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Original Article

Determinants of Vietnamese Commercial Bank Stability: The Roles of Capitalization, Credit Risk, and Bank Size

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Abstract: *This paper examines how capitalization, credit risk and bank size are related to the stability of Vietnamese commercial banks. Using consolidated financial statements of 28 commercial banks over 2015–2024 (256 bank-year observations), we measure stability with the natural logarithm of a time-varying Z-score whose denominator is the standard deviation of quarterly return on assets over a rolling three-year window. Capitalization enters with a one-year lag to avoid the mechanical link between the equity ratio and the Z-score. F, Breusch–Pagan and Hausman tests favor a two-way fixed-effects model with bank-clustered standard errors. Credit risk is the one robust correlate of stability. A one-percentage-point rise in the non-performing loan ratio is associated with a Z-score about 19% lower. The estimate is significant at the 1% level and stays negative and significant with Driscoll–Kraay standard errors, with a risk-adjusted return measure, under nine treatments of outliers and of the quarterly data, and without the most distressed bank. In 2020–2021 the association is roughly halved. This pattern is consistent with loan-classification forbearance keeping problem loans out of the reported ratio, but its size depends on how outliers are treated. Once bank and year effects are controlled for, neither lagged capitalization nor bank size is significantly associated with stability. The results suggest that supervisors and bank managers should prioritize the early recognition and resolution of problem loans, and that reported asset quality during forbearance periods should be read with caution.*

Keywords: *Bank Size, Bank Stability, Capitalization, Non-Performing Loans, Vietnam, Z-Score.*

I. INTRODUCTION

Commercial banks dominate Vietnam's financial system. Equity and corporate bond markets remain shallow, so bank credit is the main source of external finance for firms and households, and domestic credit reached almost 130% of GDP in 2023 (International Monetary Fund [IMF], 2024). The banking sector has also grown fast. Total assets of the 29 commercial banks in our data rose from about VND 5,600 trillion in 2015 to about VND 19,500 trillion in 2024, a 3.5-fold increase in nine years. Growth on this scale raises an obvious question. Have Vietnamese banks become more resilient as they have grown, or simply larger?

The past decade has repeatedly tested that resilience. After the 2011–2012 credit boom, the government launched successive programs to restructure credit institutions and resolve bad debts (Decision 254/QĐ-TTg of 2012, Decision 1058/QĐ-TTg of 2017 and Decision 689/QĐ-TTg of 2022). Banks transferred a large stock of problem loans to the Vietnam Asset Management Company (VAMC), established in 2013, in exchange for special bonds, and Resolution 42/2017/QH14 created a pilot framework for bad-debt resolution, including the right to seize collateral, which remained in force until the end of 2023. In 2015, the State Bank of Vietnam (SBV) took over three insolvent banks at zero value and placed a fourth under special control. Not until 2024 and 2025 were these banks transferred to stronger banks. The COVID-19 pandemic added a layer of regulatory forbearance. Circular 01/2020/TT-NHNN allowed banks to restructure repayment schedules and keep the classification of affected loans unchanged, and Circulars 03/2021/TT-NHNN and 14/2021/TT-NHNN extended the scheme until June 2022. A similar scheme was reintroduced by Circular 02/2023/TT-NHNN and extended to the end of 2024 by Circular 06/2024/TT-NHNN. Then came 2022. Corporate bond issuance collapsed, the real estate market turned down, and in October depositors ran on Saigon Commercial Bank. These events exposed how closely banks, property developers and the bond market are tied together.

Reported asset quality may understate these pressures. In our sample, the median non-performing loan (NPL) ratio rose from 1.7% in 2021 to 2.3% in 2024, yet the IMF estimates that NPLs, including restructured loans and loans held by VAMC, reached 7.9% of total loans in March 2024, and it has urged the authorities to phase out forbearance and strengthen capital buffers (IMF, 2024). Decision 689/QĐ-TTg goes as far as setting explicit targets for these variables. By 2025 the NPL ratio, counting loans sold to VAMC and potential bad debts, is to fall below 3%, and the capital adequacy ratio is to reach 11–12%, after 10–11% in 2023. What actually drives bank stability is therefore not an academic question.

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The international literature offers a well-established framework for studying these questions. Bank stability is commonly measured by the Z-score, which combines profitability, capitalization and earnings volatility into the number of standard deviations by which returns must fall before equity is exhausted (Roy, 1952; Boyd & Graham, 1986; Laeven & Levine, 2009). Higher capital provides a larger buffer against losses, although it may also be associated with riskier asset choices. Credit risk erodes earnings and capital through forgone interest and provisioning (Berger & DeYoung, 1997). The effect of bank size is theoretically ambiguous. Larger banks can diversify and invest in risk management, but they may also expand into riskier activities or rely on implicit too-big-to-fail guarantees (Demirgüç-Kunt & Huizinga, 2010; Laeven et al., 2016). Empirical evidence on income diversification and loan growth is similarly mixed (Stiroh, 2004; Foos et al., 2010; Köhler, 2015).

A growing body of Vietnamese research applies this framework, but its findings are far from settled. On credit risk, the evidence is consistent. Higher NPL ratios lower the Z-score in dynamic panel estimates for 2010–2019 (Nguyen & Duong, 2021), in fixed- and random-effects models for 2012–2020, where the effect also depends on inflation (Le et al., 2022), and in a fixed-effects model for 2006–2024 (Vu, 2025). The evidence on capital and size is mixed. Nguyen and Dinh (2021) find that the capital adequacy ratio raises the Z-score and bank size lowers it over 2008–2017, and Nguyen and Duong (2021) also report a negative size effect. Nguyen et al. (2024) find the opposite for size over 2013–2022. Vu (2025) finds a positive equity-to-assets coefficient, but neither size nor the capital adequacy ratio is significant once robust standard errors are used. Huynh (2020) argues that the erosion of capital buffers, more than profitability, explains the decline in Vietnamese banks' Z-scores after 2008, and Le (2020) finds that rapid loan growth is associated with lower stability. The study closest to ours is Nguyen and Nguyen (2026), who estimate a fixed-effects model with bank-clustered standard errors for 27 banks over 2015–2024. Their question, though, is a different one. They ask whether income diversification moderates the effect of global economic policy uncertainty, and they do not focus on capital, credit risk or size.

Three issues remain open. The first is measurement. Because the equity-to-assets ratio is part of the Z-score, studies that include it among the regressors (e.g., Nguyen & Duong, 2021; Vu, 2025) partly estimate an accounting identity rather than an economic effect. Volatility raises a related problem. When the standard deviation of return on assets is computed over the full sample, it is constant within each bank and is absorbed by bank fixed effects, so the model no longer explains changes in earnings volatility (Lepetit & Strobel, 2013). A rolling window of annual data avoids this, but each window then rests on just three observations. The second is forbearance. Although forbearance directly changes how NPLs are measured, we are not aware of any study that tests whether the NPL–stability relationship changed while it was in force. Nguyen et al. (2024) find that stability was lower during COVID-19 but do not ask whether the effect of credit risk changed. The third is coverage. Most samples end before 2023, so the years of bond-market stress and renewed forbearance remain largely unstudied.

This paper addresses these issues by asking four questions. (1) How does capitalization affect the stability of Vietnamese commercial banks? (2) How does credit risk affect it? (3) Does bank size increase or reduce stability? (4) Did the relationship between credit risk and stability change during COVID-19? We use consolidated financial statements of 29 commercial banks from FiinProX for 2012–2024. Agribank does not publish quarterly statements, so the estimation sample covers 28 banks and 256 bank-year observations over 2015–2024. Stability is measured by the natural logarithm of a time-varying Z-score in which earnings volatility is the standard deviation of annualized quarterly return on assets over the current and two preceding years (twelve quarters). Capitalization is lagged by one year. After F, Breusch–Pagan and Hausman tests, we estimate a two-way fixed-effects model with standard errors clustered by bank, and we check robustness with provisioning expenses in place of NPLs, a Z-score based on full-period volatility, a risk-adjusted return measure that excludes capital, Driscoll–Kraay (1998) standard errors, and eight alternative treatments of outliers and of the quarterly data.

The results point to credit risk as the main correlate of bank stability in Vietnam. A one-percentage-point increase in the NPL ratio is associated with a Z-score about 19% lower. The estimate is significant at the 1% level, and it keeps its sign and significance under every alternative treatment of outliers we try and without the most distressed bank in the sample. In 2020–2021, when the COVID-19 circulars allowed banks to keep restructured loans out of the NPL category, the association is roughly halved. That pattern fits a masking story. Its size, though, depends on how outliers are treated, so we read it as suggestive. By contrast, once bank and year effects are controlled for, neither lagged capitalization nor bank size is significantly associated with stability. The credit-risk result agrees with earlier Vietnamese evidence (Nguyen & Duong, 2021; Vu, 2025). The absence of capital and size effects suggests that the significant estimates reported in some earlier studies may reflect persistent differences between banks, or the mechanical link between capital and the Z-score, rather than changes within banks over time. One result supports this reading. When volatility is measured over the full period, lagged capitalization becomes strongly significant.

