

Legal Governance of Digital Banking and Credit Asset Quality in Indonesia

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Abstract

The banking industry plays a strategic role in the national economy as a financial intermediary, where sustainable profitability depends on effective risk management and compliance with prudential regulations. This study aims to empirically examine the effect of credit risk and digital transformation on bank profitability within the framework of Indonesian banking legal governance. Specifically, it evaluates the economic implications of Financial Services Authority Regulation (POJK) No. 40/POJK.03/2019 concerning Asset Quality Assessment and POJK No. 21 of 2023 concerning Digital Banking Services.

This research adopts an empirical legal approach using panel data regression on 26 conventional commercial banks listed on the Indonesia Stock Exchange during the 2019–2024 period (156 observations). Profitability is proxied by Return on Assets (ROA), credit risk by the Non-Performing Loan (NPL) ratio, and digital transformation by a Digital Transformation Index constructed from annual report disclosures.

The findings reveal that credit risk has a significant negative effect on profitability, while digital transformation has a significant positive effect on profitability. These results indicate that effective asset quality management and digital adoption enhance banking performance. From a legal perspective, the study demonstrates that prudential regulation and digital banking governance function not merely as administrative norms but as regulatory instruments with measurable economic consequences.

This research contributes to banking law scholarship by integrating empirical financial analysis with normative evaluation, confirming that banking profitability reflects the effectiveness of legal governance in shaping risk discipline and digital innovation within a binding regulatory framework.

I. Introduction

The banking industry occupies a strategic position within the national economic system as it functions as a financial intermediary institution that collects and distributes public funds. The sustainability of this intermediation function is largely determined by a bank's ability to maintain profitability on a continuous basis, which in turn is closely related to the quality of risk management and compliance with prevailing legal provisions. In this context, bank profitability is not merely a matter of financial performance, but also a reflection of the effectiveness of legal governance and the implementation of the prudential principle.

Profitability plays a crucial role in ensuring the sustainability of banking operations and in providing returns to investors. Therefore, bank management must consistently maintain and enhance profitability in order to contribute effectively to the broader economy (Tarawneh et al., 2024).

As lending activities constitute the core business of banking operations, ineffective credit risk management may adversely affect financial performance and undermine the sustainability of profitability. Credit risk has a significant negative effect on bank profitability, indicating that higher levels of credit risk are associated with a decline in profitability (Abdelaziz et al., 2022).

In Indonesia, the prudential principle in credit management is explicitly stipulated in Peraturan Otoritas Jasa Keuangan No.40/POJK.03/2019 concerning the Assessment of Asset Quality of Commercial Banks. This regulation provides detailed provisions on the classification of credit quality, the assessment of debtors' repayment capacity, and the obligation to establish loan loss provisions in

accordance with the level of risk inherent in productive assets (Peraturan Otoritas Jasa Keuangan, 2019). From a legal perspective, POJK 40/2019 constitutes a mandatory administrative legal norm that functions as a regulatory control instrument over banks' conduct in credit distribution.

In addition to prudent credit risk management, the rapid advancement of digital transformation has emerged as a strategic factor influencing bank profitability (Chen et al., 2023). Digital transformation has become a defining feature of modern banking systems and has fundamentally altered not only operational practices but also the legal governance structures underpinning financial intermediation (Vial, 2019). The increasing reliance on digital platforms, automated decision-making systems, and data-driven analytics has reshaped how banks assess creditworthiness, monitor borrowers, and manage credit risk. From a legal perspective, digital banking is no longer merely a technological or managerial phenomenon, but a governance issue that directly affects regulatory compliance, supervisory accountability, and financial stability (Ferilli et al., 2024).

