International Journal of Social Science Research (IJSSR)
Volume- 3, Issue- 4 | July - August 2026 ISSN: 3048-9490

An Assessment of the Role of Financial Risk Management in Reducing Investment Risks: Evidence from Afghan Commercial Banks

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Abstract

This study investigates whether financial risk management reduces the investment risk of commercial banks in Afghanistan over the period 2015–2024. Bank financial stability, measured by the Z-Score as a proxy for the distance to insolvency, serves as the dependent variable, while liquidity risk management, proxied by the loan-to-deposit ratio (LDR), and capital risk management, proxied by the equity ratio (ER), serve as the explanatory variables. A balanced panel of forty bank-year observations was constructed from the audited annual financial statements of four Afghan commercial banks. Fixed-effects and random-effects estimators were compared through the Hausman test, and robustness was verified with AR (1) and first-differenced specifications alongside cluster-robust standard errors. The results show a positive and statistically significant association between the equity ratio and the Z-Score, while the loan-to-deposit ratio shows no statistically significant influence on stability in any correctly specified model. To the author's knowledge, this is the first study to combine the Z-Score framework with both liquidity- and capital-based indicators for Afghan banks, and it offers practical guidance to bank managers, the regulator, and policymakers seeking to strengthen stability in a fragile economy.

Keywords: financial risk management, bank stability, z-score, loan-to-deposit ratio, equity ratio, afghan commercial banks

Introduction

Commercial banks stand at the centre of every economy. By gathering deposits and directing them into loans and investments, they connect savers with borrowers and sustain growth and the efficient allocation of capital (Mishkin, 2018). Since banks finance relatively illiquid, long-term assets with short-term liabilities, this maturity transformation leaves them structurally exposed to liquidity shocks and runs (Diamond & Dybvig, 1983). Operating with high leverage and thin equity cushions, they face credit, liquidity, capital, market, and operational risks (Saunders & Cornett, 2018), and financial risk management denotes the framework of policies

*Corresponding Author Email: ikramuddin.noorzada2020@gmail.com
Published: 24 July 2026
DOI: https://doi.org/10.70558/IJSSR.2026.v3.i4.301224
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and controls through which these exposures are identified, measured, monitored, and mitigated (Basel Committee on Banking Supervision, 2008). Sound risk management protects depositors, preserves capital, and ultimately reduces the investment risk borne by shareholders; two dimensions are especially central, namely liquidity risk management, concerning the ability to meet obligations as they fall due, and capital risk management, concerning the adequacy of the equity buffer available to absorb unexpected losses (Koch & MacDonald, 2014).

These concerns are magnified in developing and fragile economies, where banking systems are young, markets are thin, supervision is still maturing, and macroeconomic and political shocks are frequent (Demirgüç-Kunt & Detragiache, 1998). Afghanistan offers a particularly instructive setting. Its modern banking system was rebuilt from a very low base in the early 2000s and has since endured recurring political instability and macroeconomic uncertainty, including the September 2010 collapse of Kabul Bank, in which the official public inquiry documented fraudulent lending and embezzlement of roughly $935 million (MEC, 2012), and the severe liquidity and confidence shock that followed the political transition of August 2021, when the country lost access to the international banking system and its offshore reserves were frozen (World Bank, 2024); in the months that followed, total deposits fell by about 40 percent and non-performing loans nearly doubled to around 57 percent (UNDP, 2021).

Against this background, the study examines empirically how the principal instruments of financial risk management relate to the stability of Afghan commercial banks and, by extension, to the investment risk faced by their stakeholders. Stability is measured by the Z-Score, a widely used proxy for the distance to insolvency grounded in the safety-first framework of Roy (1952), which indicates how many standard deviations a bank's return on assets could fall below its mean before equity is exhausted (Laeven & Levine, 2009). Although the theoretical importance of risk management is widely accepted, empirical evidence on which indicators matter most is mixed and context-dependent (Chai et al., 2022; Atari et al., 2026), and quantitative evidence on Afghanistan is especially scarce, leaving managers, regulators, and policymakers with little locally grounded guidance.

The study therefore provides systematic panel-data evidence on the relationship between financial risk management and the stability of Afghan commercial banks during 2015–2024, using the loan-to-deposit ratio and the equity ratio as indicators of liquidity and capital risk management. The analysis is confined to four banks selected for continuous data availability, yielding forty bank-year observations.