The paper makes three contributions. First, relative to the closest study (Nguyen & Nguyen, 2026), it re-examines capitalization, credit risk and size over 2015–2024, a period that covers the pandemic, two rounds of loan-classification forbearance and the 2022–2024 stress. Second, it shows that measurement choices matter. Computing earnings volatility from

twelve quarterly observations instead of three annual ones raises the within-bank explanatory power of the main model from 4% to 26%, and the credit-risk result then survives the exclusion of the most distressed bank. Lagging capitalization, in turn, removes the mechanical link between capital and the Z-score. Third, it shows that the NPL–stability relationship was weaker while forbearance was in force. This is consistent with reported NPL ratios understating credit risk during that period, and with the gap between reported NPLs and the IMF's broader estimate. The evidence is indirect and sensitive to the treatment of outliers. Even so, it matters for supervisors and for anyone who reads bank disclosures.

The remainder of the paper is organized as follows. Section II reviews the literature and develops the hypotheses. Section III describes the data, the variables and the empirical strategy. Section IV presents the results and robustness checks. Section V concludes with policy implications and limitations.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

A) Bank Stability and the Measurement of Insolvency Risk

Bank stability concerns the capacity of a bank to absorb losses without becoming insolvent. Profitability contributes to this capacity, but profitability alone is insufficient. A bank may generate substantial earnings while remaining vulnerable because its capital buffer is thin or its income is highly volatile. Stability therefore depends on the interaction between earnings, capitalization, and risk.

The accounting Z-score brings these dimensions together by relating profitability and equity relative to assets to the volatility of returns. A higher value indicates a greater distance from the accounting insolvency threshold. This interpretation requires care. Lepetit and Strobel (2015) show that the measure has a probabilistic foundation, since it places a bound on the probability of insolvency. A bound is not an estimate, though, and the Z-score should not be read as the probability that a bank actually fails. Nor does it directly capture liquidity shortages or the transmission of distress across institutions.

How the underlying profitability moments are estimated also matters. Lepetit and Strobel (2013) generally favor estimates based on the full observation period combined with current capitalization under a root mean squared error criterion. Bouvatier et al. (2023), comparing alternative measures for US and European banks around the 2007–2008 financial crisis, instead find advantages in exponentially weighted profitability moments. The two studies rely on different samples and evaluation criteria. They do not establish a universally optimal estimation window.

For Vietnamese banks, this distinction is particularly relevant when examining changes within institutions over time. A fixed estimate of earnings volatility and a rolling estimate need not represent the same dimension of vulnerability. The present study consequently uses quarterly profitability information to construct a rolling volatility measure and examines sensitivity to alternative stability proxies. Its interpretation remains focused on accounting insolvency risk at the individual bank level.

B) Capitalization and Bank Stability

Capital provides a buffer against unexpected losses. It can also influence behavior. When shareholders have more resources at stake, their incentives to undertake excessive risk may weaken, although the strength of this mechanism depends on governance, supervision, and the protection afforded to creditors.

Berger and DeYoung (1997) provide evidence consistent with this disciplinary role among thinly capitalized banks, where reductions in capital precede increases in problem loans. Their findings do not imply that the same relationship applies uniformly across all institutions. Similarly, Berger and Bouwman (2013) show that the benefits of capital vary with bank size and economic conditions. Higher capital supports the survival of small banks across different periods, whereas its benefits for medium and large banks are concentrated more strongly in banking crises. Capital matters, but its protective value is conditional.

Vietnamese evidence broadly supports a positive association between capitalization and stability. Nguyen and Duong (2021) report a positive relationship between the equity-to-assets ratio and the Z-score. Pham et al. (2021) obtain a positive capitalization coefficient in their system GMM specification. Using regulatory capital measures, Nguyen and Dinh (2021) and Nguyen and Ha (2026) also report positive relationships with stability. These results are complementary rather than interchangeable. Regulatory capital adequacy incorporates risk-weighted assets, whereas the equity-to-assets ratio measures accounting leverage.

An additional issue arises from the construction of the dependent variable. Because equity relative to assets enters the Z-score directly, a positive contemporaneous capital coefficient can partly reflect an accounting relationship rather than an independently identified protective effect. Using lagged capitalization reduces this immediate overlap, but persistent capital ratios mean that it does not eliminate endogeneity or establish causality. Subject to this qualification, the loss absorption mechanism motivates the following hypothesis.

H1. Lagged capitalization is positively associated with the financial stability of Vietnamese commercial banks.

C) Credit Risk and Bank Stability

Credit deterioration can weaken a bank through several connected channels. Problem loans reduce interest receipts, generate provisioning requirements, increase collection costs, and potentially erode capital. Their consequences may also extend beyond the period in which they are first reported. The central issue is therefore not simply whether loans become non-performing, but how credit losses affect the resources available to absorb subsequent shocks.

Berger and DeYoung (1997) show why loan quality cannot be separated entirely from operating performance. Problem loans can precede deterioration in cost efficiency because monitoring and recovery become more demanding. Conversely, weak management can precede poorer loan quality. These relationships suggest that observed credit risk may reflect both external borrower difficulties and internal weaknesses in bank management.

The Vietnamese literature provides relatively consistent evidence regarding reported non-performing loans. Nguyen and Duong (2021) find a negative association between the NPL ratio and bank stability in their GMM estimates. Le et al. (2022) also report negative NPL coefficients across their principal specifications, while Nguyen and Ha (2026) obtain a negative relationship in a dynamic GMM model of financial stability.

Nevertheless, credit risk indicators should not be treated as equivalent. The NPL ratio measures the reported stock of impaired lending, whereas provisions reflect accounting recognition, expected losses, and managerial judgment. Their empirical relationships with stability can therefore differ. In Nguyen and Duong (2021), for example, the NPL ratio is significant in the GMM estimates whereas the provisioning coefficient is not, and a negative provisioning effect appears only in some static specifications. Pham et al. (2021), using system GMM, report a negative association between loan loss provisions and stability. Such differences qualify the interpretation of particular proxies without overturning the underlying credit loss mechanism.

H2. The non-performing loan ratio is negatively associated with the financial stability of Vietnamese commercial banks.

D) Bank Size and Financial Stability

Larger banks may benefit from broader loan portfolios, more diversified funding, and greater resources for screening and monitoring borrowers. Scale can also spread the fixed costs of technology and risk management across a larger asset base. These advantages provide a plausible route from expansion to greater resilience.

Yet size alone does not guarantee safety.

Demsetz and Strahan (1997) show that the diversification advantages of large bank holding companies can be offset by lower capital ratios and riskier lending. Related international evidence from Laeven et al. (2016) associates larger size with greater systemic risk. Their measure concerns contributions to the vulnerability of the financial system, which differ from the accounting insolvency risk of an individual bank. Even so, both studies challenge the assumption that expansion necessarily produces safer institutions.

Vietnamese findings reflect this ambiguity. Nguyen and Duong (2021) and Nguyen and Dinh (2021) report negative size coefficients in their fixed effects estimates. In contrast, Pham et al. (2021), Nguyen et al. (2024), and Nguyen and Ha (2026) find positive relationships. Differences in sample periods, stability measures, and estimation methods may contribute to these conflicting results. A comparison between persistently large and small banks also need not yield the same conclusion as an examination of expansion within a particular bank.

The positive prediction adopted here rests on the proposition that diversification and the capacity to invest in risk management can outweigh the additional complexity associated with expansion. It is a hypothesis to be tested, not a consensus already established by the literature.

H3. Bank size is positively associated with the financial stability of Vietnamese commercial banks.

E) The Pandemic and the Interpretation of Reported Credit Risk

The pandemic introduced a further complication. Economic deterioration and its recognition in bank accounts need not occur simultaneously. Elnahass et al. (2021), examining banks across 116 countries, document deterioration in banking performance and stability during the initial COVID-19 outbreak. Their findings establish the relevance of the pandemic shock, but they do not directly identify how Vietnamese restructuring policies affected the relationship between reported NPLs and stability.

Vietnam's institutional response makes that relationship worth examining separately. Circular 01/2020/TT-NHNN allowed eligible debt restructuring, interest and fee relief, and retention of loan classifications for customers affected by the pandemic (State Bank of Vietnam, 2020). Circulars 03/2021/TT-NHNN and 14/2021/TT-NHNN later extended these arrangements until 30 June 2022 (State Bank of Vietnam, 2021a, 2021c). Consequently, borrower repayment difficulties did

not necessarily translate immediately into a corresponding deterioration in reported loan categories. This creates a potential distinction between underlying credit weakness and its accounting visibility.

Two opposing mechanisms follow. Greater borrower distress could amplify the negative relationship between credit risk and stability. Alternatively, temporary classification relief could mask that distress, making reported NPLs a less immediate indicator of it and weakening the observed relationship. The direction is not predetermined. A change in the estimated coefficient would also remain compatible with other developments, including shifts in loan composition, profitability, and the timing of loss recognition.

The comparison period requires similar caution. The extended arrangements still covered the first half of 2022. Circular 02/2023/TT-NHNN then provided restructuring and classification retention for eligible borrowers in difficulty, and Circular 06/2024/TT-NHNN extended it to the end of 2024 (State Bank of Vietnam, 2023, 2024a). Years outside the initial pandemic period therefore cannot be treated uniformly as years without such support.

Accordingly, the pandemic interaction in this study tests whether the association between reported NPLs and stability changed during 2020 and 2021. It does not, by itself, identify the causal effect of regulatory forbearance.

