

# Digital Transformation and Islamic Banks' Financial Stability: The Role of Sustainable Economic Growth in Indonesia

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## ABSTRACT

This study aims to examine the relationship between digital transformation and the financial stability of Islamic banking in Indonesia, while analyzing the role of sustainable economic growth in moderating this relationship. Using static panel data regression with a sample of five Islamic banks in Indonesia from 2020 to 2024, the study measures bank stability through the Z-score indicator. The findings indicate that digital transformation, specifically through the number of ATMs and mobile banking usage (MU), has a significant impact on Islamic banking stability by enhancing operational efficiency and reducing transaction costs. Furthermore, Gross Domestic Product (GDP) serves as a significant interaction variable that strengthens the resilience of the Islamic banking system when combined with digital infrastructure like ATMs and commercial branches. The implications suggest that Islamic banks should leverage digital transformation to strengthen credit scoring systems and mitigate risks to ensure stability amidst macroeconomic dynamics. This study contributes to the literature by incorporating non-cash electronic financial service variables and evaluating the interaction effect of GDP on digitalization's effectiveness within the Indonesian Sharia banking sector.

**Keywords:** Digital Transformation, Islamic Banking, Financial Stability, Z-Score, Sustainable Economic Growth.

**JEL Classification:** G21, O33, Q56.

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## INTRODUCTION

In the era of Industrial Revolution 4.0, digital finance has emerged as a fundamental pillar of banking infrastructure and a catalyst for sustainable economic acceleration. This

transformation fundamentally impacts both conventional and Sharia banking sectors (Banna, 2020). Technology has reshaped conventional financial behavior by providing seamless and

comprehensive access to diverse financial services (Syakirunni'am et al., 2025). Digital transformation holds significant potential to fortify the financial system by expanding financial inclusion. Advancements in mobile technology, internet connectivity, and digital transactions have enabled the delivery of electronic financial services to remote populations previously lacking adequate access (Hordofa, 2024). However, this rapid technological evolution introduces novel risks that necessitate prudent policymaking. The increasing complexity of digital networks supporting financial services has led to challenges such as cyber threats, data privacy concerns, and disparate regulatory standards resulting from fragmented supervision (Awwad et al., 2024). Consequently, understanding how digital transformation impacts financial stability by evaluating associated risk levels is of paramount importance.

The urgency of this supervision is underscored by the recent financial crisis in the United States, which reverberated across many nations, clearly demonstrating that systemic vulnerabilities in conventional finance can severely destabilize the real economy (Banna, 2020), the vast scope and consequences of such crises highlight the inherent instability within the financial industry (Law & Ridhwan, 2022). Conversely, advancements in financial technology have catalyzed the growth of the Islamic financial industry. In this regard, the Global Islamic Financial Services Industry (GIFSI) provides a framework for the substantial development of the global Islamic financial sector. Stability, resilience, and robustness key characteristics of the Islamic financial system are receiving unprecedented attention, particularly within the macroeconomic analytical frameworks utilized by conventional economists and policymakers. As a result, formulating policies aimed at strengthening financial stability and mitigating crisis risks has

become a prominent fixture on the global economic policy agenda (Hadian, 2016).

Islamic banking assets constitute a significant portion of the GIFSI structure. While the primary objective of Islamic banking aligns with conventional banking acting as an institution for efficient fund management fundamental differences exist in their asset and liability structures. Conventional banks operate on interest-based principles, whereas Islamic banks utilize profit-sharing (*mudharabah*) on the liability side, and leasing (*ijarah*), *mudharabah*, and *musyarakah* on the asset side (Hunjra et al., 2022). These fundamental distinctions reflect divergent approaches to achieving financial efficiency and stability, serving as the primary characteristics distinguishing the Islamic financial system from its conventional counterpart. Within this context, the banking sector occupies a dominant position in the global Sharia financial structure. This strategic role positions Islamic banking as a key element in driving economic growth and development (Parsa, 2022). This aligns with the status of Islamic banking as the largest sector within the overall Islamic financial industry (Hassan et al., 2021). Such operational characteristics are considered to have a positive impact on economic growth and contribute to the overall stability of the financial system (Hunjra et al., 2022).

