The Influence of Digital Transformation, Liquidity, Credit Risk and Green Credit on Bank Performance

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Abstract

This study explores the influence of digital transformation, liquidity, credit risk, and green credit on bank performance in Indonesia. The research examines how these factors affect key banking performance indicators: Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). Using quantitative methods and panel data regression with a sample of 18 banks listed on the Indonesia Stock Exchange from 2019 to 2024, the study finds that digital transformation positively impacts ROA, ROE, and NIM. It demonstrates that digitalization in banking improves operational efficiency, service access, and risk management, thereby increasing profitability. Liquidity, measured by the Loan to Deposit Ratio (LDR), has a significant effect on ROA but does not significantly impact ROE or NIM, highlighting that aggressive credit expansion does not always increase shareholder value or improve margins. Credit risk, represented by Non-Performing Loans (NPL), negatively affects all performance metrics, confirming that asset quality is critical for banking profitability. However, green credit, while strategically important for sustainability, does not show a significant impact on short-term profitability measures such as ROA, ROE, or NIM. The findings underscore the importance of effective credit risk management, continuous digital transformation, and careful liquidity balancing in improving bank performance and supporting long-term growth.

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INTRODUCTION

The economic progress of a country is closely tied to the role of the financial sector, with banking being one of the key sectors. Banking serves as a financial intermediary between surplus units (those who have excess funds) and deficit units (those in need of funds). The Banking Law No. 10 of 1998 states that a bank is a business entity that collects funds from the public in the form of savings and distributes them to the public in the form of credit or other forms, aiming to improve the standard of living of many people. Therefore, banks are expected to maintain their financial performance in a healthy condition.

Bank performance is an important measure to assess how well a bank is conducting its operational activities and achieving its financial objectives. This performance reflects the bank's ability to manage assets, liabilities, and the risks it faces to generate optimal profits. In this study, bank performance is assessed using ratios such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin

(NIM) (Simon Oyewole et al., 2013). Bank performance is influenced by several factors, including digital transformation, liquidity, credit risk, and green credit.

The rapid development of information and communication technology has driven significant transformations in various fields, including the financial sector (Jange et al., 2024). Digital innovation plays a crucial role in changing the way financial institutions operate, from banking services and payment systems to risk management. These changes not only promote operational efficiency but also expand access to financial services more equally and inclusively. Furthermore, the government supports banking digitalization by issuing Financial Services Authority (OJK) Regulation No. 21 of 2023 regarding Digital Services by Commercial Banks, which comprehensively regulates digital banking services such as electronic banking services (LPE) and digital banking services (LPD), including internet banking, mobile banking, and digital branches. This regulation aims to provide room for innovation in banks' development of digital services, ensure customer data security, and protect consumers.

Post-COVID-19, there has been an acceleration of digital transformation in the global financial sector as a response to physical activity restrictions and changes in consumer transaction preferences. In Indonesia, the banking sector has responded by expanding and deepening the use of digital technology, such as mobile banking, internet banking, and application-based digital platforms. This aligns with global trends that show that digitalization is key to maintaining the relevance and competitiveness of banks in the modern era (Yogaswari & Diantini, 2024). However, rapid digitalization does not automatically lead to improved financial performance for banks. The effectiveness of digital transformation depends largely on the bank's ability to manage operational efficiency and implement appropriate risk management strategies. Therefore, it is important to evaluate the extent to which digitalization impacts bank performance.

In addition to digital transformation, liquidity is another crucial factor affecting a bank's performance. Liquidity reflects a bank's ability to meet short-term obligations, particularly when customers request fund withdrawals. Banks with sufficient liquidity levels are more capable of sustaining operations and avoiding potential defaults (Sahyouni & Wang, 2019). On the other hand, excessively low liquidity can disrupt intermediation functions and reduce profitability. Effective liquidity management is therefore vital in maintaining financial stability and building public trust in banking institutions (Bilal et al., 2024). In this context, analyzing the relationship between liquidity and bank performance is important to understand its contribution to long-term operational sustainability.

