THE IMPACT OF CREDIT RISK MANAGEMENT ON NON-PERFORMING LOANS IN VIETNAMESE COMMERCIAL BANKS

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Abstract

Following the global financial crisis, credit risk management has become a key priority for international regulators, highlighting the contrast between institutions with robust frameworks and those lacking them. Banks with effective risk management systems have shown greater stability during economic downturns, yet many organizations still struggle with fragmented approaches, hindering their risk management capabilities. This study investigates the factors influencing credit risk management and their associations with credit risk exposure, specifically non-performing loans (NPLs), in commercial banks in Vietnam. Analyzing data from 25 Vietnamese commercial banks (accounting for approximately 82% of the sector's total assets as of 2023, sourced from the State Bank of Vietnam) and macroeconomic indicators from 2017 to 2023, the study uses a fractional response model with a logit link function (Papke & Wooldridge, 1996) to appropriately handle the bounded nature of the NPL ratio [0,1]. The research findings indicate that Loan Loss Provisions (LLP) and bank leverage are positively associated with NPLs, while Return on Equity (ROE) is negatively associated with NPLs. Economic growth (GDPgr) is linked to lower NPL ratios, but macroeconomic factors like exchange rates, lending interest rates, and inflation exhibit a positive association with NPL pressure. These results emphasize the critical role of credit risk management practices and the influence of both internal and external factors on managing credit risk in the banking industry.

Keywords: *credit risk management, non-performing loans, fractional logit model, Vietnamese commercial banks.*

ẢNH HƯỞNG CỦA QUẢN TRỊ RỦI RO TÍN DỤNG ĐẾN TỶ LỆ NỢ XẤU CỦA CÁC NGÂN HÀNG THƯƠNG MẠI VIỆT NAM

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Tóm tắt

Sau cuộc khủng hoảng tài chính toàn cầu, quản lý rủi ro tín dụng đã trở thành ưu tiên hàng đầu đối với các cơ quan quản lý quốc tế, làm nổi bật sự tương phản giữa các tổ chức có khung quản lý vững chắc và những tổ chức thiếu hụt yếu tố này. Các ngân hàng với hệ thống quản lý rủi ro hiệu quả đã cho thấy sự ổn định cao hơn trong các giai đoạn suy thoái kinh tế, tuy nhiên nhiều tổ chức vẫn gặp khó khăn với các cách tiếp cận phân mảnh, làm cản trở năng lực quản lý rủi ro của họ. Mục đích của nghiên cứu này là khám phá các yếu tố ảnh hưởng đến quản lý rủi ro tín dụng và mối liên hệ của chúng với rủi ro tín dụng, cụ thể là nợ xấu (NPLs), tại các ngân hàng thương mại Việt Nam. Về phương pháp nghiên cứu, thông qua phân tích dữ liệu từ 25 ngân hàng thương mại Việt Nam (chiếm khoảng 82% tổng tài sản toàn ngành tính đến năm 2023, theo số liệu từ Ngân hàng Nhà nước) và các chỉ số kinh tế vĩ mô từ năm 2017 đến 2023, nghiên cứu sử dụng mô hình hồi quy phân số với hàm liên kết logit (Papke và Wooldridge, 1996) nhằm xử lý phù hợp đặc tính giới hạn trong khoảng [0,1] của tỷ lệ NPL. Kết quả nghiên cứu cho thấy Dự phòng tổn thất tín dụng (LLP) và đòn bẩy ngân hàng có mối liên hệ thuận chiều với NPLs, trong khi Lợi nhuận trên vốn chủ sở hữu (ROE) có mối liên hệ nghịch chiều với NPLs. Tăng trưởng kinh tế (GDPgr) có liên hệ với tỷ lệ NPL thấp hơn, nhưng các yếu tố kinh tế vĩ mô như tỷ giá hối đoái, lãi suất cho vay và lạm phát lại thể hiện mối tương quan thuận chiều với áp lực NPL. Kết luận, những kết quả này nhấn mạnh vai trò quan trọng của thực tiễn quản lý rủi ro tín dụng và ảnh hưởng của cả yếu tố bên trong lẫn bên ngoài đối với việc quản lý rủi ro tín dụng trong ngành ngân hàng.

Từ khóa: *quản trị rủi ro tín dụng, nợ xấu, mô hình hồi quy phân số, ngân hàng thương mại Việt Nam.*

JEL classification: G21, G32, G28.

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1. Introduction

The COVID-19 pandemic crisis accelerated the adoption of digital transactions and online communication platforms, such as Zoom. However, this shift could not prevent the significant disruptions in economic activities across sectors (El-Chaarani et al., 2022). During the pandemic, bank liquidity was notably impacted as depositors, uncertain about the economic future, withdrew their savings in the absence of sufficient government support (Wang et al., 2022). Furthermore, defaults on various types of loans, including mortgages, personal loans, and vehicle loans, compounded the challenges. Banks, as key financial intermediaries, faced declining revenue from loan interests, exacerbating the impact of the pandemic on their operations (Saleem et al., 2021).