In an effort to advance the global financial sector, numerous Islamic banks worldwide have launched various digital financial services to foster broader inclusion. Digitalization not only empowers Sharia banking to provide inclusive financial solutions for diverse customer segments but also serves as a strategic instrument for maintaining banking stability (Abu Al-Haija et al., 2025). At a macro level, the stability of the Islamic banking sector reflects national economic resilience, contributing directly to the achievement of Sustainable Development Goals (SDGs) (Banna,

2020). Therefore, this study aims to examine the relationship between digital transformation and the stability of the Sharia banking system in Indonesia, and how the interaction of sustainable economic growth influences both. Furthermore, this study adds value to the literature by explaining the impacts, prospects, and challenges of Digital Financial Inclusion (DFI) and suggesting policies to address these challenges. Islamic banks in Indonesia, such as Bank Syariah Indonesia (BSI), BCA Syariah, and Bank Aceh Syariah, have expanded digital access, citing the strengthening of competitiveness, enhancement of operational efficiency, and improved customer satisfaction as primary drivers recommendations that remain valuable for the broader advancement of Sharia banking in Indonesia (Desky et al., 2022).

This study contributes to several critical aspects. First, it employs variables related to non-cash electronic financial services that provide transaction flexibility for customers, addressing a gap in the limited existing literature. Second, contrasting with certain existing studies Jameaba (2022) argues that the massive expansion of fintech has triggered a paradigm shift in financial intermediation which, despite increasing inclusion, introduces new systemic risks to financial stability. Additionally Kasri et al. (2022) suggest that digitalization and Sharia banking stability do not share a causal relationship, likely due to the relatively small market share of Sharia banking within Indonesia's overall banking industry. Third, digital transformation is posited to support the stability of the Sharia financial system in Indonesia, particularly as many Sharia banks have developed digital banking systems. Banna et al. (2022) and Banna & Alam (2021) explain that DFI implementation fosters Sharia banking stability, reduces default risks, and encourages inclusive economic growth. Tlemsani et al. (2025) further note that Islamic digital finance has the potential to

contribute significantly to the SDGs. Digital transformation not only enhances institutional agility and crisis response but also reinforces the ethical principles of Islamic economics, including social justice, risk-sharing, and wealth redistribution (Nisa, 2025). These practical implications underscore the importance of digital transformation as a strategic tool for sustainable development within the Sharia banking system.

## LITERATURE REVIEW

Digital transformation in the financial sector is an integral part of the development of modern financial systems, catalyzed by the Industrial Revolution 4.0 (Golić, 2020). This term describes the transition from an industrial era characterized by analog technology to an era of knowledge and creativity marked by digital technology and business innovation. The digitalization of financial services contributes to strengthening banking infrastructure and fostering economic growth by increasing non-cash transaction activities and expanding the customer base (Ali et al., 2019). Then, in the era of digitalization, industrial transformation encourages the adoption of new technologies to generate revenue and create opportunities through Fintech-based transactions (Allmen et al., 2020) and unprecedented digital payment methods (Arner et al., 2020). This phenomenon signifies a shift in consumer and business behavior toward more flexible digital payment instruments (Sugandi, 2021). Extensive research indicates that digital transformation plays a crucial role in expanding financial inclusion, particularly through the provision of non-cash services via electronic devices (Pham et al., 2024). The utilization of technologies such as mobile banking, ATM networks, and electronic transactions enables banking institutions to reach segments of the population that previously had limited access to

formal financial services. In this context, digital finance is viewed as a vital pillar in building modern banking infrastructure and accelerating sustainable economic growth.