In many jurisdictions, the rapid expansion of digital banking has prompted regulators to recalibrate legal frameworks to balance innovation with prudential oversight. International studies highlight that digital banking governance must ensure transparency, risk management, and accountability to prevent technological innovation from undermining financial stability (Arner et al., 2017; Gomber et al., 2018). Empirical evidence suggests that jurisdictions with clearer digital banking regulations experience more effective supervision and lower systemic risk exposure (Khan et al., 2023; Zhao et al., 2023). Nevertheless, banking digitalization also gives rise to new legal risks related to data security, system resilience, and

consumer protection.

In Indonesia, the governance of digital banking is explicitly regulated through Peraturan Otoritas Jasa Keuangan No 21 Tahun 2023 concerning Digital Banking Services (Peraturan Otoritas Jasa Keuangan, 2023). This regulation provides a legal foundation for the delivery of digital banking services while emphasizing prudential principles, risk management, and consumer protection. The regulation reflects a broader regulatory approach that treats digital banking as a legally governed activity subject to supervisory oversight, rather than as a purely technological innovation. This approach aligns with global regulatory trends that integrate fintech development into existing banking law frameworks (Buckley et al., 2019).

Despite the advancement of digital banking, credit risk remains the most significant risk faced by banking institutions. Credit risk materializes through deteriorating asset quality, commonly reflected in rising non-performing loans (NPLs), which adversely affect bank profitability, capital adequacy, and systemic resilience (Ozili, 2019; Saliba et al., 2023). Empirical studies increasingly demonstrate that digital banking can strengthen credit risk governance by improving information processing, reducing information asymmetry, and enabling continuous monitoring of borrowers (Cheng & Qu, 2020; Wang et al., 2023).

The application of big data analytics, machine learning, and automated credit scoring systems allows banks to detect early signs of credit deterioration and to enhance compliance with prudential supervision requirements (Li et al., 2020; Noriega et al., 2023). However, much of the existing literature focuses on the efficiency and performance implications of digital transformation, with limited

attention to its role within a binding legal governance framework (Yang & Masron, 2024)

This study addresses that gap by examining digital banking through the lens of legal governance. By integrating digital banking regulation and prudential asset quality supervision into a single empirical legal framework, this research contributes to banking law scholarship by demonstrating how regulatory alignment can enhance supervisory effectiveness and support financial stability.

The novelty of this study lies in the integration of empirical analysis of banking financial performance with an evaluation of the effectiveness of banking legal norms. Unlike prior studies that generally position regulation as an external context, this research places Peraturan Otoritas Jasa Keuangan No.40/POJK.03/2019 and Peraturan Otoritas Jasa Keuangan No.21 Tahun 2023 as legal instruments with measurable economic consequences. Thus, this study not only explains the determinants of bank profitability but also demonstrates how legal governance operates functionally in shaping the economic behavior of banks as legal subjects. The originality of this research resides in its law-and-economics approach, which conceptualizes banking profitability as an outcome of the effective implementation of the prudential principle and digital service governance within a binding regulatory framework.

Based on this research gap, this article aims to empirically examine the effect of credit risk and digital transformation on bank profitability within the framework of banking legal governance in Indonesia. The study integrates empirical findings derived from banking data with a normative analysis of POJK 40/POJK.03/2019 and POJK 21 of 2023 as the legal foundations governing asset quality and digital

banking services. Accordingly, this research is expected to provide both theoretical and practical contributions to the development of banking law and supervisory policy in Indonesia.

2. Research Method

This study adopts an empirical legal research design using a quantitative approach to examine how digital banking regulation operates in practice and affects credit asset quality (Epstein & King, 2002; McConville, 2017). Empirical legal research is particularly suitable for banking law studies because it allows for the evaluation of regulatory effectiveness through observable financial outcomes, such as changes in asset quality and credit risk indicators.

The objective is to empirically examine the effect of credit risk and digital transformation on bank profitability. This approach is selected because it aligns with the research objective of explaining the causal relationships among financial variables that are relevant to the implementation of the prudential principle and banking governance as regulated by statutory provisions.

