Third, the broad money supply (M2) consistently showed significant effects, indicating that liquidity remains a key determinant of banking performance, while inflation only demonstrated limited significance, with a positive relationship found solely with ROE.

Conversely, the findings indicate that inflation generally did not have a significant impact on most bank health indicators during the study period. This suggests that Indonesia's inflation levels were relatively stable and well anticipated by banks, thereby minimizing their influence on operational performance. These results are consistent with previous studies showing that stable macroeconomic conditions reduce

the sensitivity of bank performance to inflationary shocks, while liquidity factors and digital transactions play a more direct role in shaping financial outcomes.

This study has several limitations. First, the analysis only focused on five indicators of bank health (ROA, ROE, CAR, CIR, and LDR) under the RBBR framework, without incorporating qualitative measures such as governance practices. Second, the dataset was limited to quarterly data from 2021 to 2024, which may not fully capture long-term effects of digital finance adoption. Third, the analysis was restricted to KBMI 3 and 4 banks, excluding smaller banks that may face different challenges in digital transformation.

Despite these limitations, the study provides meaningful implications. For banks, the findings emphasize the need to align digital innovation with prudent risk management strategies, particularly in managing capital adequacy and liquidity. For regulators such as OJK and Bank Indonesia, the results highlight the importance of balancing policies that encourage digital transformation with safeguards for systemic stability. For investors and market participants, the findings indicate that digital transaction growth and liquidity expansion are more influential than inflation in shaping bank health, offering valuable insights for portfolio allocation and risk assessment.

For future research, it is recommended to extend the time horizon beyond 2024, incorporate additional macroeconomic and social variables, and examine the experiences of smaller banks to capture a more comprehensive picture of digital finance's impact on the banking sector. Comparative studies with other emerging economies could also provide broader insights.

In practical terms, this study suggests that while e-money adoption strengthens profitability, it also demands enhanced capital, efficiency, and liquidity management. Banks should invest in digital risk infrastructure, regulators should strengthen oversight mechanisms, and policymakers should ensure liquidity stability. These measures will help create a more resilient and inclusive banking system in the era of digital finance.

References

Awwad, B. S. (2021). The role of e-payments in enhancing financial performance: A case study of the Bank of Palestine. *Banks and Bank Systems*, *16*(4), 114–124. https://doi.org/10.21511/BBS.16(4).2021.10

Bank Indonesia. (2020). *Uang Elektronik*.

Bank Indonesia. (2023). *Inflasi*. https://www.bi.go.id/id/fungsi-utama/moneter/inflasi/default.aspx?

Bank Indonesia. (2025). *Definisi Inflasi*.

Brigham, E. F. ., & Houston, J. F. . (2022). *Fundamentals of financial management*. https://books.google.com/books/about/Fundamentals_of_Financial_Management.html?hl=id&id=9uUXEAAAQBAJ

Cetin, H. (2019). Inflation and bank profitability: G20 countries banks panel data analysis. *ACM International Conference Proceeding Series*, 168–172. https://doi.org/10.1145/3335550.3335574;GROUPTOPIC:TOPIC:ACM-PUBTYPE>PROCEEDING;JOURNAL:JOURNAL:ACMOTHERCONFERENCES;CTYPE:STRING:BOOK

CFI. (2024). *Return on Assets - ROA Formula, Calculation, and Examples*. https://corporatefinanceinstitute.com/resources/accounting/return-on-assets-roa-formula/?utm_source=chatgpt.com

Chand, S. A., Singh, B., Narayan, K., & Chand, A. (2025). The Impact of Financial Technology (FinTech) on Bank Risk-Taking and Profitability in Small Developing Island States: A Study of Fiji. *Journal of Risk and Financial Management 2025, Vol. 18, Page 366*, *18*(7), 366. https://doi.org/10.3390/JRFM18070366

Chen, H., & Tillmann, P. (2023a). Lockdown spillovers*. *Journal of International Money and Finance*, *137*, 102890. https://doi.org/10.1016/J.JIMONFIN.2023.102890

Chen, H., & Tillmann, P. (2023b). Lockdown spillovers*. *Journal of International Money and Finance*, *137*, 102890. https://doi.org/10.1016/J.JIMONFIN.2023.102890

de Mello Gindri, I., Silveira da Silva, L., Vitor Salmoria, G., & Rodrigo de Mello Roesler, C. (2023). Ibuprofen-loaded UHMWPE for orthopedics applications: preliminary evaluation of mechanical and biological properties. *Polymer Bulletin*, *80*(10), 10907–10919. https://doi.org/10.1007/S00289-022-04598-0

Ghossoub, E. A. (2023a). Economic growth, inflation, and banking sector competition. *Economic Modelling*, *129*, 106528. https://doi.org/10.1016/J.ECONMOD.2023.106528

Ghossoub, E. A. (2023b). Economic growth, inflation, and banking sector competition. *Economic Modelling*, *129*, 106528. https://doi.org/10.1016/J.ECONMOD.2023.106528

Ghozali. (2019). *Ghozali Edisi 9 PDF | PDF*. https://www.scribd.com/document/729101308/644946086-Ghozali-Edisi-9-PDF

Huang, Z. (2024). E-Money and Monetary Policy Transmission. *IMF Working Papers*, *2024*(069), 1. https://doi.org/10.5089/9798400270543.001

Kasri, R. A., Indrastomo, B. S., Hendranastiti, N. D., & Prasetyo, M. B. (2022). Digital payment and banking stability in emerging economy with dual banking system. *Heliyon*, *8*(11), e11198. https://doi.org/10.1016/J.HELIYON.2022.E11198

Ky, S. S., Rugemintwari, C., & Sauviat, A. (2024a). Is Fintech Good for Bank Performance? The Case of Mobile Money in the East African Community. *International Journal of Finance & Economics*, *0*, 1–32. https://doi.org/10.1002/IJFE.3100

Ky, S. S., Rugemintwari, C., & Sauviat, A. (2024b). Is Fintech Good for Bank Performance? The Case of Mobile Money in the East African Community. *International Journal of Finance & Economics*, *0*, 1–32. https://doi.org/10.1002/IJFE.3100

Lu, M. P., Ooi, C. A., Lee, K. T., & Kossim, Z. (2022). Does Electronic Payment Services Create Value to Bank Performance? Evidence from Southeast Asia. *Asian Academy of Management Journal of Accounting and Finance*, *18*(2), 139–167. https://doi.org/10.21315/AAMJAF2022.18.2.7

(PDF) Impact of Inflation on Bank Performance: Evidence from Licensed Commercial Banks in Sri Lanka. (n.d.). Retrieved September 4, 2025, from https://www.researchgate.net/publication/384385378_Impact_of_Inflation_on_Bank_Performance_Evidence_from_Licensed_Commercial_Banks_in_Sri_Lanka

Sugiyono. (2014). *Sugiyono (2014) Educational Research Methods Quantitative, Qualitative, and R&D Approaches. Alfa Beta, Bandung, 65. (In Indonesian) - References - Scientific Research Publishing*. https://www.scirp.org/reference/referencespapers?referenceid=3167301&utm_source=chatgpt.com

Sujud, H., & Hashem, B. (2017). Effect of Bank Innovations on Profitability and Return on Assets (ROA) of Commercial Banks in Lebanon. *International Journal of Economics and Finance*, *9*(4), 35. https://doi.org/10.5539/IJEF.V9N4P35

Wang, W., Xiong, D., & Li, Y. (2025). The Impact of FinTech on Financial Institution Performance and Risk: An Empirical Analysis from China. *SAGE Open*, *15*(2). https://doi.org/10.1177/21582440251344376