H4. The association between the non-performing loan ratio and bank stability differs during 2020 and 2021 relative to the other sample years.

F) Operating Efficiency, Loan Growth, and Income Diversification

Operating efficiency, loan growth, and income composition provide additional channels through which bank characteristics may be associated with stability. A higher cost-to-income ratio can indicate pressure on operating margins and a reduced capacity to retain earnings. Berger and DeYoung (1997) support considering operating performance alongside loan quality, although their estimated cost efficiency measure is not identical to the accounting ratio used here.

Loan growth presents a timing problem. Expansion may support current interest income while creating losses that emerge later. Foos et al. (2010) associate abnormal loan growth with higher loan loss provisions over the following three years, lower relative interest income, and lower capital ratios. This evidence cautions against assuming that contemporaneous growth and stability must move together.

Income diversification is similarly conditional. Additional revenue sources can reduce dependence on lending, but their contribution depends on their volatility and correlation with traditional income. Stiroh (2004) finds that greater reliance on non-interest income, particularly trading revenue, is associated with higher risk and lower risk-adjusted profits. A larger non-interest income share therefore does not necessarily represent a more resilient business model.

These variables are included as controls, without imposing a uniformly beneficial interpretation on either credit expansion or revenue diversification.

Table 1 summarizes the hypotheses and the expected sign of each variable.

Table 1: Hypotheses and Expected Signs

Variable	Measure	Hypothesis	Expected sign	Main references
CAP(t−1)	Equity to total assets, previous year	H1	+	Berger & DeYoung (1997); Berger & Bouwman (2013); Nguyen & Duong (2021); Pham et al. (2021); Nguyen & Ha (2026)
NPL	Non-performing loans (groups 3–5) to gross loans	H2	−	Berger & DeYoung (1997); Nguyen & Duong (2021); Le et al. (2022); Nguyen & Ha (2026)
SIZE	Natural logarithm of total assets	H3	+	Demsetz & Strahan (1997); Laeven et al. (2016); Pham et al. (2021); Nguyen et al. (2024); Nguyen & Ha (2026)
NPL × COVID	NPL interacted with a 2020–2021 dummy	H4	+/−	Elnahass et al. (2021); State Bank of Vietnam (2020, 2021a, 2021c)
CIR	Operating expenses to total operating income	Control	−	Berger & DeYoung (1997)
LG	Annual growth of gross customer loans	Control	+/−	Foos et al. (2010); Le (2020)
DIV	Non-interest income to total operating income	Control	+/−	Stiroh (2004); Köhler (2015); Nguyen & Nguyen (2026)

Note: Variable definitions and data sources are given in Section III.

G) Synthesis and Research Focus

The literature does not support a simple ranking in which more capital, fewer problem loans, and greater size always translate into greater stability through identical mechanisms. The evidence is more differentiated. Reported NPLs exhibit a comparatively consistent negative association with stability in the Vietnamese studies reviewed here. Capitalization is generally associated with greater resilience, but its interpretation is complicated by measurement and its direct inclusion in the Z-score. The role of size remains contested.

Existing Vietnamese studies have already examined these characteristics jointly. Their inclusion in a single model is therefore not, on its own, a sufficient contribution. The present study instead focuses on whether the relationships persist when stability reflects changing profitability volatility, when the analysis distinguishes variation within banks from persistent differences across banks, and when alternative stability measures are considered.

Using observations from 2015 to 2024, the study also examines whether the information conveyed by reported NPLs changed during the initial pandemic years. Its contribution is thus a qualified reassessment of established relationships in Vietnam, with particular attention to measurement and the institutional context of credit risk recognition.

III. DATA AND METHODOLOGY

A) Data and Sample

We collect annual and quarterly financial statements for 29 Vietnamese commercial banks from the FiinProX database. The banks range from the four state-controlled banks, which are the largest in the system, to large joint-stock banks and several smaller unlisted banks. We use consolidated statements throughout. This choice matters in Vietnam, where some banks own large consumer-finance subsidiaries whose loans and losses would be missing from the parent bank's separate accounts.

The annual data cover 2012 to 2024. The first three years are used only to build lagged and rolling variables, so the estimation period is 2015 to 2024. The sample does not include the banks the SBV took over or placed under special control in 2015, or Saigon Commercial Bank, which has not published audited statements since 2022. Their statements are either unavailable for much of the period or not comparable with those of banks operating normally.

Two further restrictions come from the quarterly data. Agribank does not publish quarterly statements, and several banks reported only semi-annually before 2017. Because our stability measure needs at least eight quarters of earnings (Section III-B), these bank-years drop out. The final sample is an unbalanced panel of **28 banks and 256 bank-year observations**. It contains 18 banks in 2015 and all 28 from 2020 onwards, and each bank appears for between six and ten years.

We compute the NPL ratio ourselves from the notes on loan classification, as loans in groups 3 to 5 divided by gross customer loans. The result matches the NPL ratio reported by FiinProX closely, with a correlation of 0.998. Six bank-years lack a usable classification note and are treated as missing. We winsorize the three dependent variables and the seven explanatory, control and alternative variables at the 1st and 99th percentiles. The bounds are computed over all 2015–2024 bank-years with data on each variable, and values beyond them are set equal to the bounds, so no observation is dropped. The dependent variables are winsorized as constructed. Their components, ROA, ETA and σ_{it}, are left unchanged. One bank deserves special mention. National Citizen Bank (NCB) is by far the most distressed bank in the sample. Its NPL ratio reached 29.8% in 2023, and its total operating income was negative in 2024. We keep it in the main sample, where winsorization limits its influence, and Section IV-D reports the results without it and under other treatments of outliers.

B) Measuring Bank Stability

The dependent variable is the natural logarithm of a time-varying Z-score:

$$LNZ_{it} = \ln[(ROA_{it} + ETA_{it}) / \sigma_{it}] \quad (1)$$

Where ROA_{it} is net profit after tax divided by average total assets in year t, and ETA_{it} is the ratio of equity to total assets at the end of year t. The volatility term σ_{it} is where our measure departs from most earlier work. We first compute an annualized return on assets for each quarter, equal to four times quarterly net profit divided by the average of total assets at the end of that quarter and the previous one. We then take the standard deviation of this quarterly return over the twelve quarters from the first quarter of year t−2 to the fourth quarter of year t, requiring at least eight valid quarters. FiinProX reports each quarter's own income statement rather than year-to-date totals, and we checked this against the annual accounts. For the 308 bank-years with four quarters of data, the four quarterly profits add up to annual profit within 1% in 76% of cases and within 5% in 90%. The remaining gaps reflect audit adjustments, since most fourth-quarter statements are unaudited. Of the 256 bank-years in the estimation sample, 235 use all twelve quarters.

Why quarterly data? A standard deviation computed from three annual observations is extremely noisy, and one computed over the whole sample is constant within each bank. In a model with bank fixed effects, the second option is simply

absorbed. The regression then explains only the numerator of the Z-score and says nothing about earnings volatility. Twelve quarterly observations give a volatility measure that changes from year to year and is estimated with far more precision.

Two alternative measures are used to test robustness. LNZ_F replaces σ_{it} with the standard deviation of annual return on assets over 2015 to 2024. It follows the full-sample convention found in much of the literature, so it shows how far our conclusions depend on the volatility measure. RAROA is risk-adjusted return on assets, ROA_{it} / σ_{it}. It excludes the capital ratio altogether. If capital affects stability only through the accounting identity in the Z-score, it should have no effect on RAROA.

C) Explanatory and Control Variables

Table 2 defines every variable. Three choices need explanation.

First, capitalization enters with a one-year lag. ETA_{it} already sits in the numerator of the Z-score, so including the same ratio on the right-hand side would partly regress the Z-score on itself. $CAP_{i,t-1}$ avoids this. It asks a behavioral question instead. Do banks that entered the year with more equity end it in a safer position?

Second, we measure capital with the simple equity-to-assets ratio rather than the regulatory capital adequacy ratio. The regulatory ratio changed definition during the sample, as banks moved from the rules of Circular 36/2014/TT-NHNN to the Basel II framework of Circular 41/2016/TT-NHNN at different dates, and many banks do not disclose it consistently. Equity to assets is available for every bank and year and is measured the same way throughout.

Third, the NPL ratio follows the SBV's five-group loan classification, under which groups 3 to 5 (substandard, doubtful and loss) are non-performing. The classification rules were set by Circular 02/2013/TT-NHNN until September 2021, by Circular 11/2021/TT-NHNN from October 2021 and by Circular 31/2024/TT-NHNN from July 2024. Two features of the Vietnamese setting mean that this ratio is, if anything, a lower bound on true credit risk. Between 2013 and 2018, many banks sold problem loans to VAMC in exchange for special bonds, which removed them from the reported ratio, and from 2020 the forbearance circulars discussed in Section II-E allowed restructured loans to keep their original classification. For this reason, we also use loan-loss provision expense relative to gross loans (LLP) as an alternative measure. Provision expense records the losses that banks recognize in their income statements, including the additional provisions that Circular 03/2021/TT-NHNN required against restructured loans. It is therefore less exposed to the retention of loan classifications under forbearance.