This study proposes three hypotheses: (H1) credit risk affects the profitability of banks listed on the Indonesia Stock Exchange during the 2019–2024 period; and (H2) digital transformation affects bank profitability of banks listed on the Indonesia Stock Exchange during the 2019–2024 period.

The context of banking law, the quantitative approach functions as an analytical instrument to assess the economic implications of legal norms governing asset quality and digital banking services (Abdelaziz et al., 2022; Suroso, 2022). The use of this approach is situated within a legal compliance framework, in which

provisions concerning credit asset quality and digital services are understood as norms that both constrain and direct the behavior of banks as legal subjects. Accordingly, this research method is not intended to evaluate the norms from a normative-dogmatic perspective, but rather to assess how these legal norms are reflected in banking financial performance.

This study employs secondary data derived from the annual financial statements and annual reports of conventional commercial banks listed on the Indonesia Stock Exchange (IDX). The financial statements utilized are audited reports, thereby fulfilling the principles of accountability and transparency that constitute essential components of good banking governance. In addition, regulatory data are obtained from relevant Financial Services Authority Regulations, particularly POJK No.40/POJK.03/2019 concerning the Assessment of Asset Quality of Commercial Banks and POJK No.21 Tahun 2023 concerning Digital Services by Commercial Banks, which serve as the legal basis for interpreting the empirical findings.

The population of this study consists of commercial banks listed on the Indonesia Stock Exchange (IDX) during the period 2019–2024. This observation period captures the dynamics of digital transformation both prior to and following the enactment of Peraturan Otoritas Jasa Keuangan No.21 Tahun 2023. Publicly listed banks are selected due to their enhanced disclosure obligations and stricter regulatory oversight, which ensure data reliability and legal accountability (Uddin et al., 2020).

The research sample covers the period from 2019 to 2024 and is determined based on specific criteria relevant to the research objectives, Banking companies that publish annual reports; Conventional banking companies listed on the Indonesia

Stock Exchange (IDX); Banking companies that report positive profits. Based on purposive sampling, a total of 26 banking companies were selected as the research sample. With an observation period of six years, the total number of observations employed in this study amounts to 156 observations. These criteria ensure that the selected banks are subject to both digital banking governance and prudential asset quality supervision (Xie & Wang, 2023).

Secondary data are obtained from banks' annual reports and financial statements. Bank profitability is measured using Return on Assets (ROA), which reflects a bank's ability to generate profit from the total assets under its management (Jewell et al., 2011). Credit asset quality is measured using the Non-Performing Loan (NPL) ratio, which represents a core prudential indicator widely used in banking regulation and credit risk research (Ozili, 2019). Digital banking implementation is measured using a Digital transformation is measured using the Digital Transformation Index using a dummy variable (a value of 1 is assigned if the indicator is disclosed, and 0 if it is not disclosed). One approach to measuring digital transformation is to employ a set of indicators from the Peking University Digital Transformation Index for Commercial Banks, which consists of three dimensions: strategic digitalization, business digitalization, and management digitalization (Chao et al., 2024).

Data analysis is conducted using panel data regression techniques to examine the relationship between digital banking implementation and credit asset quality. Panel data analysis allows for the assessment of both cross-sectional and time-series variations, providing a robust framework for evaluating regulatory impacts over time (Baltagi, 2021). The regression results are interpreted within a legal

governance framework to assess whether digital banking strengthens compliance with prudential asset quality supervision.

3. Results and Discussion

The average Return on Assets (ROA) of banks listed on the Indonesia Stock Exchange during the 2019–2024 period exhibits a fluctuating yet upward trend. In 2019, ROA stood at 0.0121 and declined to 0.0092 in 2020, which may be attributed to the economic slowdown resulting from the COVID-19 pandemic and its impact on banking performance. Subsequently, ROA increased to 0.0110 in 2021 and continued to improve in 2022 and 2023. In 2024, ROA remained relatively stable at 0.0134. This trend indicates that bank profitability gradually recovered and improved in line with economic stabilization and enhanced operational efficiency.