Credit risk is one of the primary risks faced by banks and has a direct impact on their financial performance. When debtors fail to meet payment obligations, banks experience reduced interest income, increased provisions for losses, and deteriorating asset quality. These conditions can ultimately pressure the bank's profitability and disrupt its operational stability (Natalia, 2015). In Indonesia, fluctuations in the ratio of non-performing loans (NPL) often serve as a key indicator in assessing credit risk and its impact on banking performance. Therefore, a bank's ability to effectively manage credit risk is crucial for maintaining performance and customer trust over the long term.

Green credit has now become a major focus in the banking industry. Green credit refers to financing activities allocated to support environmentally friendly and sustainable projects, such as the development of renewable energy, energy efficiency improvements, and responsible natural resource management. In Indonesia, attention to green credit has grown alongside increasing awareness of sustainability principles and corporate social responsibility. In recent years, banks have started directing their financing portfolios toward sectors that support sustainable development goals. The implementation of green credit not only positively contributes to environmental preservation but can also enhance the bank's image and create new market opportunities. However, the success of green credit implementation depends on the bank's ability to manage inherent risks and how well the market can accept sustainability-based financial products (Afifah et al., 2023).

Overall, digitalization, liquidity, credit risk, and green credit are four interconnected aspects that have a significant impact on banking performance in the modern era. Digital transformation helps banks become more efficient, expand service reach, and improve customer convenience in conducting transactions (Jange et al., 2024). However, the success of digitalization depends on the readiness of technological infrastructure, system security, and the ability of human resources to manage the changes. Liquidity indicates the bank's ability to meet short-term obligations, which is crucial for maintaining operational stability and supporting intermediation functions (Bilal et al., 2024; Sahyouni & Wang, 2019). Credit risk is one of the key risks influencing the bank's financial performance, especially when debtors fail to meet their obligations, which can reduce income and profitability (Natalia, 2015). Meanwhile, green credit reflects the bank's commitment to sustainable financing, which not only helps environmental preservation but also enhances the bank's reputation and creates new market opportunities (Afifah et al., 2023). However, the implementation of green credit needs to be carefully managed as it carries its own risks and requires market readiness. Therefore, a comprehensive understanding of these four factors is essential for banks to devise the right strategies to maintain healthy and sustainable performance while contributing optimally to national economic growth.

Research on bank performance has been extensively conducted by previous scholars. For instance, studies by Haryanto et al. (2021) and Wedaswari et al. (2024) found that the Loan to Deposit Ratio (LDR) has a positive and significant effect on bank financial performance. The higher the LDR ratio, the greater the amount of credit disbursed by the bank, which contributes to increased interest income and improved financial performance, especially in the Return on Assets (ROA) ratio. On the other hand, studies by Astriliana & Mudjija (2024) and Yakub & Murtanto (2024) found that LDR did not have a significant impact on bank profitability. However, in recent years, digital developments have expanded into the banking sector. Additionally, with increasing environmental awareness, some banks have started providing credit financing allocated for environmentally friendly and sustainable projects. As a result, further research on bank performance, influenced by digitalization and green credit, is essential.

Based on the background explained by the author, the problem to be answered in this study is how digital transformation, liquidity, credit risk, and green credit affect bank performance with firm size and firm age as control variables. So that these factors can increase the value of bank performance as measured by the ratio of Return On Assets (ROA), Return On Equity (ROE), and Net Interest Margin (NIM).

The aim of this research is to analyze the impact of various factors on bank performance, specifically focusing on banks listed on the Indonesia Stock Exchange (IDX). The study seeks to understand how digital transformation, liquidity, credit risk, and green credit influence key performance indicators such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). By examining these relationships, the research aims to provide insights into the ways these factors contribute to the financial performance of the banking sector in Indonesia.