Table 2: Variable Definitions

Variable	Definition	Role
LNZ	ln[(ROA + ETA) / σ], with σ the standard deviation of annualized quarterly ROA over the 12 quarters of years t−2 to t	Dependent (main)
ROA	Net profit after tax / average total assets	Component of LNZ
ETA	Equity / total assets, end of year t	Component of LNZ
LNZ_F	As LNZ, but σ is the standard deviation of annual ROA over 2015 to 2024	Dependent (robustness)
RAROA	ROA / σ	Dependent (robustness)
CAP(t−1)	Equity / total assets, end of year t−1	Explanatory, H1
NPL	Loans in groups 3 to 5 / gross customer loans	Explanatory, H2
SIZE	Natural logarithm of total assets (VND million)	Explanatory, H3
COVID	1 for 2020 and 2021, 0 otherwise, used only in the interaction NPL × COVID	Explanatory, H4
CIR	Operating expenses / total operating income	Control
LG	Annual growth rate of gross customer loans	Control
DIV	(Total operating income − net interest income) / total operating income	Control
LLP	Loan-loss provision expense / gross customer loans	Alternative to NPL (robustness)

Note: *All data come from consolidated financial statements in FiinProX. Ratios are expressed as fractions, so a value of 0.02 for NPL means 2%. LNZ, LNZ_F, RAROA, CAP(t−1), NPL, SIZE, CIR, LG, DIV and LLP are winsorized at the 1st and 99th percentiles of their pooled 2015–2024 distribution. ROA, ETA and σ are not (Section III-A). DIV can be negative when a bank records a net loss on non-interest activities, which happens for a few bank-years.*

D) Empirical Model and Estimation Strategy

The baseline model is

$$LNZ_{it} = \beta_0 + \beta_1 CAP_{i,t-1} + \beta_2 NPL_{it} + \beta_3 SIZE_{it} + \beta_4 CIR_{it} + \beta_5 LG_{it} + \beta_6 DIV_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Where μ_i is a bank effect, and λ_t is a year effect. H1 to H3 concern the signs of β_1, β_2 and β_3. To test H4, we add the interaction $NPL_{it} \times COVID_t$:

$$LNZ_{it} = \beta_0 + \beta_1 CAP_{i,t-1} + \beta_2 NPL_{it} + \beta_7 (NPL_{it} \times COVID_t) + \beta_3 SIZE_{it} + \beta_4 CIR_{it} + \beta_5 LG_{it} + \beta_6 DIV_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

The NPL slope is β_2 in normal years and $\beta_2 + \beta_7$ in 2020 and 2021. The COVID dummy itself does not appear separately, because it is perfectly collinear with the year effects. For the same reason, we include no macroeconomic variables. GDP growth, inflation and the policy rate are common to all banks in a given year, so the year effects capture them, together with any other nationwide shock such as a change in regulation.

Because LNZ is in logarithms and NPL is a fraction, the coefficients have a direct reading. A one-percentage-point rise in the NPL ratio changes the Z-score by approximately $\exp(0.01\beta_2) - 1$.

We choose among three estimators in the usual way. Pooled OLS ignores bank heterogeneity, random effects (RE) treats it as uncorrelated with the regressors, and fixed effects (FE) allows any correlation. All three include year dummies. An F test of the joint significance of the bank effects compares FE with pooled OLS, and a Breusch–Pagan Lagrange multiplier test, adjusted for the unbalanced panel, compares RE with pooled OLS. The choice between FE and RE rests on the Hausman (1978) test. The classic version of this test assumes homoskedastic, serially uncorrelated errors, which is unlikely to hold for bank data. We therefore also run a robust version based on Mundlak (1978). We add the bank means of the regressors to the RE model and test, with cluster-robust standard errors, whether their coefficients are jointly zero.

Inference needs care. With 28 banks we have only 28 clusters, and Vietnamese banks are exposed to the same shocks, so their errors are likely to be correlated across banks within a year. Our main standard errors are clustered by bank with a small-sample correction. Because 28 clusters is a small number, their p-values come from a t distribution with $G - 1 = 27$ degrees of freedom rather than from the normal distribution (Cameron & Miller, 2015). As a check, we also report Driscoll and Kraay (1998) standard errors, which remain valid under both serial correlation and cross-sectional dependence. They are computed with a Bartlett kernel and a bandwidth of two.

The robustness analysis has five columns. Column 1 replaces NPL with LLP. Column 2 uses LNZ_F as the dependent variable. Column 3 uses RAROA. Column 4 estimates Equation (3) with Driscoll–Kraay standard errors. Column 5 re-estimates Equation (2) without NCB. Columns 1 to 4 use the same 256 bank-years as the baseline, so differences between them reflect the specification and not the sample. We then re-estimate Equations (2) and (3) under eight alternative treatments of outliers and of the quarterly data. Estimation is carried out in Python with the linearmodels package. A second implementation in R, written separately, gives the same estimates to the last reported digit. The replication package contains both versions. It extracts the data from the FiinProX statements, builds every variable and reproduces all tables, and is available from the authors on request. The FiinProX data themselves are licensed and cannot be redistributed.

IV. RESULTS AND DISCUSSION

A) Descriptive Statistics and Correlations

Table 3 reports descriptive statistics for the 256 bank-years used in estimation. The mean LNZ is 3.16, which corresponds to a Z-score of about 23. Put simply, the return on assets of a typical bank would have to fall some 23 standard deviations before its equity was gone. Banks differ widely around that figure. LNZ ranges from 1.89 to 4.31, so the least stable bank-year has a Z-score of about 7 and the most stable one a Z-score of about 74. The average bank earns a return on assets of 1.04% and funds 8.4% of its assets with equity. The mean NPL ratio is 2.09%, with a maximum of 9.08% after winsorization. The spread in size is enormous. After winsorization, total assets run from about VND 21 trillion to VND 2,242 trillion, a hundredfold gap.

The time pattern deserves a closer look. All 28 banks are in the sample from 2020, so averages from that year on are not distorted by changes in its composition. Average LNZ was highest in 2020 and 2021 and fell in 2022. In those two pandemic years, the average reported NPL ratio stayed below 2%, and the volatility of quarterly earnings was the lowest of the decade. It then climbed to about 2.5% in 2023 and 2024. This is the pattern one would expect if forbearance kept problem loans, and the losses attached to them, out of the accounts. Section IV-E examines this idea.

Table 4 reports pairwise correlations and variance inflation factors (VIFs). LNZ is most strongly correlated with the NPL ratio (−0.34), as H2 predicts. It is positively correlated with size (0.29) and negatively with lagged capitalization (−0.21). That negative correlation says little about the effect of capital. Better-capitalized banks in the sample tend to be smaller (−0.24) and to have more volatile earnings (0.44, not tabulated), and the raw correlation mixes all of these differences. Among the regressors, the strongest correlation is between size and the cost-to-income ratio (−0.63), since larger banks operate at lower cost relative to income. No VIF exceeds 2.1, far below the conventional threshold of 10, so multicollinearity is not a concern.

Table 3: Descriptive Statistics

Variable	Mean	SD	Min	Median	Max
LNZ	3.156	0.515	1.892	3.123	4.305
ROA	0.0104	0.0085	−0.0478	0.0084	0.0365
ETA	0.0844	0.0308	0.0406	0.0760	0.1911
σ(ROA)	0.0048	0.0043	0.0005	0.0040	0.0512
LNZ_F	3.101	0.665	1.107	3.039	4.783
RAROA	2.900	2.212	0.003	2.485	9.332
CAP(t−1)	0.0843	0.0305	0.0436	0.0760	0.1726
NPL	0.0209	0.0132	0.0058	0.0181	0.0908
SIZE	19.131	1.121	16.870	19.066	21.531
CIR	0.4787	0.1405	0.2361	0.4698	0.8752
LG	0.1794	0.0916	−0.0317	0.1688	0.4915
DIV	0.2130	0.0969	−0.0646	0.2125	0.4459
LLP	0.0117	0.0091	−0.0001	0.0095	0.0508

Note: *Estimation sample of 256 bank-years for 28 banks, 2015–2024. Ratios are fractions. σ(ROA) is the standard deviation of annualized quarterly ROA over the 12 quarters of years t−2 to t. LNZ, LNZ_F, RAROA and the regressors are winsorized at the 1st and 99th percentiles. ROA, ETA and σ(ROA) are shown before winsorization.*

Table 4: Correlation Matrix and Variance Inflation Factors

	LNZ	CAP(t−1)	NPL	SIZE	CIR	LG	DIV	VIF
LNZ	1							
CAP(t−1)	−0.205	1						1.21
NPL	−0.343	0.050	1					1.11
SIZE	0.287	−0.241	−0.236	1				2.04
CIR	−0.194	−0.097	0.193	−0.631	1			1.88
LG	−0.080	−0.035	−0.093	0.112	−0.113	1		1.07
DIV	−0.072	0.104	0.165	0.133	−0.136	−0.193	1	1.13

Note: *Pearson correlations for the estimation sample of 256 bank-years. VIFs are computed from the regressors of Equation (2).*

B) Choice of Estimator

Table 5 reports the specification tests. The F test rejects the hypothesis that all bank effects are zero ($F(27, 213) = 7.48$, $p < 0.001$), and the Breusch–Pagan test rejects the hypothesis that there is no random bank effect ($\chi^2(1) = 118.64$, $p < 0.001$). Pooled OLS is therefore rejected against both panel alternatives. That is no surprise for banks that differ in ownership, business model and history. Between FE and RE, the classic Hausman test gives $\chi^2(6) = 30.85$ ($p < 0.001$) and the robust Mundlak version gives $\chi^2(6) = 19.93$ ($p = 0.003$). The two tests agree. Unobserved bank characteristics are correlated with the regressors; RE is inconsistent, and FE is our baseline estimator.