The average NPL during the observation period generally exhibits a downward trend, despite experiencing some fluctuations. In 2019, the NPL ratio was recorded at 0.0290 and slightly declined to 0.0279 in 2020. In 2021, NPL increased again to 0.0293, reflecting heightened credit risk as a continued impact of economic pressures. However, from 2022 to 2024, the average NPL demonstrated a consistent decline, reaching 0.0250, 0.0220, and 0.0209, respectively. This decrease indicates an improvement in credit quality and the effectiveness of restructuring policies as well as credit risk management practices implemented by banks.

The average level of digital transformation demonstrates a consistently increasing trend throughout the 2019–2024 period. In 2019, the Digital Transformation (DT) index was recorded at 0.3331 and continued to rise each year, reaching 0.3701 in 2020 and 0.4017 in 2021. This upward trend persisted in 2022 and 2023, ultimately

attaining 0.4614 in 2024. This sustained increase reflects the commitment of Indonesian banks to developing digital services and infrastructure, particularly to enhance transaction convenience and improve service quality for customers.

Panel Data Regression Analysis Results

Dependent Variable: ROA
Method: Panel EGLS (Cross-section random effects)
Date: 11/10/25 Time: 18:45
Sample: 2019 2024
Periods included: 6
Cross-sections included: 26
Total panel (balanced) observations: 156
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013252	0.002156	6.146257	0.0000
NPL → ROA	-0.174585	0.033349	-5.235110	0.0000
TD → ROA	0.008450	0.003177	2.659488	0.0087
Effects Specification				
			S.D.	Rho
Cross-section random			0.006573	0.7641
Idiosyncratic random			0.003652	0.2359
Weighted Statistics				
Root MSE	0.003659	R-squared		0.214561
Mean dependent var	0.002700	Adjusted R-squared		0.204294
S.D. dependent var	0.004142	S.E. of regression		0.003695
Sum squared resid	0.002089	F-statistic		20.89772
Durbin-Watson stat	1.282380	Prob(F-statistic)		0.000000
Unweighted Statistics				
R-squared	0.238633	Mean dependent var		0.012205
Sum squared resid	0.009395	Durbin-Watson stat		0.285163

Table 3.1 Panel Data Regression Analysis Results

3.1.The Effect of Credit Risk on the Profitability of Banks Listed on the Indonesia Stock Exchange during the 2019–2024 Period

There is a significant negative effect of financial risk variables on bank profitability, a significance value of $0.000 < 0.05$, Credit Risk (NPL) has a significant negative effect on profitability (ROA). These results are supported by empirical data based on the average values of credit risk and profitability variables. The Non-Performing Loan (NPL) ratio demonstrates a downward trend in the medium term, although it experienced fluctuations at the beginning of the observation period. The initial increase in NPL reflects heightened credit risk due to economic pressures, while the subsequent consistent decline indicates improvements in credit quality and the effectiveness of risk management policies implemented by banks.

Meanwhile, the Return on Assets (ROA) of banks exhibits a fluctuating yet generally upward trend throughout the 2019–2024 period. This analysis further reinforces the negative impact of credit risk on bank profitability. It also confirms that when credit risk is effectively mitigated, banks can reduce loan loss provision expenses and optimize interest income through credit distribution, thereby enhancing overall profitability.

3.2. The Effect of Digital Transformation on the Profitability of Banks Listed on the Indonesia Stock Exchange during the 2019–2024 Period

There is a significant positive effect of the digital transformation variable on bank profitability, significance value of $0.0087 < 0.05$, digital transformation has a significant positive effect on profitability (ROA). These findings are supported by empirical data based on the average values of digital transformation and profitability variables. Banking digital transformation exhibits a consistently

increasing trend throughout the research period, while Return on Assets (ROA) shows a fluctuating yet generally upward trend during the 2019–2024 period. This pattern indicates that as the level of digital transformation increases, bank profitability correspondingly improves.