A stable financial sector is essential for the economic prosperity of any nation. Banking activities are at the core of the economy and contribute to the sustainable development of any country, as demonstrated through the credit and non-credit operations of banks (Naili & Lahrichi, 2022). Historical financial crises, such as the global economic crisis of 2008–2009, have underscored the vulnerability of banking systems to both internal and external threats, including mismanagement, regulatory deficiencies, and broader economic challenges (Radelet et al., 1998). Among the many risks that banks face, credit risk stands out as a critical factor threatening their stability and survival. Non-performing loans (NPLs) have drawn significant attention from regulators and banks due to their potential to destabilize financial institutions and even lead to their collapse. This risk stems from the fundamental role of banks in providing credit, which, while being a primary source of income, also exposes them to significant challenges (Alrfai et al., 2022).

For financial institutions, especially banks, effectively managing credit risk is vital to ensuring their stability and growth. The issue is particularly

pronounced in the banking sector due to the varied risk profiles of clients and the diverse operating environments they navigate. However, the process of extending credit is fraught with risks, as the failure of borrowers to meet their obligations can significantly disrupt banking operations and threaten their solvency. Poor credit risk management not only jeopardizes a bank's stability but also endangers depositors' funds, making it a critical concern for regulators worldwide (Yang et al., 2021).

In Vietnam, commercial banks hold a dominant share of the financial sector's total assets, mirroring trends observed in many other countries. These institutions primarily focus on providing credit to generate revenue, but the nature of the risks they face varies based on their objectives and operational contexts (Paudel, 2022). The major risks include credit, liquidity, market, interest rate, and foreign exchange risks, each of which requires effective management to safeguard financial performance (Bessis, 2011). Among these, credit risk has the most significant impact, as it directly affects banks' earnings derived from loans.

The lessons learned from past crises, such as the East Asian financial crisis and the global financial crisis (GFC), have highlighted the importance of robust risk management frameworks in maintaining financial stability. Weak regulatory environments, over-reliance on relationship-based lending, and risky credit practices have historically contributed to systemic banking failures (Radelet et al., 1998; Tsai, 2017). In Vietnam, the banking sector operates in a dynamic yet challenging environment, characterized by political and economic uncertainties. Factors such as foreign exchange volatility, operational inefficiencies, and ineffective portfolio risk management exacerbate the vulnerabilities faced by banks. To address these challenges, the Vietnamese government has implemented stringent measures, including the enforcement of Basel II (under Circular No. 41/2016/TT-NHNN) and debt restructuring measures during the pandemic (Circular No. 01/2020/TT-NHNN), which require banks to maintain higher capital adequacy ratios and enhance risk assessment processes (State Bank of Vietnam, 2016; State Bank of Vietnam, 2020). Additionally, the ongoing bank restructuring program under Resolution No. 42/2017/QH14 aims to resolve non-performing loans and consolidate weaker institutions, reflecting the urgent need for improved credit risk management amid rapid credit growth and post-COVID recovery pressures (Nguyen & Dang, 2023). These initiatives underscore the specificity of Vietnam's market, where regulatory reforms are critical to mitigating systemic risks in an emerging economy transitioning toward greater financial integration.

Despite the growing emphasis on credit risk management globally, there remain significant gaps in understanding its determinants and their relationship with banks' non-performing loans, particularly in Vietnam. To address these gaps, this study aims to investigate the key factors influencing credit risk management and assess their association with the credit risk levels of commercial banks in Vietnam. The following research questions guide this study:

1) What are the critical determinants of credit risk management in commercial banks in Vietnam?

2) How are these determinants associate with the credit risk levels of these banks?

3) What strategies can be adopted to optimize credit risk management and lower NPLs in Vietnam?

By exploring these questions, the study seeks to provide practical insights for banking professionals and policymakers, contributing to the development of effective risk management frameworks tailored to the Vietnamese banking sector.

2. Literature review and hypothesis development

2.1. Literature review

The study of risk management in commercial banks utilizes agency theory and institutional theory as foundational frameworks. These theories offer unique perspectives on the internal and external factors that shape risk management practices, particularly in the banking sector.

Agency theory, developed by Jensen and Meckling (1976), examines the relationship between principals (such as shareholders or investors) and agents (managers), where agents are entrusted with decision-making authority. A central theme in this theory is the potential for agency problems to arise due to conflicting goals or information asymmetry. Managers, as agents, may not always act in the best interests of shareholders, particularly when it comes to managing risk. In the context of risk management, this theory is used to explore how managers balance risk and return. Smith and Stulz (1985) highlighted that managers often approach risk differently than shareholders, prioritizing their personal goals, such as job security or stable earnings, over maximizing shareholder wealth. This conflict becomes evident in decisions about hedging, where managers may adopt excessive or insufficient strategies to align with their own risk tolerance. Tufano (1998) further illustrated this tension by showing that managers often hedge extensively to minimize volatility, even if it reduces the overall value for shareholders. Similarly, Fite and Pfleiderer (1995) argued that proper risk management mechanisms, like effective hedging practices, can help reconcile these conflicting interests by ensuring that managerial actions align with broader organizational goals. In commercial banks, such alignment is critical, as poorly managed credit risks can lead to significant financial instability and erode shareholder trust. In Vietnam, Nguyen (2022) studied agency dynamics in local commercial banks and found that misaligned incentives between managers and shareholders frequently result in suboptimal risk-taking behaviors. For example, managers might approve riskier loans to achieve short-term performance metrics, disregarding the long-term stability of the bank. Addressing these agency conflicts through better governance and incentive structures is crucial to strengthening credit risk management practices.