Several studies emphasize that the expansion of digital infrastructure is a primary prerequisite for supporting digital transformation in banking (Osei et al., 2023). Indicators such as the number of ATMs, bank branches, mobile phone subscription rates, and broadband penetration are widely used to assess a country's non-cash financial service penetration and digital readiness. This infrastructure allows banks to provide more efficient and flexible services while expanding financial inclusion, especially in developing countries (Tsindeliani et al., 2022). The availability of ATMs and physical branches remains critical as service access points, while mobile and broadband penetration serves as the primary foundation for developing application-based digital banking services.

From a macroeconomic perspective, the enhancement of financial inclusion through digital transformation is linked to improvements in financial system stability and banking sector resilience. This is achieved by encouraging increased economic participation and expanding the customer base, which in turn strengthens the stability of the banking sector through the diversification of funding sources and increased transaction volumes (Ibrahim Hadid et al., 2020). Financial system stability has become a primary concern in post-global crisis economic studies, given the broad impact of banking sector instability on the real economy (Banna et al., 2022). In this context, empirical literature frequently utilizes the Z-score as an indicator of banking stability because it comprehensively represents a bank's risk level by combining profitability and capitalization aspects (Alfiyan et al., 2023). The use of this indicator is considered relevant in Sharia banking studies as it

does not depend on the characteristics of specific financial instruments.

Sharia banking possesses structural characteristics that distinguish it from conventional banking, particularly in the mechanisms of fund management and financing distribution (Parsa, 2022). The application of profit-sharing principles and real-asset-based financing creates a closer link between the financial sector and productive economic activities. Several studies show that these characteristics have the potential to enhance the resilience of Sharia banking and support overall financial system stability, especially in facing economic fluctuations. The dominance of Sharia banking within the Global Islamic Financial Services Industry structure underscores the strategic role of this sector in economic development (Aladağ, 2023). Literature indicates that the contribution of Sharia banking is not limited to financial intermediation functions but also includes a role in promoting inclusive economic growth through real-sector financing (Eid et al., 2023). Consequently, strengthening the stability of Sharia banking is an essential component of the economic policy agenda in various countries.

The advancement of Digital Financial Innovation (DFI) has accelerated the operational transformation of Sharia banking across various jurisdictions. The implementation of digital banking services enables increased efficiency, optimized fund management, and the expansion of non-cash service reach (Hakizimana et al., 2023). Empirical findings suggest that the adoption of digital services in Sharia banking is associated with improved financial performance and strengthened capital structures, which ultimately support banking stability (Riza & Wijayanti, 2024). Furthermore, Sharia banking stability has significant macroeconomic implications for supporting sustainable economic growth. The

stability of the banking sector reflects the level of economic resilience and plays a role in fostering the achievement of the Sustainable Development Goals (SDGs) through increased financial inclusion and financing of productive activities (Riza & Wijayanti, 2024). Research by Asif & Nasir, (2024); Khattak et al., (2023); Syed et al., (2022) demonstrates that the positive influence of digital transformation on Sharia banking stability tends to be stronger when supported by stable economic growth, as reflected in the interaction between digitalized financial services and Gross Domestic Product (GDP).

## METHODOLOGY

This study is structured into two primary analyses. First, we examine the impact of digital transformation on the stability of Islamic banking in Indonesia. Second, we analyze the interaction effect of Gross Domestic Product (GDP) on this relationship to evaluate how macroeconomic conditions contribute to the effectiveness of digitalization. To measure the stability of Islamic banks, we employ the Z-score, which is the most widely utilized proxy in the literature, such as in Banna & Alam (2021); Hordofa (2024) The Z-score is recognized as an unbiased parameter for assessing bank risk. The following equation illustrates the Z-score measurement:

$$Z - SCORE = \frac{ROA + CAR}{\sigma(ROA)}$$

Meanwhile, for the independent variable of digital transformation, we utilize several metrics focusing on non-cash banking services, including the number of ATMs, mobile branches, the number of physical branch offices, mobile use, and the volume of mobile banking transactions. Furthermore, we incorporate bank-specific variables as controls to ensure the consistency of the research estimates. Adopting the framework of