This study provides empirical legal evidence that digital banking implementation significantly strengthens the legal governance of digital bank quality in Indonesian commercial banks.

From a theoretical perspective, the findings support the Resource-Based View, which posits that strategically managed internal resources enhance organizational performance and governance outcomes (Barney, 1991). Digital capabilities, when embedded within regulatory and supervisory frameworks, function as strategic legal resources that strengthen compliance, transparency, and risk control (Ferilli et al., 2024; Willie, 2024). This study extends existing theory by situating digital transformation within a legal governance context.

The findings also align with studies emphasizing the importance of regulatory oversight in maximizing the benefits of digital transformation. While rapid digitalization may introduce new operational and cybersecurity risks (Uddin et al., 2020), this study demonstrates that under a coherent legal framework, digital banking contributes positively to asset quality and financial stability. The regulatory alignment between POJK No. 21 Tahun 2023 (Peraturan Otoritas Jasa Keuangan, 2023) and POJK No. 40 Tahun 2019 (Peraturan Otoritas Jasa Keuangan, 2019) illustrates how digital banking regulation can function as a complementary legal mechanism enhancing prudential supervision (Chunyang et al., 2025; Saif-Alyousfi et al., 2020).

4. Conclusion

The results of the panel data regression analysis indicate that credit risk, proxied by the Non-Performing Loan (NPL) ratio, has a negative and significant effect on bank profitability as measured by Return on Assets (ROA). This finding suggests that an increase in non-performing loans directly reduces a bank's ability to generate profits from the assets it manages. Empirically, these results are consistent with prior studies emphasizing that asset quality constitutes a primary determinant of banking financial performance (Abdelaziz et al., 2022; Suroso, 2022).

Furthermore, the findings also reveal that digital transformation has a positive and significant effect on bank profitability. Banks with higher levels of digital technology adoption and utilization tend to exhibit stronger profitability performance. This result confirms the argument that digitalization enhances operational efficiency, broadens service accessibility, and strengthens banks' competitiveness in responding to the evolving dynamics of the financial industry (Chen et al., 2024; Chao et al., 2024).

Juridical Analysis of the Effect of Credit Risk within the Framework of POJK 40/POJK.03/2019

From the perspective of banking law, the empirical finding regarding the negative effect of credit risk on bank profitability reinforces the urgency of implementing the prudential principle as stipulated in Peraturan Otoritas Jasa Keuangan No. 40/POJK.03/2019 concerning the Assessment of Asset Quality of Commercial Banks. Normatively, this regulation obliges banks to conduct continuous assessments of credit quality and to establish impairment loss provisions in

accordance with the level of risk inherent in productive assets.

These provisions reflect the function of law as a regulatory instrument aimed at preventing excessive and high-risk lending practices. The increase in NPLs, which has been shown to suppress bank profitability, indicates that failure to implement asset quality standards and sound credit risk management will directly result in a decline in financial performance. Therefore, POJK 40/2019 functions not merely as an administrative norm, but also as a legal mechanism with tangible economic consequences for banks as legal subjects.

Furthermore, the findings of this study provide empirical justification that compliance with asset quality regulations constitutes a prerequisite for the sustainability of banking operations. In this context, bank profits may be viewed as a reflection of the degree of compliance with the prudential principle internalized through prudent credit management. Accordingly, these findings strengthen the position of POJK 40/2019 as a central pillar of the banking legal regime aimed at maintaining financial system stability and protecting the public interest.

Juridical Analysis of Digital Transformation within the Framework of POJK 21 of 2023

The empirical results demonstrating the positive effect of digital transformation on bank profitability must be analyzed within the legal governance framework of digital services as regulated under Peraturan Otoritas Jasa Keuangan No.21 Tahun 2023 concerning Digital Services by Commercial Banks. This regulation emphasizes that the provision of digital services constitutes an integral part of banking business activities and must be carried out in accordance with the prudential principle, risk management standards, consumer protection requirements, and sound

information technology governance.