Objectives of the Study

General Objective

To assess the role of financial risk management in reducing the investment risk of Afghan commercial banks, measured through their financial stability, over the period 2015–2024.

Specific Objectives

- To examine the effect of liquidity risk management, proxied by the loan-to-deposit ratio (LDR), on the financial stability (Z-Score) of Afghan commercial banks.

- To examine the effect of capital risk management, proxied by the equity ratio (ER), on the financial stability (Z-Score) of Afghan commercial banks.

Research Questions

In line with the objectives stated above, the study seeks to answer the following questions:

- Does liquidity risk management, proxied by the loan-to-deposit ratio (LDR), have a statistically significant effect on the financial stability (Z-Score) of Afghan commercial banks?
- Does capital risk management, proxied by the equity ratio (ER), have a statistically significant effect on the financial stability (Z-Score) of Afghan commercial banks?

Significance of the Study

This study is expected to be beneficial theoretically and practically. It adds theoretically to the meagre empirical literature on determinants of bank stability in fragile and developing economies by providing panel-data evidence from the Afghan banking sector, an environment that has been given very little quantitative attention. In separating liquidity risk management and capital risk management, and assessing the different effects on stability, the study helps to shed light on which dimensions of risk management matter most in such contexts. The results are of practical relevance for several groups of stakeholders. The study provides bank managers evidence on the most effective risk-management levers for strengthening stability and reducing investment risk that can be used for capital planning and liquidity policy. For the sector regulator and supervisor, Da Afghanistan Bank, the findings provide locally grounded evidence to support prudential policy, in particular capital adequacy requirements. The study provides a better understanding of the determinants of resilience of Afghan commercial banks for policymakers, depositors, and investors. Lastly, the study serves as a methodological reference and a foundation for future research on bank risk and stability in Afghanistan and similar economies.

Literature Review

Financial Risk Management and Bank Stability

Financial risk management arose largely in response to growing uncertainty in financial markets, and its aim is not to eliminate risk but to identify, measure, monitor, and control it in a disciplined way; liquidity and leverage risks are often harder to evaluate than market or credit risk, a weakness exposed by the 2007–2009 global financial crisis (Malz, 2011). In banking, commercial institutions must manage liquidity, meet capital adequacy requirements, and satisfy reserve obligations to remain stable, with prudential regulation restraining excessive risk-taking (McLeay et al., 2014). Levine (1996) argues that effective risk management enables banks to contain losses, deploy resources efficiently, regulate liquidity, and preserve stability. Two components are central here: liquidity risk management, proxied by the loan-to-deposit ratio, where a higher ratio signals greater liquidity risk, and capital risk management, proxied by the equity ratio, where a higher ratio signals a stronger capacity to absorb shocks; stability itself is commonly captured by the Z-Score, which combines profitability, capitalisation, and

earnings volatility into a single index.

Theoretical Framework

The conceptual framework draws mainly on financial intermediation theory (Levine, 1996; Diamond, 1984; Allen & Santomero, 1997) and on risk–return and portfolio ideas (Markowitz, 1952; Sharpe, 1964), linking the loan-to-deposit ratio and the equity ratio to bank stability measured by the Z-Score. A higher LDR implies greater liquidity risk, while a higher ER implies a stronger capital buffer; the equity ratio is expected to relate positively to the Z-Score, and the loan-to-deposit ratio's association with stability is explored empirically within the Afghan context.

Empirical Review of Previous Studies

A substantial body of research links risk-management indicators to bank stability, and its findings fall into two broad groups. The first group reports weak or insignificant effects of liquidity-based indicators. Fatmawati et al. (2025), studying 438 commercial banks across six ASEAN countries during 2019–2023, found the LDR positive but statistically insignificant for the Z-Score. Mahmud (2023), examining twenty-three Bangladeshi banks over 2013–2022 with a Z-Score defined identically to the present study, found neither the credit-to-deposit ratio nor capital adequacy significant. Atari et al. (2026), covering fifteen Jordanian banks over 2018–2024 with the same two explanatory variables used here, found no significant direct LDR effect once credit risk and capital were controlled for, and Chai et al. (2022) reported that funding risk had no major effect on the stability of fifteen Pakistani banks during 2009–2020. Across these markets, therefore, loan-to-deposit-type indicators repeatedly carry little independent statistical weight once capital is accounted for.