This study aims to provide academic benefits as part of the requirements for the Master of Management program at the Faculty of Economics, State University of Jakarta. Theoretically, it expands knowledge on how digital transformation, liquidity, credit risk, and green credit affect bank performance, considering firm size and age as control variables. Practically, the research is intended to serve as a reference for future studies and help banks in formulating effective policies by analyzing factors influencing their performance.

METHOD

Unit of Analysis, Population, and Sample

This study uses a quantitative research method, which emphasizes theory testing through variable measurement and statistical data analysis. The research approach is descriptive, aimed at describing or presenting data through tables, graphs, and charts (Sugiyono, 2017). The population for this study consists of 57 banks listed on the Indonesia Stock Exchange (IDX), as they share relevant characteristics for the research objectives. Due to limitations in time, resources, and access, a sample was selected using purposive sampling, which resulted in 18 banks that met the specified criteria and are considered representative of the population.

Sampling Techniques

The sampling technique used in this study is purposive sampling, where samples are selected based on specific criteria to meet the research objectives. The sample characteristics include: (a) banks listed on the Indonesia Stock Exchange (IDX) from 2019 to 2024, (b) banks with complete data for the study period, and (c) banks with data on digital transformation for the same period. Based on these criteria, 18 banks were selected as the final sample.

Data Collection Techniques

The data collection technique used in this study is the documentation technique. While the data in question is by recording and documenting the financial statements of companies registered as banking sector companies on the IDX for the 2019-2024 period.

The documentation technique in this study is by accessing the official IDX website to obtain data in the form of banking financial reports from the objects to be studied, so that financial reports and a general overview of banking in 2019-2024 can be obtained.

Data Analysis Techniques

This study uses quantitative analysis to test theories through variable measurement and statistical procedures (Ghozali, 2011). Panel data, combining time series and cross-sectional data, is used in this study, covering the period 2019-2024 and 18 banking companies. Data is processed using assumption tests in Eviews 12.

1. Panel Data Regression Estimation

   The analysis method used is panel data regression to examine the relationship between variables. The models employed are:

   a. Common Effect Model (CEM): A simple model combining time series and cross-sectional data without considering individual or time dimensions.
   b. Fixed Effect Model (FEM): Assumes individual differences can be accommodated by intercept differences across entities.

2. Model Selection

   The Chow test is used to determine whether to use CEM or FEM. If the probability value is greater than 0.05, CEM is selected; if less than 0.05, FEM is chosen.

3. Classical Assumption Tests

   These tests ensure OLS regression assumptions are met, including:

   a. Multicollinearity: Identifies perfect linear relationships between independent variables.

    b. Heteroscedasticity: Checks if residual variances are unequal across observations, tested using the Glejser test.

    c. Autocorrelation: Identifies correlations between errors in time series data, which is not applicable for panel or cross-sectional data.

4. Hypothesis Testing

    a. t-Test: Assesses the individual impact of independent variables on the dependent variable.

    b. F-Test: Assesses the collective influence of all independent variables on the dependent variable.

5. Coefficient of Determination

      Measures the model's ability to explain variance in the dependent variable, with values closer to 1 indicating better explanatory power.

6. Multiple Linear Regression Model

      The models used are:

a. Model 1 (ROA): $Y(ROA) = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$

b. Model 2 (ROE): $Y(ROE) = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$

c. Model 3 (NIM): $Y(NIM) = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$

      Where Y represents dependent variables (ROA, ROE, NIM), X represents independent variables (Digital Transformation, Liquidity, Credit Risk, Green Credit, Firm Size, Firm Age), and e represents error terms.

RESULT AND DISCUSSION

The Effect of Digital Transformation on Return on Assets (ROA)

      This study finds that Digital Transformation (DT) significantly influences Return on Assets (ROA) in the banking industry. The findings indicate that the widespread adoption of digital technology in banking operations improves operational efficiency, which in turn enhances banks' ability to generate profits from their assets. Digital transformation in banking involves not only internal process digitalization but also the development of digital services for customers, such as mobile banking, internet banking, and the use of big data and artificial intelligence for risk management and strategic decision-making. The implementation of digital technology allows banks to reduce operational costs by digitizing services, increasing asset productivity, and optimizing data analytics for better decision-making. These improvements contribute to a higher ROA, reinforcing the view that digital transformation is a key driver of financial performance in the banking sector.