Banna & Alam (2021), liquidity is measured through Total Financing (FINC). To control for the influence of company scale, we use the natural logarithm of total assets (Bank Size - SIZE). We also include the ratio of loan loss provisions to total loans (Loan Loss Provision - LLP). Finally, Revenue Diversification (RD) is proxied by the ratio of non-interest operating income to the company's total operating income. The data for these variables are sourced from the annual reports of each respective Islamic bank. This study employs a purposive sampling technique based on specific criteria: Islamic banks in Indonesia that reported Digital Banking Performance in their annual reports during the period of 2020–2024. Based on these criteria, the final sample consists of 5 Islamic banks. The list of sampled banks is presented below:

**Table 1**  
**Research Sample List**

Kode	Islamic Banks
BCAS	Bank Central Asia Syariah
BJBS	Bank BJB Syariah
BSI	Bank Syariah Indonesia
BMI	Bank Muamalat Indonesia
BMS	Bank Mega Syariah

This study uses static panel regressions including a fixed effects model, a random effects model, and robust standard errors. The equation model in static panel data regression is as follows:

$$Z - score = \beta_0 + \beta_1 ATM_{it} + \beta_2 MB_{it} + \beta_3 MU_{it} + \beta_4 NCB_{it} + \beta_5 BS_{it} + \varepsilon_{it} \dots (1)$$

Moreover, this study examines the interaction between the independent variables and the dependent variable included in the model. GDP is utilized as an interaction variable to assess its influence on the relationship between digital transformation and Islamic bank stability. This interaction suggests that the impact of digital technology on national welfare is not isolated; rather, it significantly depends on economic

conditions (GDP) in strengthening the resilience of the Islamic banking system (Banna et al., 2022).

$$Z - score = \beta_0 + \beta_1 ATM_{it} + \beta_2 MB_{it} + \beta_3 MU_{it} + \beta_4 NCB_{it} + \beta_5 GDP * DT + \beta_6 BS_{it} + \varepsilon_{it} \dots\dots\dots (2)$$

Table 2 below describes the definition and explanation of each variable used in this paper. The detail information is as follows:

**Table 2**  
**Definition Operational Variable**

Variable	Definition and Measurement	Source
<i>Dependent Variable (Bank Stability)</i>		
Z-Score	A stability proxy that measures the resilience of Islamic banks against insolvency risk, calculated using the formula: $z - SCORE = \frac{ROA + CAR}{\sigma(ROA)}$	Author calculation
<i>Independent Variabel (Digital Transformation)</i>		
ATM	Number of ATMs	Annual Report
MB	Number of Mobile Bank Branches	Annual Report
MU	Mobile Use	Annual Report
NCB	Number of Commercial Bank Branches	Annual Report
<i>Interaction Variable</i>		
GDP	Total GDP at Current Market Prices by Industry	Badan Pusat Statistik (BPS)
<i>Control Variable (Bank Specific)</i>		
FINC	Total Financing	Annual Report
Bank Size	Logarithm Natural of total assets	Annual Report
LLP	Loan Loss Provision	Annual Report
REV	Revenue Diversification	Annual Report

Source: Author's own calculation

## RESULT AND DISCUSSION

In this section, we discuss the results of the observed data, beginning with descriptive statistics and followed by hypothesis testing using various analytical methods. To begin, Table 3 presents the descriptive statistics. The average number of ATMs provided by Islamic banks in Indonesia is 4,689 units. The minimum number recorded was 81 units by BJBS in 2020, while the highest was achieved by BCAS in 2024 with 19,453 units. This high figure for BCAS is attributed to the integration of its ATM network with its parent bank, BCA, whereas other Islamic banks typically operate independent ATM networks from their parent companies. Mobile branches and the number of

commercial branches serve as units that enhance the service effectiveness of Islamic banking, with average counts of 21.12 and 78.83 units, respectively. The minimum value for mobile branches was 0 units, recorded by BSI in 2021 during its initial establishment. Furthermore, the minimum number of branches was recorded by BJBS in 2020 and 2021, which subsequently increased to 10 units from 2022 to the present. On average, digital transformation within Islamic banks has shown an annual increase, providing concrete evidence of the sector's commitment to massively enhancing banking service effectiveness.