The second group documents a robust positive relationship between capital strength and stability. Nguyen and Tran (2025) found for Vietnamese banks (2008–2022) that liquidity creation and capital growth both raised stability; Durguti et al. (2025) reported significant positive capital-adequacy effects for South-Eastern European banks; Islam (2025) confirmed a positive capital–stability link for foreign banks in India; Abrar et al. (2018) associated higher equity-to-assets ratios with greater stability in Pakistan; Mahmoudinia (2024) found capital adequacy significantly positive, and liquidity risk negative, for Iranian banks; and Alouane and Haddou (2026) observed that Tunisian banks with moderate loan-to-deposit ratios were more resilient. Afghan-specific evidence remains thin: Haidary and Abbey (2018) found capital adequacy, asset quality, and management efficiency significant for the profitability of fifteen Afghan banks; Jamal et al. (2023) found liquidity and credit risk negatively affecting the performance of six Afghan banks; and Asif (2022) linked bank size and capital adequacy positively to liquidity-risk management in Nangarhar. The pattern documented in the present study, a strong capital association together with an insignificant loan-to-deposit effect, is thus corroborated across very different banking systems, which lends the findings external validity.

Research Hypothesis

Based on the objectives of the study and the reviewed literature, the following hypotheses are formulated for empirical testing at the 5 percent significance level.

H_1: The loan-to-deposit ratio has a statistically significant effect on the financial stability (Z-Score) of Afghan commercial banks.

H_2: The equity ratio has a statistically significant effect on the financial stability (Z-Score) of Afghan commercial banks.

Research Gap

The literature confirms the importance of financial risk management for stability but leaves clear gaps. Evidence on the liquidity–stability relationship is mixed, most studies come from relatively developed or more stable systems, and existing Afghan research has concentrated on profitability (Haidary & Abbey, 2018; Jamal et al., 2023) or a single liquidity indicator (Asif, 2022) rather than insolvency-based stability, with no published work testing the loan-to-deposit ratio and the equity ratio jointly against the Z-Score. Given Afghanistan's repeated episodes of acute distress, from the Kabul Bank collapse to the 2021 liquidity shock, this absence is striking; the present study closes the gap directly for 2015–2024.

Methodology

Research Design

The study adopts a quantitative, explanatory, longitudinal panel design, using numerical secondary data and econometric techniques to test hypotheses about the effect of the explanatory variables on stability while exploiting both cross-sectional and time-series variation and controlling for unobserved, time-invariant differences across banks. The population comprises commercial banks operating in Afghanistan during 2015–2024 under the supervision of Da Afghanistan Bank. The decade deliberately spans the August 2021 political transition; it is treated as a single balanced panel rather than modelling 2021 as a structural break, since the small cross-section does not permit reliable sub-period estimation. Four banks (Afghanistan International Bank, Afghan United Bank, Islamic Bank of Afghanistan, and Ghazanfar Bank) were selected by purposive sampling on the criterion of continuous availability of complete audited data, yielding a balanced panel of forty bank-year observations; the limitations of this small cross-section are addressed explicitly in the discussion.

Data Collection and Measurement of Variables

The analysis rests exclusively on secondary data drawn from audited financial statements, annual reports, and the supervisory publications of Da Afghanistan Bank, from which total assets, total equity, total loans, total deposits, and net income were obtained. The use of audited financial statements increases the reliability of the data, although, as acknowledged in the limitations, the reliability of any secondary data ultimately depends on the quality of the underlying reporting. The dependent variable, financial stability, is measured by the Z-Score, computed as $Z = (ROA + Equity/Total\ Assets) / \sigma(ROA)$, where $\sigma(ROA)$ is the standard deviation of return on assets over the study period for each bank; the score rises with profitability and capitalisation and falls with earnings volatility. Because the equity-to-assets ratio enters the numerator of the Z-Score by construction, and $\sigma(ROA)$ is fixed within a bank, the Z-Score is a fixed linear rescaling of the sum of ROA and the equity ratio, so the ER–Z

relationship is largely mechanical rather than purely behavioural; this overlap is acknowledged as a key limitation, and the robustness checks address only whether the relationship is spurious in the time-series sense. Liquidity risk management is measured by the loan-to-deposit ratio, total loans divided by total deposits, where a higher value means more deposits have been lent out and liquidity risk is greater, so its expected effect on stability is generally negative although the literature is mixed; capital risk management is measured by the equity ratio, total equity divided by total assets, whose expected effect is positive (Laeven & Levine, 2009). Table 1 summarises the variables.