From a juridical perspective, POJK 21/2023 positions digital transformation not merely as a business strategy, but as a banking activity subject to regulatory and supervisory oversight. The empirical finding that digitalization contributes positively to bank profitability indicates that the legal governance framework established by the OJK provides legal certainty and normative boundaries that enable banks to optimally utilize digital technologies without neglecting customer protection and systemic stability.

With clear regulatory provisions regarding information technology infrastructure, data security, and digital risk management mechanisms, POJK 21/2023 functions as an enabling regulation that encourages innovation while maintaining legal discipline. The findings of this study suggest that banks capable of implementing digital transformation in compliance with legal requirements tend to obtain economic benefits in the form of improved profitability. This demonstrates a causal relationship between legal compliance in digital services and banking financial performance.

Integration of Empirical and Normative Analysis

The integration of empirical findings and juridical analysis in this study demonstrates that bank profitability is the result of an interaction between economic factors and the legal framework governing them. POJK 40/POJK.03/2019 and POJK 21 Tahun 2023 function as two complementary normative instruments: the former emphasizes risk control through asset quality and credit management, while the latter regulates the utilization of digital technology within the framework of sound governance.

In this context, the study confirms that banking law is not passive in nature, but rather plays an active role in shaping the economic behavior of banks. Effective legal norms do not merely create formal compliance; they also generate economic incentives that encourage banks to improve financial performance sustainably. Thus, the primary contribution of this research lies in affirming that strong legal governance constitutes a prerequisite for the successful implementation of digital transformation and credit risk management in enhancing banking profitability.

Legal Contribution and Policy Implications

This study provides a significant legal contribution to the development of empirical banking law scholarship, particularly by demonstrating that legal norms function not only as administrative control mechanisms but also possess normative efficacy in influencing banks' economic performance. The empirical confirmation of the negative effect of credit risk on profitability reinforces the position of POJK Number 40/POJK.03/2019 as an essential legal instrument in upholding the prudential principle. From a legal standpoint, this regulation may be understood as a form of preventive regulation aimed at internalizing risk discipline into banks' economic behavior, ensuring that generated profits are not speculative but grounded in compliance with asset quality standards established by the authority.

Moreover, this study enriches the understanding of the role of law in managing technological innovation within the banking sector. The findings indicate that digital transformation regulated under POJK Number 21 of 2023 serves as a legal governance mechanism that enables banks to derive economic benefits from digitalization while safeguarding consumer protection, data security, and financial system stability. In this regard, POJK 21/2023 may be positioned as an enabling

legal framework that normatively provides legal certainty while establishing clear boundaries for banks in developing digital services. Thus, the law does not operate repressively toward innovation; rather, it functions as a regulatory enabler that directs digital transformation in alignment with banking prudential principles.

From a policy perspective, the findings underscore that strengthening banking profitability cannot be separated from the consistent implementation and enforcement of regulatory provisions. For regulators, this research provides empirical grounds to maintain and refine asset quality and digital service regulations as two principal pillars of the banking legal regime. Supervisory policies should therefore focus not only on formal compliance but also on evaluating the economic impact of regulatory implementation, ensuring that the effectiveness of legal norms can be continuously assessed.

For the banking industry, this study confirms that compliance with POJK 40/2019 and POJK 21/2023 is not merely a legal obligation, but also a rational law-and-economics strategy to achieve business sustainability. Banks that are able to integrate prudent credit management and digital transformation within a framework of legal compliance have greater opportunities to generate sustainable profits while maintaining public trust. Accordingly, the principal legal contribution of this research lies in affirming that banking profitability is an outcome of effective legal governance, rather than merely the result of isolated business decisions.

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