Table 5: Specification Tests

Test	Null hypothesis	Statistic	p-value	Preferred model
F test of bank effects	All bank effects are zero	$F(27, 213) = 7.48$	< 0.001	FE over pooled OLS
Breusch–Pagan LM	No random bank effect	$\chi^2(1) = 118.64$	< 0.001	RE over pooled OLS
Hausman, classic	RE is consistent	$\chi^2(6) = 30.85$	< 0.001	FE over RE
Hausman, robust (Mundlak)	Bank means of the regressors are jointly zero	$\chi^2(6) = 19.93$	0.003	FE over RE

Note: *The Breusch–Pagan test is the version for unbalanced panels. The robust Hausman test uses standard errors clustered by bank. Its small-sample F version gives F(6, 22) = 2.71 (p = 0.040).*

C) Baseline Results

Table 6 presents the pooled OLS, FE and RE estimates of Equation (2). We focus on the FE estimates in column 2.

Credit risk has a large and precisely estimated coefficient. The NPL coefficient is −20.81 and significant at the 1% level. A one-percentage-point rise in the NPL ratio is associated with a Z-score about 19% lower, and a one-standard-deviation rise, 1.3 percentage points, with one about 24% lower. The coefficient is negative and significant under all three estimators, and it grows in absolute value as we move from pooled OLS (−11.45) to RE (−18.12) and FE. Comparisons across banks therefore understate the link. When problem loans rise within a given bank, its stability falls by more than the cross-section would suggest. H2 is supported.

Lagged capitalization shows no significant association with stability. Its FE coefficient is 1.52, with a standard error of 1.31, and the estimate is small as well as insignificant. Even at the upper end of its 95% confidence interval, a one-percentage-point increase in CAP(t−1) would be associated with a Z-score only about 4% higher, less than a quarter of the effect of the same change in the NPL ratio. In pooled OLS, the coefficient is negative, and in RE it is close to zero. H1 is not supported.

Size is not significant either. Its FE coefficient is 0.15, with a standard error of 0.28, and the pooled and RE coefficients are smaller and also insignificant. H3 is not supported.

None of the control variables are significant at conventional levels. The cost-to-income ratio has a positive sign, contrary to our expectation, while loan growth and income diversification have negative ones. The model explains 26% of the within-bank variation in LNZ. Section IV-F returns to the missing capital and size effects and to the signs of the controls.

Table 6: Baseline Estimates

	(1) Pooled OLS	(2) FE	(3) RE
CAP(t−1)	−2.708	1.520	0.023
	(2.279)	(1.310)	(1.595)
NPL	−11.452***	−20.808***	−18.123***
	(3.814)	(3.593)	(3.892)
SIZE	0.070	0.150	0.101
	(0.070)	(0.282)	(0.064)
CIR	−0.237	0.483	0.344
	(0.497)	(0.408)	(0.376)
LG	−0.786	−0.469	−0.527
	(0.681)	(0.530)	(0.555)
DIV	−0.384	−0.575	−0.524
	(0.606)	(0.438)	(0.422)
Constant	2.558*		1.534
	(1.495)		(1.290)
Bank effects	No	Fixed	Random
Year effects	Yes	Yes	Yes
Observations	256	256	256
Banks	28	28	28
R^2	0.225	0.264	0.171

Note: *The dependent variable is LNZ. Standard errors clustered by bank are in parentheses. R^2 is the ordinary R^2 for pooled OLS, the within R^2 for FE and the overall R^2 for RE. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, based on a t distribution with $G - 1 = 27$ degrees of freedom.*

D) Robustness Checks

Table 7 reports the robustness checks set out in Section III-D. All columns use the baseline sample of 256 bank-years, except column 5, which drops NCB. Column 4 tests H4 and is discussed in Section IV-E.

Column 1 replaces the NPL ratio with loan-loss provisions. The LLP coefficient is positive (7.53) and insignificant, and the model explains only 3% of the within-bank variation in LNZ. Provision expense does not capture the credit-risk channel in this sample. Timing is one likely reason. Laeven and Majnoni (2003) find that banks in most countries delay provisioning for bad loans until a downturn has already set in, and in Vietnam Circular 03/2021/TT-NHNN explicitly spread the extra provisions for restructured loans over three years. The expense booked in a given year therefore reflects credit problems from earlier years, and possibly how much the bank can afford to set aside, as much as current credit risk. Income diversification is negative and significant at the 10% level in this column.

Column 2 uses LNZ_F. Its volatility term is constant within each bank, so the bank effects absorb it and the column explains movements in ln(ROA + ETA) alone. The results change sharply. Lagged capitalization becomes large and significant (7.33), the cost-to-income ratio and loan growth become significant with negative signs, and the within R^2 rises to 0.71. This is the accounting identity at work. Within banks, lagged and current equity ratios have a correlation of 0.84, so a regression of ln(ROA + ETA) on CAP(t−1) largely recovers ETA itself. The NPL coefficient falls to −0.98 and is no longer significant. With all 284 bank-years for which LNZ_F can be computed, Agribank included, it is −1.93 and significant at the 1% level, still less than a tenth of the baseline estimate. Splitting LNZ into its two parts, on the sample of row G of Table 8, shows why. We winsorize ROA, ETA and σ before building the Z-score, so that LNZ equals ln(ROA + ETA) minus ln σ exactly, and regress each part on the same variables. The NPL coefficient is −0.32 and insignificant for the first part, but −22.15 and significant at

the 1% level for the second. Credit risk is related to stability almost entirely through the volatility of earnings, which is precisely the term a full-sample standard deviation removes.

Column 3 uses risk-adjusted return on assets, which leaves the capital ratio out of the dependent variable. The NPL coefficient remains negative and significant at the 5% level (−27.84). A one-percentage-point rise in the NPL ratio lowers RAROA by 0.28, roughly a tenth of its mean. Lagged capitalization has a coefficient of −0.04, which is essentially zero. If capital made banks safer through their behavior rather than through arithmetic, this is the column where it should appear. It does not.

Column 5 drops NCB. The NPL coefficient falls to −13.97 but remains significant at the 5% level, so a one-percentage-point rise in the NPL ratio is still associated with a Z-score about 13% lower. What changes most is the fit. The within R^2 drops from 0.26 to 0.04, because a large share of the within-bank variation that the baseline explains comes from NCB's decline. From 2022, its NPL ratio sat at the winsorization cap, and by 2023 its LNZ had reached the bottom of the distribution. NCB therefore shapes the size of the credit-risk coefficient and the fit of the model. It does not create the association.

Driscoll–Kraay standard errors for the baseline model, which are not tabulated, leave the conclusions unchanged. The NPL coefficient stays significant at the 1% level (standard error 2.82), and income diversification becomes significant at the 10% level. Across the five columns, the NPL coefficient is negative wherever it appears and significant everywhere except column 2, for the reason just given. No other variable is significant in more than two columns.

Table 7: Robustness Checks

	(1) LLP	(2) LNZ_F	(3) RAROA	(4) NPL × COVID	(5) Without NCB
Dependent variable	LNZ	LNZ_F	RAROA	LNZ	LNZ
CAP(t−1)	0.841	7.332***	−0.037	1.736	1.501
	(2.171)	(0.708)	(8.705)	(1.631)	(1.398)
NPL		−0.981	−27.838**	−22.749***	−13.968**
		(0.687)	(10.215)	(1.935)	(5.330)
NPL × COVID				11.018***	
				(2.021)	
LLP	7.534				
	(8.863)				
SIZE	0.245	−0.047	1.474	0.159	−0.057
	(0.494)	(0.054)	(0.922)	(0.228)	(0.299)
CIR	0.527	−0.553***	−2.072	0.417	0.194
	(0.628)	(0.166)	(1.462)	(0.315)	(0.557)
LG	−0.143	−0.557***	0.163	−0.339	−0.344
	(0.551)	(0.098)	(1.479)	(0.268)	(0.534)
DIV	−1.162*	0.122	−0.442	−0.571*	−0.657
	(0.571)	(0.129)	(1.567)	(0.296)	(0.557)
NPL + NPL × COVID				−11.731***	
				(2.734)	
Standard errors	Clustered	Clustered	Clustered	Driscoll–Kraay	Clustered
Observations	256	256	256	256	246
Banks	28	28	28	28	27
Within R^2	0.033	0.707	0.261	0.294	0.036

Note: *All columns include bank and year fixed effects. Standard errors are in parentheses. Clustered standard errors are clustered by bank, and their p-values use a t distribution with G − 1 degrees of freedom. Driscoll–Kraay standard errors use a Bartlett kernel with a bandwidth of two. Columns 1 to 4 use the same 256 bank-years, and column 5 drops the ten observations of NCB. Driscoll–Kraay p-values use a t distribution with T − 1 = 9 degrees of freedom. *** p < 0.01, ** p < 0.05, * p < 0.1.*

Table 8 turns to the treatment of outliers and the construction of σ. Row A repeats the baseline. Rows B to F change how the variables are winsorized. Row B does not winsorize at all; rows C and D use the 2.5th and 97.5th or the 5th and 95th percentiles; row E takes the bounds from the estimation sample, and row F computes them year by year. Row G winsorizes ROA, ETA and σ before building LNZ. Row H requires all twelve quarters for σ, which leaves 235 observations. Row I replaces fourth-quarter profit with audited annual profit minus the first three quarters.