The Effect of Liquidity on Return on Assets (ROA)

      The research shows that liquidity, measured by the Loan to Deposit Ratio (LDR), does not have a significant effect on ROA in the banking industry. This suggests that the bank's ability to meet short-term obligations through third-party funds does not fully reflect the effectiveness of asset utilization in generating profit. While optimal liquidity allows banks to channel funds into productive credit, excessively high liquidity may indicate underutilized funds, thereby not maximizing potential returns. Banks must balance liquidity management with credit disbursement to ensure both operational stability and profitability. The study suggests that profit generation depends not only on credit volume but also on credit quality, operational efficiency, and risk management strategies.

The Effect of Credit Risk on Return on Assets (ROA)

The research reveals that credit risk, measured by the Non-Performing Loan (NPL) ratio, significantly impacts ROA in the banking sector. The findings highlight that the quality of productive assets, especially loans, plays a critical role in determining profitability. Higher credit risk, represented by an increased NPL ratio, results in higher provisions for loan losses, decreased interest income, and potential capital losses, negatively affecting the bank's ability to generate profits from its assets. Proper credit risk management, including prudent lending policies and continuous monitoring, is essential to maintaining a healthy portfolio and optimizing ROA.

The Effect of Green Credit on Return on Assets (ROA)

The study finds that green credit, measured by the percentage of loans allocated for sustainable activities, does not significantly affect ROA in the banking industry. This indicates that, despite green credit being part of the bank's commitment to sustainability and environmental responsibility, its contribution to short-term profitability is not yet evident. Green credit generally targets low-risk sectors but offers moderate returns, which may delay financial gains. The findings suggest that green banking is more of a long-term strategic investment, improving reputation and compliance with regulations, rather than providing immediate financial returns.

The Effect of Digital Transformation on Return on Equity (ROE)

The study shows that digital transformation, measured by the proportion of software investment to total intangible assets, significantly impacts Return on Equity (ROE) in the banking sector. This reflects that banks' efforts to strengthen their digital capabilities positively affect shareholder equity returns. Digital investments allow banks to increase service capacity and expand their customer base without proportionally increasing capital, thus generating higher profits. Digitalization opens opportunities for new business models, cost reductions, and service optimization, directly impacting net income and ROE.

The Effect of Liquidity on Return on Equity (ROE)

The study indicates that liquidity, measured by the Loan to Deposit Ratio (LDR), does not significantly impact ROE in the banking sector. This suggests that the ability to channel third-party funds into credit, as a representation of liquidity, does not directly lead to higher returns on equity. The findings imply that banks focusing on liquidity stability and risk mitigation may not experience proportional increases in net income relative to equity, as aggressive credit expansion does not guarantee higher profitability if credit quality is low.

The Effect of Credit Risk on Return on Equity (ROE)

The study shows that credit risk, reflected in the Non-Performing Loan (NPL) ratio, significantly affects ROE in the banking industry. An increase in NPL forces banks to set aside more provisions for loan losses, reducing net income available for shareholders. The higher the NPL ratio, the lower the effectiveness of equity utilization in generating profits. Efficient credit risk management is crucial to maintain a healthy portfolio, ensuring that productive assets generate sustainable income and enhancing ROE.

The Effect of Green Credit on Return on Equity (ROE)

The research reveals that green credit, measured by the proportion of loans allocated for sustainability financing, does not have a significant impact on ROE in the banking sector. This reflects that banks' focus on green financing, while strategically important, does not immediately translate into higher returns for shareholders. Green credit generally targets long-term objectives, such as environmental risk mitigation and sustainable development, which might not yield high short-term financial returns. However, green credit contributes strategically by improving the bank's reputation and ensuring compliance with environmental regulations.