Furthermore, bank-specific variables measured by total financing, bank size, revenue diversification, and

LLP reveal that the maximum total financing was achieved by BCAS in 2024, while the minimum was recorded by BMS in 2020. When evaluated against bank size (representing total assets), the data shows that the largest bank size was held by Bank Muamalat Indonesia (BMI) in 2023, while the smallest was BJBS in 2020. This indicates that a larger bank size does not necessarily guarantee maximum financing distribution. Interestingly, BJBS, despite having the smallest bank

size, recorded the highest revenue from other business activities compared to its peers. Regarding Loan Loss Provisions (LLP), which represent the reserves banks must set aside from profits to anticipate future potential losses, BSI recorded the highest LLP level during its inception in 2021. This high level is likely a precautionary measure to mitigate default risks, thereby ensuring the bank's liquidity remains secure.

**Table 3**  
**Statistic Descriptive**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
Z_SCORE	22.706	17.022	54.126	7.9619	12.704	24
ATM	4689.6	654.00	19453	81.000	7335.2	24
MB	21.125	5.5000	60.000	0.0000	25.594	24
MU	1086975.	336876.	7990000.	35432.	2005529.	24
NCB	78.833	74.500	272.00	8.0000	60.123	24
FINC	2.35E+10	1.06E+10	1.07E+11	4.85E+09	2.77E+10	24
BANK_SIZE	23.730	23.385	24.927	22.907	0.6881	24
REV	4.94E+09	3.49E+09	2.06E+10	5.75E+08	4.51E+09	24
LLP	2.124	1.750	7.590	0.290	1.545	24

*Source: Author's own calculation*

*Notes: ATM= Number of ATM, MB= Number of Mobile Branche, MU= Mobile Use, NCB= Number of Commercial Branches, FINC= Total Financing, REV= Revenue Diversification, LLP= Loan Loss Provision.*

Several classical assumptions must be examined when employing the Ordinary Least Squares (OLS) method, including tests for normality, multicollinearity, and heteroscedasticity. In this study, the normality test, the skewness–kurtosis normality test yields a p-value greater than 0.05, indicating that the data are normally distributed. Then, the correlation matrix of both exogenous and endogenous variables is presented in Table 4. The results reveal that all independent variables have correlation coefficients below the threshold of 0.80, indicating the absence of strong correlations among them. Accordingly, the estimated model does not suffer from perfect multicollinearity. Further details are provided in the table. Table 4 also presents the results of the

heteroscedasticity test, which aims to evaluate whether the variance of the error terms in the regression model is constant. The presence of heteroscedasticity would violate a key assumption of the OLS method, resulting in estimators that are no longer Best Linear Unbiased Estimators (BLUE) and thereby reducing the reliability of the regression results. To test for heteroscedasticity, this study applies the Glejser test by regressing the absolute values of the residuals on the independent variables. The findings indicate that the model does not exhibit heteroscedasticity, implying homoscedastic error variance and confirming that the model satisfies the minimum variance assumption.

**Table 4**  
**Classical Assumption Test**

Normality Test					
	Statistic				Prob.
Skewness	-0.825609				0.795487
Skewness 3/5	1.421654				0.077563
Kurtosis	1.823832				0.034089
Normality	2.011038				0.365855
Multicollinearity Test					
	ATM	MB	MU	NCB	
ATM	1.0000	-0.2071	-0.0752	0.0834	
MB	-0.2071	1.0000	0.5561	0.3545	
MU	-0.0752	0.5561	1.0000	0.6104	
NCB	0.0834	0.3545	0.6104	1.0000	
Heteroscedasticity Test (Glejser Test)					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
C	-4.1031	6.1139	-0.6711	0.5117	
ATM	0.0013	0.0013	0.9325	0.3649	
MB	0.1112	0.0996	1.1164	0.2807	
MU	-1.66E-06	1.54E-06	-1.0768	0.2975	
NCB	-0.003858	0.025526	-0.151123	0.8818	

Source: Author's own calculation

## 1. Panel Data Regression

In the panel data regression model, a specification test was conducted prior to determining the appropriate estimation method.