The NPL coefficient is negative and significant in all nine rows. It ranges from −13.72 without winsorization, where NCB's NPL ratios of 18% to 30% in 2022–2024 pull the slope toward zero, to −24.41 at the 5th and 95th percentiles. Without

NCB, the range is much narrower, from −13.91 to −16.47, and every estimate is significant. Lagged capitalization and size are insignificant in every row. The COVID interaction is less stable. It is positive in every row but ranges from 3.76 to 13.22, and with clustered standard errors it is significant at the 5% level in only four of the nine rows. With Driscoll–Kraay standard errors, it is significant in all nine, at the 10% level or better.

Table 8: Sensitivity to the Treatment of Outliers and to the Construction of σ

	N	NPL	CAP(t−1)	SIZE	NPL, without NCB	NPL × COVID, clustered	NPL × COVID, Driscoll–Kraay
A. Baseline: 1st/99th, pooled	256	−20.808***	1.520	0.150	−13.968**	11.018**	11.018***
		(3.593)	(1.310)	(0.282)	(5.330)	(4.702)	(2.021)
B. No winsorization	256	−13.720***	1.109	0.150	−14.566***	3.764	3.764*
		(0.916)	(1.580)	(0.299)	(5.067)	(5.210)	(2.041)
C. 2.5th/97.5th, pooled	256	−23.218***	1.697	0.171	−14.131**	13.217**	13.217***
		(7.839)	(1.231)	(0.309)	(6.185)	(6.371)	(2.258)
D. 5th/95th, pooled	256	−24.409**	1.304	0.097	−14.494*	11.683	11.683***
		(10.274)	(1.354)	(0.264)	(7.839)	(7.678)	(2.757)
E. Bounds from estimation sample	256	−17.321***	1.388	0.092	−13.913**	8.641*	8.641***
		(1.675)	(1.390)	(0.271)	(5.325)	(4.918)	(2.191)
F. Bounds by year	256	−15.567***	1.175	0.190	−14.458**	5.454	5.454**
		(1.131)	(1.435)	(0.291)	(5.706)	(5.495)	(2.409)
G. Components winsorized first	256	−22.474***	1.608	0.208	−14.115**	11.622**	11.622***
		(4.177)	(1.299)	(0.289)	(5.318)	(4.741)	(2.289)
H. σ from all 12 quarters	235	−22.284***	2.184	0.129	−16.465**	12.459*	12.459***
		(3.256)	(1.384)	(0.296)	(6.108)	(6.706)	(3.587)
I. Q4 profit reconciled to audited annual profit	256	−22.288***	1.090	0.133	−16.364**	11.032**	11.032***
		(3.422)	(1.385)	(0.275)	(5.916)	(4.895)	(2.469)

Note: *Two-way fixed-effects estimates with LNZ as the dependent variable. NPL, CAP(t−1), SIZE and NPL without NCB come from Equation (2), the two NPL × COVID columns from Equation (3). Standard errors in parentheses are clustered by bank, except in the last column. Without NCB, the sample has 246 bank-years (225 in row H). Stars use t(G − 1) for clustered and t(T − 1) for Driscoll–Kraay standard errors. *** p < 0.01, ** p < 0.05, * p < 0.1.*

E) Credit Risk Under Forbearance

Column 4 of Table 7 estimates Equation (3). The NPL coefficient for normal years is −22.75, and its interaction with the COVID dummy is +11.02. Both are significant at the 1% level with Driscoll–Kraay standard errors. The slope in 2020 and 2021 was therefore −11.73, about half its value in other years. A one-percentage-point rise in the NPL ratio went with a Z-score about 20% lower in normal years, but only 11% lower during the pandemic. The combined slope is still significantly negative ($t = -4.29$, $p = 0.002$, with $T - 1 = 9$ degrees of freedom). With bank-clustered standard errors, the interaction is significant at the 5% level ($p = 0.027$), and so is the combined slope ($p = 0.039$).

This evidence is weaker than the baseline NPL result in two ways. Without NCB, the interaction falls to 10.25 and is significant only at the 10% level with clustered standard errors, and the combined slope is no longer significant with clustered standard errors ($p = 0.18$), although it stays significant with Driscoll–Kraay standard errors ($p = 0.012$). Its size also depends on the treatment of outliers, as Table 8 shows. H4 is therefore partly supported. The positive sign points to masking rather than amplification, the two mechanisms set out in Section II-E. We treat it as an association that is consistent with masking, not as proof of it.

It helps to be clear about what the interaction measures. The year effects absorb everything that moved all banks together in 2020 and 2021, such as the cuts in policy rates and any general change in stability. The interaction captures something narrower. During those two years, a bank's reported NPL ratio said less about its stability than in other years. Forbearance would produce this result. Under Circular 01/2020/TT-NHNN and its amendments, restructured loans kept their original classification, so the reported ratio stopped tracking the full stock of problem loans. The descriptive evidence in Section IV-A fits this account. Reported NPLs stayed below 2%, earnings volatility was at its lowest and average stability peaked. After the scheme ended in mid-2022, and as the extra provisions required by Circular 03/2021/TT-NHNN were phased in, NPLs rose, and stability fell. The IMF's estimate that NPLs reached 7.9% of loans in March 2024, once restructured loans and those held by VAMC are included, points in the same direction (IMF, 2024).

The interaction cannot rule out every alternative. Lower funding costs, for example, may have helped banks with weak loan books more than others, which would also flatten the slope. Its sensitivity to NCB and to the treatment of outliers is a further reason for caution. The result is best read as indirect evidence. It suggests that the reported NPL ratio was a weaker signal of credit risk while forbearance was in force, which is what masking implies and what anyone who relies on that ratio to judge a bank's health needs to know.

F) Discussion

Table 9 summarizes the tests of the four hypotheses. Of the three bank characteristics in the title of this paper, only credit risk is robustly associated with stability within Vietnamese banks. For capital and size, we find no significant association.

Capital. Several Vietnamese studies find that better-capitalized banks are more stable (Nguyen & Dinh, 2021; Nguyen & Duong, 2021; Dang et al., 2025). Our results suggest one reason why our estimates differ. When the capital ratio, or a close proxy for it, appears on both sides of the regression, the coefficient picks up the accounting identity in the Z-score. Column 2 of Table 7 shows how strong that pull is. With volatility held fixed, lagged capitalization is highly significant. Once volatility is allowed to vary, as in the baseline, or the capital ratio is taken out of the dependent variable, as with RAROA, the association disappears. A second reading is also possible. Part of the capital that Vietnamese banks raised during the sample was probably a response to regulation, in particular the move to Basel II under Circular 41/2016/TT-NHNN. Koehn and Santomero (1980) show that banks forced to hold more capital may shift to riskier assets to restore their expected return, in which case more capital leaves the probability of insolvency largely unchanged. The split of LNZ in Section IV-D, based on row G of Table 8, fits this second reading. Within banks, a higher lagged capital ratio goes with a larger buffer (a coefficient of 7.27 on ln(ROA + ETA)) but also with more volatile earnings (−5.66 on −ln σ), and the two associations largely offset each other. Our data cannot separate the two readings, and neither shows that capital is unimportant. What they do not support is the view that a higher capital ratio by itself makes a Vietnamese bank safer.

Size. Size varies a great deal across banks but very little within them. Once bank and year effects are removed, the standard deviation of SIZE falls to 12% of its original value. The FE estimate thus answers a narrow question. Does a bank that grows faster than the system become more stable? We find no evidence that it does. The broader question, whether large banks are more stable than small ones, is answered mainly by the bank effects. These also absorb any implicit state support for the three state-controlled banks in the estimation sample, because their ownership did not change. The raw correlation between size and LNZ is positive (0.29), but once other characteristics and year effects are controlled for, the coefficient is small and insignificant even in pooled OLS and RE. This agrees with Vu (2025), who finds no significant effect once robust standard errors are used, and falls between the negative estimates of Nguyen and Duong (2021) and Nguyen and Dinh (2021) and the positive one of Nguyen et al. (2024). It is also consistent with Demsetz and Strahan (1997), in whose sample the diversification benefits of size are offset by lower capital and riskier activities.

Controls. Income diversification is negative in every specification except column 2 of Table 7, and significant in columns 1 and 4. Section II-F sets no sign for this variable. The negative estimate is closer to the international evidence of Stiroh (2004) and Demirgüç-Kunt and Huizinga (2010), in which non-interest income adds to risk rather than reducing it, than to the positive effect that Nguyen and Nguyen (2026) report for Vietnamese banks over the same period. It also agrees with Nguyen and Ha (2026), who find a negative coefficient on non-interest income for 25 listed Vietnamese banks over 2013–2023. The cost-to-income ratio and loan growth are significant only in column 2, where they act through the level of profits. Both have negative signs, in line with the bad management hypothesis of Berger and DeYoung (1997) and with the findings of Foos et al. (2010) and Le (2020). Neither is associated with the full Z-score once earnings volatility is allowed to vary.