The Effect of Digital Transformation on Net Interest Margin (NIM)

The study shows that Digital Transformation (DT), measured by the proportion of software investment to total intangible assets, significantly affects Net Interest Margin (NIM) in the banking sector. This suggests that digital investments help banks optimize net interest income by improving service quality, expanding market reach, and enhancing operational efficiency. Digital transformation allows banks to segment markets better, offer personalized services, and optimize risk management, contributing to improved NIM.

The Effect of Liquidity on Net Interest Margin (NIM)

The research finds that liquidity, measured by the Loan to Deposit Ratio (LDR), does not significantly affect NIM in the banking sector. This implies that increasing the proportion of credit disbursed does not necessarily result in higher net interest margins. High LDR may increase the risk of liquidity, forcing banks to seek additional funds at higher costs, thereby reducing the interest margin. Conversely, maintaining low LDR may underutilize available funds, limiting potential interest income.

The Effect of Credit Risk on Net Interest Margin (NIM)

The study shows that credit risk, measured by the NPL ratio, significantly affects NIM in the banking sector. As NPLs increase, banks face higher costs from unpaid loans and provisions for loan losses, reducing net interest income. Effective credit risk management is vital to maintaining a healthy NIM, as higher NPLs tend to lower the bank's ability to optimize interest income from productive assets.

The Effect of Green Credit on Net Interest Margin (NIM)

The research reveals that green credit, measured by the proportion of loans allocated to sustainable financing, does not significantly affect NIM in the banking sector. This suggests that green credit, while beneficial for long-term sustainability and compliance with regulations, does not immediately contribute to higher net interest margins. Green credit tends to have lower initial returns and longer repayment periods, which affects short-term profitability. Nevertheless, green credit remains an important strategic tool for long-term business sustainability.

CONCLUSION

Based on the analysis, the study concludes that digital transformation positively impacts both Return on Assets (ROA) and Return on Equity (ROE), indicating that the adoption of digital technology enhances operational efficiency, service access, and intermediation quality, thereby boosting profitability. Digital transformation also significantly affects Net Interest Margin (NIM), optimizing asset use and fund

management. Liquidity, measured by Loan to Deposit Ratio (LDR), significantly influences ROA but does not significantly affect ROE or NIM, suggesting that aggressive credit expansion may not necessarily increase shareholder value or improve margins. Credit risk, measured by the Non-Performing Loan (NPL) ratio, significantly impacts all profitability indicators, emphasizing the importance of asset quality in banking performance. Green credit, however, does not show a significant impact on ROA, ROE, or NIM, reflecting that its financial impact is still limited, although it aligns with long-term sustainability goals.

Managerial Implications

The findings highlight the need for continuous investment in digital technology to improve operational efficiency, service quality, and competitiveness. Banks must balance liquidity management to maintain both operational stability and profitability. The study emphasizes the importance of strict credit risk management to preserve asset quality and financial stability. Additionally, banks should expand their green credit portfolios to contribute to long-term sustainability, even though its immediate financial benefits are not yet apparent.

Research Limitations

The study has limitations in terms of the scope of variables analyzed, focusing only on digital transformation, liquidity, credit risk, and green credit. Future research should include additional factors such as macroeconomic conditions, corporate governance, and capital structure. The study is also limited geographically to Indonesian banks and may not be generalized to international contexts. Furthermore, the study covers a specific period, which may affect the findings due to economic dynamics outside this period. Future studies should consider a broader time range for more comprehensive insights.

Suggestions for Future Research

Future research should expand the model by including other internal and external factors affecting bank performance, such as operational efficiency, macroeconomic conditions, and financial stability. Additionally, research should extend to include banks in other countries, especially in ASEAN, to provide comparative insights into banking performance. A longer research period would allow for a better understanding of the long-term effects of digital transformation and green credit, as these practices are still in early stages in Indonesia. Studying countries with more mature implementations of these policies could provide valuable insights into their effectiveness.

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