As presented in Table 5, the Chow test and the Hausman test were performed to select the most suitable model between Fixed Effects and Random Effects.

**Table 5**  
**Spesification Model**

Uji Chow			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	6.783783	(4, 16)	0.0022
Cross-section Chi-square	24.793726	4	0.0001
Uji Hausman			
Test Summary	Chi-Sq. Statistic	Chi-Sq. D.f.	Prob.
Cross-section random	27.135131	4	0.0000

Source: Author's own calculation

Table 6 describes the results of the panel regression. The analysis is divided into two sections: all-sample calculations and split-sample calculations. The findings indicate that in the split-sample analysis using the Fixed

Effects Model, the digital transformation variables specifically the number of ATMs and the number of mobile banking users (MU) have a significant impact on Islamic banking stability (Z-score). ATM and mobile banking services are

integral components of banking digitalization that enhance service efficiency for customers. In contrast, the proxies for mobile branches (MB) and the number of commercial bank branches (NCB) do not show a significant influence on the Z-score.

Digital transformation in Sharia banking drives innovation in products and services. The implementation of digital solutions, such as information technology adoption and mobile banking, enhances service quality and effectively meets customer needs. The results clarify that digitalization facilitates broader physical accessibility through ATMs, while mobile banking adoption reflects a strategic shift toward operational efficiency reducing costs for passbook printing, office rentals, and labor while simultaneously increasing customer convenience. Theoretically, digitalization reduces transaction costs and information asymmetry, which in turn boosts the net profit

of the banking sector. This is consistent with [Hordofa \(2024\)](#), who posits that IT investment enables banks to diversify income and enhance real-time credit monitoring, thereby increasing the Z-score and the bank's resilience against bankruptcy risk. Furthermore, research by [Widyandri & Laila \(2022\)](#) on Indonesian Islamic banks suggests that digitalization is not merely a technological trend but a crucial strategy for cost efficiency that directly contributes to long-term stability. Studies by [Banna et al. \(2022\)](#) and [Khattak et al. \(2023\)](#) across several countries also confirm that digital transformation improves overall efficiency and reduces operating expenses. For instance, the advancement of mobile banking at BSI demonstrates that the integration of IT and mobile services plays a pivotal role in achieving operational efficiency, expanding financial inclusion, and supporting environmental sustainability ([Aprilia et al., 2025](#)).

**Table 6**  
**Panel Data Regression**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	42.47084	7.526259	5.643022	0.0000
ATM	-0.005435	0.001716	-3.167557***	0.0060
MB	-0.210862	0.122607	-1.719820	0.1047
MU	5.40E-06	1.89E-06	2.848526***	0.0116
NCB	0.034723	0.031423	1.105049	0.2855

Source: Author's own calculation. Standard error in parentheses. \*, \*\*, and \*\*\* denote significant at 10%, 5%, and 1%.

Notes: ATM= Number of ATM, MB= Number of Mobile Branche, MU= Mobile Use, NCB= Number of Commercial Branches.

Furthermore, to strengthen the validity of the findings, a robustness check was applied, as shown in Table 7. The robustness model corroborates the previous analysis, showing an even stronger relationship between digital transformation and Islamic banking stability with higher coefficients. The results consistently show that ATM and MU maintain a significant influence on the Z-score, while MB and NCB remain insignificant. To ensure

consistent estimation, bank-specific control variables were added, including total financing, LLP, revenue diversification, and bank size (total assets). The results indicate that FINC (Financing), as a liquidity measure, and LLP (Loan Loss Provision) have a significant influence on the Z-score. Conversely, REV (Revenue Diversification) and BANK\_SIZE do not yield a significant impact.