Table 1. Definition and Measurement of Variables

Variable	Type	Measurement	Expected Sign
Z-Score (Z)	Dependent	(ROA + Equity/Total Assets) / σ(ROA)	n/a
Loan-to-Deposit Ratio (LDR)	Independent	Total Loans / Total Deposits	Negative (−)
Equity Ratio (ER)	Independent	Total Equity / Total Assets	Positive (+)

Note. ROA = return on assets (net income / total assets); σ(ROA) = standard deviation of ROA.

Model Specification

To test the hypotheses, a panel regression is specified in which the Z-Score is a function of the two risk-management indicators (Gujarati, 2004):

$$Z(it) = \beta_0 + \beta_1 LDR(it) + \beta_2 ER(it) + \varepsilon(it) \qquad (Equation\ 1)$$

where Z(it) is the Z-Score of bank i in year t; β_0 is the constant; β_1 and β_2 are the coefficients of the loan-to-deposit ratio and the equity ratio, respectively; and ε(it) is the error term, with i = 1, …, 4 and t = 2015, …, 2024. Each hypothesis stated above is evaluated by examining the statistical significance of its estimated coefficient, being supported if the coefficient is significant at the 5 percent level.

Data Analysis Techniques

The analysis was carried out in EViews in a fixed sequence: descriptive statistics with the Jarque-Bera test, pairwise correlation as an initial multicollinearity check, with values above 0.80 between regressors treated as problematic (Gujarati, 2004), and panel unit-root tests (Levin-Lin-Chu, Im-Pesaran-Shin, ADF-Fisher, and PP-Fisher) in level and first-difference form. Pooled OLS, Fixed Effects, and Random Effects estimators were compared using the Redundant Fixed Effects test, the Breusch-Pagan Lagrange Multiplier test, and the Hausman test. Diagnostics covered panel heteroskedasticity likelihood-ratio tests, the Durbin-Watson statistic, the Jarque-Bera test for residual normality, and the Breusch-Pagan LM, Pesaran scaled LM, and Pesaran CD tests for cross-section dependence (Brooks, 2008). The final model was

estimated with robust (White period, cross-section cluster) standard errors and re-estimated under an AR(1) specification and entirely in first differences to confirm that the results were not driven by the construction of the Z-Score, regressor persistence, or serial correlation.

Results and Findings

Descriptive Statistics

Descriptive statistics were used to summarise the key study variables, and the results are reported in Table 2.

Table 2. Descriptive Statistics of Study Variables (2015–2024, N = 40)

Statistic	Z-Score (Z)	LDR	ER
Mean	8.4152	0.2181	0.1053
Median	7.6015	0.1988	0.1018
Maximum	14.2690	0.4601	0.1805
Minimum	2.4730	0.0125	0.0481
Std. Deviation	3.2518	0.1575	0.0413
Skewness	0.2151	0.1590	0.1968
Kurtosis	1.9155	1.4142	1.6544
Jarque-Bera (p)	2.2687 (0.3216)	4.3600 (0.1130)	3.2757 (0.1944)

Note. Based on the author's computation using EViews and panel data from Afghan commercial banks (2015–2024).

Interpretation: The mean Z-Score of about 8.42 (range 2.47–14.27, SD 3.25) points to relatively satisfactory stability. The LDR averaged 0.218, meaning loans amounted to roughly 21.8 percent of deposits, consistent with a conservative lending stance, and the equity ratio averaged 0.105, indicating sound capitalisation; the Jarque-Bera probabilities of all three variables do not reject normality, so the series are suitable for further econometric analysis (Brooks, 2008). In the correlation matrix reported in Table 3, the Z-Score correlates weakly and positively with the LDR ($r = 0.18$) and strongly and positively with the ER ($r = 0.76$); the LDR–ER correlation of 0.57 lies comfortably below the 0.80 multicollinearity threshold (Gujarati, 2004).

Table 3. Correlation Matrix of Z-Score, LDR, and ER

Variable	1	2	3
1. Z-Score (Z)	1.00		

2. LDR	0.1818	1.00	
3. ER	0.7636	0.5708	1.00

Note. Based on the author's computation using EViews and panel data from Afghan commercial banks (2015–2024).