The overall picture is simple. Within Vietnamese banks, stability rises and falls with credit risk. The reported NPL ratio appears to track that risk less well when forbearance is in force, although that evidence is weaker. Section V draws out what this means for banks and supervisors.

Table 9: Summary of Hypothesis Tests

Hypothesis	Variable	Expected sign	Baseline FE	Robustness	Conclusion
H1	CAP(t−1)	+	1.520, not significant	Significant only with LNZ_F, not significant under any treatment of outliers	Not supported
H2	NPL	−	−20.808***	Negative in every column where it appears and significant except with LNZ_F, significant under all nine treatments of outliers and of the quarterly data	Supported
H3	SIZE	+	0.150, not significant	Not significant in any column or treatment	Not supported
H4	NPL × COVID	+/−	11.018*** with Driscoll–Kraay, ** clustered (Table 7, column 4)	Positive in all nine treatments, significant at 5% with clustered standard errors in four, only at 10% without NCB	Partly supported, consistent with masking

Note: **** p < 0.01. Coefficients are from Tables 6 and 7, and the treatments of outliers and of the quarterly data are those of Table 8.*

V. CONCLUSIONS AND POLICY IMPLICATIONS

A) Conclusions

This paper asked what drives the stability of Vietnamese commercial banks. Using 256 bank-year observations for 28 banks over 2015–2024, and a Z-score whose volatility term is computed from twelve quarters of earnings, we reach three conclusions.

The first is that credit risk dominates. A one-percentage-point rise in the NPL ratio is associated with a Z-score about 19% lower. The association holds across estimators and standard errors, with RAROA, under nine treatments of outliers and of the quarterly data, and without the most distressed bank in the sample, although it becomes smaller. It runs almost entirely through the volatility of earnings, which is why it becomes small, and on the estimation sample insignificant, when volatility is held fixed within banks.

The second is that capital and size show no significant association with stability within banks once permanent differences between banks and shocks common to all of them are removed. For capital, the confidence interval is narrow enough to rule out large positive associations, and the significant estimates that appear when volatility is held fixed reflect the accounting identity in the Z-score, not the behavior of banks. For size, there is too little variation within banks to detect an effect, and the positive association between size and stability across banks does not survive basic controls.

The third concerns forbearance. In the baseline specification, the link between reported NPLs and stability was roughly half as strong in 2020 and 2021, when restructured loans were allowed to keep their original classification, as in other years. This is consistent with the reported NPL ratio becoming a weaker signal of credit risk exactly when supervisors and investors needed it most. The size of the change depends on NCB and on the treatment of outliers, so we regard it as suggestive rather than conclusive.

B) Policy Implications

For the SBV, the message is that asset quality is the variable to watch. Our results do not show that capital is unimportant. They show that, within the range observed in Vietnam over 2015–2024, a rise in a bank's capital ratio was not followed by a measurable improvement in its stability, whereas a rise in its problem loans was consistently associated with lower stability. Capital targets such as those in Decision 689/QĐ-TTg are therefore best paired with measures that act on asset quality directly. These include timely recognition of problem loans, provisioning that keeps pace with them and an effective legal framework for resolving them.

Forbearance deserves particular care. Circulars 02/2023/TT-NHNN and 06/2024/TT-NHNN reintroduced the retention of loan classifications until the end of 2024, so the weaker link we observe for 2020–2021 may have recurred. Supervisors and analysts should not rely on the reported NPL ratio alone in such periods. Banks could be required to disclose, next to the NPL ratio, the stock of restructured loans whose classification has been retained and the loans sold to VAMC that remain unresolved, which is close to the broader measure that Decision 689/QĐ-TTg already uses for its own targets. The IMF has urged the authorities to phase forbearance out (IMF, 2024). Our evidence is consistent with that advice.

For bank managers, the lesson is similar. Of the characteristics we examine, problem loans are the one most closely tied to a bank's distance from insolvency, so underwriting, monitoring and early workout deserve priority. Growth and diversification are no substitute. We find no evidence that faster balance-sheet growth makes a bank safer, and some evidence that a larger share of non-interest income goes with lower stability. Policies that encourage consolidation or rapid growth in the name of stability should not assume that scale alone will deliver it.

C) Limitations and Future Research

The study has several limitations. The sample covers 28 banks and excludes the banks taken over or placed under special control in 2015, Saigon Commercial Bank and Agribank. The excluded banks include the most troubled institutions in the system, so our estimates describe banks that survived the period and may understate how strongly credit risk erodes stability in the weakest ones. The Z-score is an accounting measure, and forbearance affects accounting profits as well as reported NPLs. Market-based measures would avoid this problem but are not available for most Vietnamese banks. The volatility term also rests on quarterly statements, and most fourth-quarter statements are unaudited, although reconciling them with audited annual profit leaves the results unchanged.

Identification is a second limitation. Bank and year effects remove permanent differences between banks and shocks common to all of them, but they do not rule out reverse causality between credit risk and stability, or bank-specific shocks that move both. With only 28 banks and at most ten years, dynamic panel estimators would rest on weak or numerous instruments, and we do not use them. Our estimates are therefore conditional associations rather than causal effects, and we read the capital, size and COVID results in that light. The forbearance result is also indirect, and its size depends on how outliers are treated. It suggests that the reported NPL ratio became less informative in 2020–2021, but it cannot separate masking from other changes that may have flattened the relationship.

These limitations suggest three directions for future work. Loan-level or supervisory data on restructured loans would allow a direct test of masking. Consistent data on regulatory capital under Circular 41/2016/TT-NHNN would show whether risk-weighted capital behaves differently from the simple equity ratio used here. Extending the sample beyond 2024, after Circular 31/2024/TT-NHNN replaced the earlier classification rules and the second round of forbearance ended, would show whether the relationship between credit risk and stability returns to its normal strength.

Interest Conflicts

The author declares that there is no conflict of interest concerning the publishing of this paper.

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Data Availability Statement

The bank financial statement data used in this study were obtained from the FiinProX database under license and cannot be shared publicly. A replication package in Python and R that extracts the data from the FiinProX statements, builds every variable and reproduces all tables is available from the corresponding author on reasonable request.

AI Declaration Statement

In line with the IRJEMS policy on the use of generative AI and AI-assisted tools in manuscript preparation, the author discloses the following.

1. Tools: Claude, a large language model developed by Anthropic, used through Claude Code, and ChatGPT, a large language model developed by OpenAI.
2. Purpose: ChatGPT was used to help synthesize the literature reviewed in Section II and to edit its wording. Under the author's instructions, Claude was used (i) to write and run the Python and R code that cleaned the FiinProX data, constructed the variables and estimated the regression models, (ii) to search for and check the literature and Vietnamese regulatory documents cited in the paper, and (iii) to draft and edit the English text.
3. Extent: The author designed the study and chose the data and the model specification. The author wrote the literature review in Section II, with ChatGPT used to synthesize the literature and edit the wording, and Claude was then used to check and correct the citations in that section. The data-processing and estimation code was written with Claude, and the author re-ran the R version of the code in RStudio to verify that it reproduces every reported result. The English text of Sections I, III, IV and V was drafted with Claude from the author's results and instructions, and the wording of the whole manuscript was edited with it.
4. Human oversight: The author reviewed and verified all code, results, references and text produced with these tools, revised the manuscript and takes full responsibility for its content. Neither tool is listed as an author.

VI. REFERENCES

[1] Berger, A. N., & Bouwman, C. H. S. (2013). How does capital affect bank performance during financial crises? *Journal of Financial Economics, 109*(1), 146–176. https://doi.org/10.1016/j.jfineco.2013.02.008

[2] Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. *Journal of Banking & Finance, 21*(6), 849–870.

[3] Bouvatier, V., Lepetit, L., Rehault, P.-N., & Strobel, F. (2023). Time-varying Z-score measures for bank insolvency risk: Best practice. *Journal of Empirical Finance, 73*, 170–179. https://doi.org/10.1016/j.jempfin.2023.06.002

[4] Boyd, J. H., & Graham, S. L. (1986). Risk, regulation, and bank holding company expansion into nonbanking. *Federal Reserve Bank of Minneapolis Quarterly Review, 10*(2), 2–17.