Bank characteristics such as total financing and LLP significantly affect the Z-score. An increase in well-managed financing volume as demonstrated by the consistent trends at Bank BCA Syariah (BCAS), Bank Syariah Indonesia (BSI), and Bank BJB Syariah (BJBS) has proven to strengthen financial performance annually. To maintain growth quality, these banks maintain a relatively high level of LLP to anticipate potential losses from non-performing financing. Prudent financing management in Sharia banks increases margin income (profit sharing) (Ichsan et al., 2025). This increased income contributes to retained earnings, which fortifies the capital structure, mathematically raising the Z-score and

distancing the bank from insolvency risks. Within the framework of sustainable economic growth, Sharia banks are urged to leverage digital transformation not only for expansion but also to strengthen credit scoring systems to mitigate the risk of high LLP formation, ensuring stability amidst macroeconomic dynamics. This aligns with Saadaoui & Chouchene (2025), who state that stronger digital implementation bolsters business strategy and firm value. Moreover, referring to Ahamed & Mallick (2019), digitalization enhances a bank's reputation and attracts more customers, ultimately improving performance, competitiveness, and long-term growth.

**Table 7**  
**Robustness Check**

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	116.4655	89.16516	1.306177	0.1915
ATM	0.001052	0.000203***	5.177757	0.0000
MB	0.078186	0.109405	0.714648	0.4748
MU	-1.89E-06	1.12E-06*	-1.686810	0.0916
NCB	0.081769	0.049853	1.640204	0.1010
FINC	-3.350929	1.442573***	-2.322883	0.0202
LLP	-3.263852	1.330457***	-2.453181	0.0142
REV	0.570273	2.088611	0.273040	0.7848
BANK_SIZE	-1.372554	3.523188	-0.389577	0.6968

Source: Author's own calculation. Standard error in parentheses. \*, \*\*, and \*\*\* denote significant at 10%, 5%, and 1%.  
Notes: ATM= Number of ATM, MB= Number of Mobile Branche, MU= Mobile Use, NCB= Number of Commercial Branches.

**2. Interaction Model**

Furthermore, we estimate an additional model by incorporating interaction variables between Digital Transformation and GDP. These interactions are categorized into four types based on the digital transformation metrics used: ATM\*GDP, MB\*GDP, MU\*GDP, and NCB\*GDP, with the results detailed in Table 8. GDP serves as an interaction variable to evaluate how Indonesia's economic conditions strengthen or weaken the relationship between

digital transformation and the stability of the Islamic banking system. The synergy between these factors is also considered a driver of significant inclusive sustainable growth. The findings indicate that GDP functions not only as an interaction variable but also exerts a direct and significant influence on the Z-score. Specifically, the interaction effects of ATM\*GDP and NCB\*GDP are significant, whereas MU\*GDP and MB\*GDP do not yield a significant impact on the Z-score.

**Table 8**  
**Interaction Model**

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-35.24709	10.99281	-3.206378	0.0013
ATM	-0.000581	0.000116***	-5.015649	0.0000
MB	-0.053047	0.037344	-1.420523	0.1555
MU	3.87E-07	1.26E-07***	3.067449	0.0022
NCB	-0.002808	0.003570	-0.786442	0.4316
GDP	1.719319	0.610338***	2.816995	0.0048
ATM_GDP	0.195570	0.040192***	4.865863	0.0000
MU_GDP	-0.000179	0.002743	-0.065108	0.9481
MB_GDP	0.001902	0.033469	0.056832	0.9547
NCB_GDP	-0.156505	0.047385***	-3.302873	0.0010

Source: Author's own calculation. Standard error in parentheses. \*, \*\*, and \*\*\* denote significant at 10%, 5%, and 1%.