Stationarity, Diagnostics, and Model Selection

Panel unit-root evidence is mixed, as expected with only four cross-sections. The Levin-Lin-Chu test finds the Z-Score stationary at level ($p = 0.0109$) while the Im-Pesaran-Shin, ADF-Fisher, and PP-Fisher tests do not, and the level forms of LDR and ER appear non-stationary while at least one test finds their first differences stationary. Since a literal unit root in bounded financial ratios is theoretically implausible, the mixed results are read as strong persistence; the main model is estimated in levels and re-estimated fully in first differences in the robustness check below as a safeguard against spurious regression. Diagnostic testing found no cross-sectional heteroskedasticity (LR $p = 0.4221$) but significant heteroskedasticity over time ($p = 0.0220$), so the final model relies on robust standard errors; the Durbin-Watson statistic of 1.3354 indicates positive first-order autocorrelation, and adding an AR(1) term raises it to 2.186 without altering the conclusions. Residual normality is not rejected (Jarque-Bera 1.0477, $p = 0.5922$), although standardised residuals from −4.76 to +5.70 flag one or two influential observations, and the Breusch-Pagan LM, Pesaran scaled LM, and Pesaran CD tests ($p = 0.0828$, 0.1345, and 0.4323) detect no cross-section dependence. On model selection, the Redundant Fixed Effects test rejects Pooled OLS ($F = 20.676$, $p = 0.0000$), the Breusch-Pagan LM test likewise rejects pooling in favour of Random Effects (43.888, $p = 0.0000$), and the Hausman test fails to reject the consistency of Random Effects ($\chi^2 = 1.047$, $p = 0.5925$); given its limited power with four cross-sections, this last result is treated as suggestive, supported by the consistency of estimates across the FE, RE, AR(1), and first-differenced specifications.

Regression Results

Regression analysis was conducted to determine the effect of the risk-management indicators on stability; the final Random Effects results with robust standard errors are reported in Table 4.

Table 4. Random Effects Regression Results (Robust SE) for the Dependent Variable Z-Score

Predictor	Coefficient	Std. Error	t	p-value
LDR	−0.865629	3.040807	−0.2847	0.7944
ER	78.60639	7.070486	11.1175	0.0016
Constant (C)	0.325997	0.695166	0.4689	0.6711

Note. R-squared = 0.8136; Adj. R-squared = 0.8035; F-statistic = 80.756 (p = 0.0000); Durbin-Watson = 1.3354; Observations = 40.

Interpretation: Explanatory power is strong, with an R-squared of about 0.81 and a significant F-statistic (80.76, p = 0.0000). The equity ratio is positively and significantly associated with the Z-Score at the 1 percent level (β = 78.61, p = 0.0016), while the loan-to-deposit ratio is negative but insignificant (β = −0.87, p = 0.7944). The LDR is insignificant in every correctly specified model: Fixed Effects (p = 0.928), Random Effects (p = 0.737), robust Random Effects (p = 0.794), first differences (p = 0.695), and AR(1) (p = 0.875). The fitted model is Z(it) = 0.3260 − 0.8656 LDR(it) + 78.6064 ER(it) + ε(it), and the null liquidity result is broadly consistent with Fatmawati et al. (2025), plausibly reflecting the conservative lending practices of Afghan banks.

Robustness Check Using First-Differenced Estimation

Because both regressors are highly persistent, the model was re-estimated entirely in first differences; a relationship that survives differencing cannot be a spurious levels artefact. The results are reported in Table 5.

Table 5. First-Differenced Regression Results for the Dependent Variable D(Z-Score)

Predictor	Coefficient	Std. Error	t	p-value
D(LDR)	1.159383	2.934381	0.3951	0.6953
D(ER)	77.760750	10.972430	7.0869	0.0000
Constant (C)	0.184195	0.230423	0.7994	0.4298

Note. R-squared = 0.7000; Adj. R-squared = 0.6818; F-statistic = 38.499 (p = 0.0000); Durbin-Watson = 2.3199; Observations = 36.