[5] Cameron, A. C., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources, 50*(2), 317–372. https://doi.org/10.3368/jhr.50.2.317

[6] Dang, T. T., Le, T. L., Nguyen, T. X. L., & Nguyen, H. T. (2025). The effect of competition and industrial concentration on banking stability: The case of Vietnam. *Journal of Social Economics Research, 12*(2), 93–108. https://doi.org/10.18488/35.v12i2.4223

[7] Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. *Journal of Financial Economics, 98*(3), 626–650. https://doi.org/10.1016/j.jfineco.2010.06.004

[8] Demsetz, R. S., & Strahan, P. E. (1997). Diversification, size, and risk at bank holding companies. *Journal of Money, Credit and Banking, 29*(3), 300–313. https://doi.org/10.2307/2953695

[9] Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics, 80*(4), 549–560. https://doi.org/10.1162/003465398557825

[10] Elnahass, M., Trinh, V. Q., & Li, T. (2021). Global banking stability in the shadow of Covid-19 outbreak. *Journal of International Financial Markets, Institutions and Money, 72*, Article 101322. https://doi.org/10.1016/j.intfin.2021.101322

[11] Foos, D., Norden, L., & Weber, M. (2010). Loan growth and riskiness of banks. *Journal of Banking & Finance, 34*(12), 2929–2940. https://doi.org/10.1016/j.jbankfin.2010.06.007

[12] Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251–1271. https://doi.org/10.2307/1913827

[13] Huynh, J. (2020). Ổn định tài chính của hệ thống ngân hàng Việt Nam: Góc nhìn mới từ chỉ số Z-score [Financial stability of the Vietnamese banking system: A new application of the Z-score index]. *Tạp chí Thị trường Tài chính Tiền tệ*, (11). https://thitruongtaichinhtiente.vn/on-dinh-tai-chinh-cua-he-thong-ngan-hang-viet-nam-goc-nhin-moi-tu-chi-so-z-score-29027.html

[14] International Monetary Fund. (2024). *Vietnam: 2024 Article IV consultation-press release; staff report; and statement by the Executive Director for Vietnam* (IMF Country Report No. 24/306). https://doi.org/10.5089/9798400290404.002

[15] Koehn, M., & Santomero, A. M. (1980). Regulation of bank capital and portfolio risk. *Journal of Finance, 35*(5), 1235–1244.

[16] Köhler, M. (2015). Which banks are more risky? The impact of business models on bank stability. *Journal of Financial Stability, 16*, 195–212. https://doi.org/10.1016/j.jfs.2014.02.005

[17] Laeven, L., & Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics, 93*(2), 259–275. https://doi.org/10.1016/j.jfineco.2008.09.003

[18] Laeven, L., & Majnoni, G. (2003). Loan loss provisioning and economic slowdowns: Too much, too late? *Journal of Financial Intermediation, 12*(2), 178–197. https://doi.org/10.1016/S1042-9573(03)00016-0

[19] Laeven, L., Ratnovski, L., & Tong, H. (2016). Bank size, capital, and systemic risk: Some international evidence. *Journal of Banking & Finance, 69*(Suppl. 1), S25–S34. https://doi.org/10.1016/j.jbankfin.2015.06.022

[20] Le, T. D. Q. (2020). The interrelationship among bank profitability, bank stability, and loan growth: Evidence from Vietnam. *Cogent Business & Management, 7*(1), Article 1840488. https://doi.org/10.1080/23311975.2020.1840488

[21] Le, T. T., Vo, T. T. K., & Ho, P. D. D. (2022). Ảnh hưởng tương tác giữa rủi ro tín dụng và lạm phát đến Z-score: Nghiên cứu tại các ngân hàng thương mại cổ phần Việt Nam [The interactive effects between credit risk and inflation on Z-score: Case of Vietnam joint stock commercial banks]. *Tạp chí Khoa học Kinh tế, 10*(01), 39–52. https://vjol.info.vn/due/article/view/69208

[22] Lepetit, L., & Strobel, F. (2013). Bank insolvency risk and time-varying Z-score measures. *Journal of International Financial Markets, Institutions and Money, 25*, 73–87. https://doi.org/10.1016/j.intfin.2013.01.004

[23] Lepetit, L., & Strobel, F. (2015). Bank insolvency risk and Z-score measures: A refinement. *Finance Research Letters, 13*, 214–224. https://doi.org/10.1016/j.frl.2015.01.001

[24] Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica, 46*(1), 69–85. https://doi.org/10.2307/1913646

[25] National Assembly of Vietnam. (2017). *Resolution No. 42/2017/QH14 on piloting the settlement of bad debts of credit institutions*.

[26] Nguyen, H. C., & Nguyen, N. T. T. (2026). Vai trò điều tiết của đa dạng hóa thu nhập trong mối quan hệ giữa bất định chính sách kinh tế thế giới và sự ổn định của các ngân hàng thương mại Việt Nam [The moderating role of income diversification in the relationship between global economic policy uncertainty and the stability of Vietnamese commercial banks]. *Chuyên trang Nghiên cứu Kinh tế-Tài chính*. https://nghiencuu.tapchikinhtetaichinh.vn/vai-tro-dieu-tiet-cua-da-dang-hoa-thu-nhap-trong-moi-quan-he-giua-bat-dinh-chinh-sach-kinh-te-the-gioi-va-su-on-dinh-cua-cac-ngan-hang-thuong-mai-viet-nam-157025.html

[27] Nguyen, P. A., & Dinh, T. T. T. (2021). Factors affecting bank risks in Vietnam. *International Journal of Economics and Finance, 13*(10), 42–53. https://doi.org/10.5539/ijef.v13n10p42

[28] Nguyen, Q. A., & Duong, N. T. P. (2021). The impact of credit risk on the financial stability of commercial banks in Vietnam. *Ho Chi Minh City Open University Journal of Science - Economics and Business Administration, 11*(2), 67–80. https://doi.org/10.46223/HCMCOUJS.econ.en.11.2.1421.2021

[29] Nguyen, Q. A., Ho, L. L., Phan, T. A., Tran, T. D., & Nguyen, T. Q. T. (2024). Các yếu tố ảnh hưởng đến ổn định tài chính của ngân hàng thương mại Việt Nam [Factors affecting the financial stability of Vietnamese commercial banks]. *Tạp chí Tài chính*, (Kỳ 2 tháng 3/2024). https://tapchikinhtetaichinh.vn/cac-yeu-to-anh-huong-den-on-dinh-tai-chinh-cua-ngan-hang-thuong-mai-viet-nam.html

[30] Nguyen, T. N. Q., & Ha, M. T. (2026). Factors affecting the financial stability of Vietnamese commercial banks. *Journal of Finance - Marketing Research, 4*(3), 120–133. https://doi.org/10.52932/jfmr.v4i3en.1074

[31] Pham, T. T., Dao, L. K. O., & Nguyen, V. C. (2021). The determinants of bank's stability: A system GMM panel analysis. *Cogent Business & Management, 8*(1), Article 1963390. https://doi.org/10.1080/23311975.2021.1963390

[32] Prime Minister of Vietnam. (2012). *Decision No. 254/QĐ-TTg approving the scheme for restructuring the system of credit institutions in the 2011–2015 period*.

[33] Prime Minister of Vietnam. (2017). *Decision No. 1058/QĐ-TTg approving the scheme for restructuring the system of credit institutions associated with bad debt settlement in the 2016–2020 period*.

[34] Prime Minister of Vietnam. (2022). *Decision No. 689/QĐ-TTg approving the scheme for restructuring the system of credit institutions associated with bad debt settlement in the 2021–2025 period*.

[35] Roy, A. D. (1952). Safety first and the holding of assets. *Econometrica, 20*(3), 431–449. https://doi.org/10.2307/1907413
[36] State Bank of Vietnam. (2013). *Circular No. 02/2013/TT-NHNN on asset classification, levels and methods of setting up risk provisions, and use of provisions against credit risks in the banking activities of credit institutions and foreign bank branches*.
[37] State Bank of Vietnam. (2014). *Circular No. 36/2014/TT-NHNN on limits and prudential ratios for the operations of credit institutions and foreign bank branches*.
[38] State Bank of Vietnam. (2016). *Circular No. 41/2016/TT-NHNN on capital adequacy ratios for banks and foreign bank branches*.
[39] State Bank of Vietnam. (2020). *Circular No. 01/2020/TT-NHNN on restructuring repayment terms, exempting or reducing interest and fees, and retaining loan classification to support customers affected by the COVID-19 pandemic*.
[40] State Bank of Vietnam. (2021a). *Circular No. 03/2021/TT-NHNN amending and supplementing Circular No. 01/2020/TT-NHNN*.
[41] State Bank of Vietnam. (2021b). *Circular No. 11/2021/TT-NHNN on asset classification, levels and methods of setting up risk provisions, and use of provisions against risks in the operations of credit institutions and foreign bank branches*.
[42] State Bank of Vietnam. (2021c). *Circular No. 14/2021/TT-NHNN amending and supplementing Circular No. 01/2020/TT-NHNN*.
[43] State Bank of Vietnam. (2023). *Circular No. 02/2023/TT-NHNN on restructuring repayment terms and retaining loan classification to support customers in difficulty*.
[44] State Bank of Vietnam. (2024a). *Circular No. 06/2024/TT-NHNN amending and supplementing Circular No. 02/2023/TT-NHNN*.
[45] State Bank of Vietnam. (2024b). *Circular No. 31/2024/TT-NHNN on the classification of assets in the operations of commercial banks, non-bank credit institutions and foreign bank branches*.
[46] Stiroh, K. J. (2004). Diversification in banking: Is noninterest income the answer? *Journal of Money, Credit and Banking, 36*(5), 853–882. https://doi.org/10.1353/mcb.2004.0076
[47] Vu, A. L. D. (2025). Ổn định tài chính các ngân hàng thương mại Việt Nam: Nghiên cứu thực nghiệm giai đoạn 2006–2024 [Financial stability of Vietnamese commercial banks: Empirical evidence for 2006–2024]. *Tạp chí Quản lý nhà nước*. https://www.quanlynhanuoc.vn/2025/10/30/on-dinh-tai-chinh-cac-ngan-hang-thuong-mai-viet-nam-nghien-cuu-thuc-nghiem-giai-doan-2006-2024/