Notes: ATM= Number of ATM, MB= Number of Mobile Branche, MU= Mobile Use, NCB= Number of Commercial Branches.

Macroeconomic conditions, measured through GDP growth, represent a direct determinant of Islamic banking resilience in Indonesia. The adoption of digitalization within the financial system fosters not only financial inclusion but also inclusive economic growth. GDP is regarded as a primary developmental index; thus, the implementation of digitalization in the Sharia banking sector contributes to GDP growth, which aids in poverty reduction and leads to inclusive economic growth in alignment with the SDGs (Banna & Alam, 2021). Consistent with research by Banna et al. (2022), Gross Domestic Product (GDP) is a fundamental benchmark for assessing economic sustainability, where an increase in GDP reflects broad economic development success. Given that both GDP and financial digitalization play crucial roles in driving growth, their integration is expected to accelerate the creation of an inclusive economy and tangibly enhance sustainable development outcomes.

Regarding the interaction results, the insignificant role of GDP in moderating the relationship between Mobile Branches (MB) and Mobile Use (MU) on Sharia bank stability suggests that Islamic banks in Indonesia

possess a relatively independent resilience. This implies that the contribution of digital services to bank stability remains consistent regardless of whether economic growth is high or low. This underscores that digital transformation in Islamic banks functions more as an internal risk mitigation instrument and a direct tool for enhancing customer service. This is in line with Ozili & Iorember (2024), who explain that despite fluctuations in a country's economic cycle, financial stability continues to influence sustainable economic development. Furthermore, research by Azizah (2023) emphasizes that the primary contribution to sustainable economic growth is achieved when the integration of digital technology in financial transactions is supported by legal certainty regarding the protection of customers' digital assets.

## CONCLUSION AND RECOMMENDATION

This study examines the role of digital transformation in the financial stability of Islamic banking in Indonesia, incorporating sustainable economic growth proxied by Gross Domestic Product (GDP) as an interaction variable. Utilizing panel data from five Islamic banks over the 2020–

2024 period and employing the Z-score as an indicator of banking stability, the empirical results demonstrate that digital transformation is a critical factor in strengthening the resilience of the Islamic banking system.

Specifically, the findings indicate that digital transformation oriented toward non-cash financial services, such as the increased number of ATMs and the adoption of mobile banking, has a significant impact on Islamic banking stability. In the Indonesian context, these results suggest that digitalization enhances operational efficiency, reduces transaction costs, and fortifies risk management mechanisms. Consequently, these impacts improve the ability of Islamic banks to withstand financial stress and mitigate insolvency risks. Conversely, digitalization indicators still reliant on physical expansion, such as mobile branches and the total number of physical branch offices, show limited influence on stability, signaling a shift toward more technology-based banking service models. Robustness tests reinforce the consistency of these primary findings. Furthermore, bank-specific characteristics, particularly total financing and Loan Loss Provisions (LLP), proved to play a significant role in influencing stability. This underscores that successful digital transformation is inseparable from prudent risk management practices, especially regarding

financing management and the establishment of adequate loss reserves.

Moreover, interaction analysis reveals that economic growth plays a vital moderating role in the relationship between digital transformation and Islamic banking stability. GDP not only directly affects banking stability but also amplifies the impact of specific digitalization aspects—notably the interaction between ATMs and GDP on the Z-score. This suggests that the effectiveness of digital transformation in bolstering financial stability is highly contingent upon stable and sustainable macroeconomic conditions.

Nevertheless, these findings should be interpreted considering the limitations of the sample size and the relatively short observation period. Nonetheless, this study provides a significant contribution to the Islamic finance literature by demonstrating that digital transformation serves as a strategic instrument for enhancing stability, particularly when supported by inclusive economic growth. From a policy perspective, the results emphasize the importance of synergy between digital infrastructure development, strengthened risk governance, and supportive macroeconomic policies to ensure the sustainability and stability of the Sharia financial system.

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