Interpretation: On 36 observations, the first-differenced model yields an R-squared of 0.70 and a significant F-statistic (38.50, p = 0.0000); the equity ratio remains positive and highly significant (β = 77.76, p = 0.0000), nearly identical to its level estimate, the loan-to-deposit ratio remains insignificant (p = 0.6953), and serial correlation is absent (Durbin-Watson = 2.32). The check confirms that the levels regression is not spurious, and its principal value is to reinforce confidence in the LDR result. In summary of hypothesis testing, H_1 is not supported (−0.8656, p = 0.7944), while H_2 is supported at the 1 percent level (78.6064, p = 0.0016).

Discussion

A finding repeated throughout the bank-stability literature is that capital adequacy predicts the Z-Score strongly and significantly, and this study's central contribution is to show why that finding deserves closer scrutiny and how to test it properly. Because the equity ratio enters the Z-Score by algebraic construction, its coefficient of 78.61 sits almost exactly at the cross-bank average of 1/σ(ROA), the value a purely definitional relationship would generate, a reading reinforced rather than undermined by the near-identical coefficient of 77.76 after first-differencing. Few Z-Score studies frame this distinction explicitly, raising the possibility that a meaningful share of the reported "capital effect" in the wider literature is mechanical rather than behavioural. Once that definitional component is set aside, the loan-to-deposit ratio stands

as the study's genuine test of a risk-management lever, and its insignificance holds across five separate specifications, a consistency reflecting the conservative, low-volume lending culture of Afghan banks rather than a fragile model.

The capital-strength evidence nevertheless aligns with a wide range of earlier work: capital growth raised stability among Vietnamese banks (Nguyen & Tran, 2025), comparable positive effects were reported for Iranian and South-Eastern European banks (Mahmoudinia, 2024; Durguti et al., 2025), and higher equity-to-assets ratios were linked to greater stability in Pakistan and Jordan (Abrar et al., 2018; Atari et al., 2026), although none of these studies isolates the mechanical component of the ER–Z relationship, which is precisely the point the present study makes explicit. The insignificant LDR result likewise matches recent work pairing similar liquidity indicators with the Z-Score: Mahmud (2023) found no significant role for the credit-to-deposit ratio in Bangladesh, and Atari et al. (2026) found none for Jordan once credit risk and capital were controlled for. That the same null result recurs across such different systems suggests that loan-to-deposit ratios at conventional, moderate levels carry too little independent signal to move an insolvency-based measure, particularly where lending is conservative relative to deposits, as in Afghanistan with a mean LDR of 21.8 percent. This does not mean liquidity management is unimportant (it remains a precondition for day-to-day solvency), only that its variation here was not large enough to register as a statistically distinguishable driver of the Z-Score.

Conclusion and Recommendations

This study analysed the role of financial risk management in reducing investment risks in Afghan commercial banks over 2015–2024. Descriptive results showed a moderate average Z-Score of about 8.42, conservative lending (average LDR near 21.8 percent), and reasonable capitalisation (average ER near 10.5 percent); model-selection tests supported the Random Effects estimator, which explained roughly 81 percent of the variation in stability. Two conclusions follow. First, on capital adequacy, the equity ratio is positively and significantly associated with the Z-Score, confirming within the Afghan sample the well-documented principle that a stronger capital buffer supports greater measured stability. Second, the loan-to-deposit ratio had no robust or significant influence on stability in any properly specified model, consistent with the sector's conservative lending behaviour.

On this basis, Afghan commercial banks should give priority to building and maintaining strong equity buffers; Da Afghanistan Bank should continue to enforce, and where appropriate strengthen, minimum capital-adequacy requirements in line with Basel standards; bank management should integrate capital planning within broader risk-management frameworks and stress capital adequacy against the shocks characteristic of the Afghan environment; banks should keep managing liquidity prudently even though the LDR effect was insignificant; and policymakers should promote measures that restore confidence in the banking system and support capital rebuilding. Several limitations remain: the panel of four banks limits the power of the diagnostics, so significance levels are indicative rather than definitive; a few influential observations are present; the ER–Z relationship is largely mechanical and the first-differenced check removes only the spurious-regression concern; only two explanatory variables are modelled; and the sample spans the August 2021 structural change, which could not be

modelled separately. Future research should extend the sample to more banks and higher-frequency data, adopt a stability measure that does not embed the capital ratio, add further covariates within dynamic panel methods such as system GMM, examine the 2021 transition through a structural-break design, and pursue comparative studies in other fragile economies.

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