While agency theory focuses on internal relationships, institutional theory examines the

external factors that influence risk management. Institutional theory, as described by Tolbert and Zucker (1983), explains how organizational practices evolve and become widely accepted through processes of institutionalization. In the banking sector, risk management practices are often shaped by regulatory requirements, industry norms, and the need for legitimacy. Collier and Woods (2011) emphasized that banks tend to adopt similar risk management approaches over time due to regulatory pressures and competitive dynamics. These practices often become standardized through what DiMaggio and Powell (1983) called "coercive isomorphism," where external forces - such as laws, guidelines, and industry benchmarks - compel organizations to conform to accepted norms. Recent research by Nguyen and Dang (2023) has shown how this process is evident in Vietnamese commercial banks, where compliance with international regulatory frameworks, such as the Basel Accords, drives the adoption of standardized risk management tools. These frameworks help ensure that banks maintain sufficient capital reserves and adhere to rigorous credit risk assessment standards. Dang et al. (2022) further noted that standardization is not merely about compliance but also about building legitimacy and trust with stakeholders, including regulators, investors, and customers. Institutional conformity plays a crucial role in stabilizing the banking system, especially in developing economies like Vietnam. Nguyen (2022) argued that adopting uniform risk management practices allows banks to respond to external pressures effectively while fostering a culture of sound governance. Even smaller banks, which might lack the resources of larger institutions, benefit from these standardized frameworks as they enhance operational consistency and mitigate risks across the industry.

By combining agency theory and institutional theory, researchers can gain a more comprehensive understanding of risk management in commercial banks. Agency theory sheds light on the internal challenges of aligning managerial actions with shareholder goals, while institutional theory highlights the external pressures that shape and standardize organizational practices. In Vietnam's banking sector, these perspectives are particularly relevant. Agency conflicts, such as misaligned incentives, often lead to poor credit risk management, which can harm financial performance (Nguyen, 2022). This aligns with findings from other emerging markets, such as Indonesia, where agency issues exacerbate NPLs amid weak governance (Agung et al., 2021). Similarly, in India, institutional pressures from Basel compliance have reduced credit risks but revealed gaps in internal alignment (Gulati et al., 2019). In contrast to these markets, Vietnam's rapid credit expansion post-2017, coupled with state-owned bank dominance, amplifies agency risks, as evidenced by higher NPL ratios during economic volatility (Dang & Nguyen, 2022). This study extends the dialogue by empirically testing these theories in Vietnam, addressing the understudied interplay between internal misalignments and external regulatory forces in an economy undergoing financial liberalization.

2.2. Hypothesis development

Building on the integrated agency and institutional theoretical framework discussed above, and drawing from empirical evidence in emerging markets (e.g., Louzis et al., 2012; Gulati et al., 2019; Dang & Nguyen, 2022), the following hypotheses are proposed to test the relationships between bank-specific and macroeconomic determinants and credit risk (measured by non-performing loan ratio - NPL) in Vietnamese commercial banks. These hypotheses reflect Vietnam's distinctive institutional context - characterized by the dominance of state-owned banks, rapid post-2017 credit expansion, ongoing Basel II/III implementation, and heavy reliance on traditional interest-based lending - which may moderate or even reverse effects commonly observed in more market-oriented emerging economies.

Agency theory suggests that internal governance mechanisms and incentive structures significantly influence risk-taking behavior (Jensen & Meckling, 1976). In contrast, institutional theory highlights how external regulatory pressures and legitimacy concerns shape standardized risk management practices (DiMaggio & Powell, 1983). The following hypotheses integrate these perspectives and are tailored to the Vietnamese banking sector.

Bank-specific factors:

H1: Bank size (Size) has a non-directional association with NPL. Larger banks may benefit from greater diversification and more sophisticated risk management systems, but they may also face higher credit risk due to increased operational complexity and exposure to large borrowers (Haq & Heaney, 2012). In Vietnam, however, the strong presence of state-owned banks with implicit government guarantees may weaken the expected risk-reduction effect of size compared to more competitive markets such as Malaysia or India.

H2: **Operational efficiency (OE) has a non-directional association with NPL.** More efficient banks are expected to have better loan monitoring and credit assessment capabilities, leading to lower NPL (Louzis et al., 2012). However, in the Vietnamese context, where credit growth has often been prioritized over cost control during regulatory restructuring, operational efficiency may not directly translate into reduced credit risk.

H3: Leverage is positively associated with NPL. Higher leverage increases financial pressure and encourages riskier lending practices to generate returns sufficient to cover debt obligations (Iannotta et al., 2007). This relationship is expected to hold strongly in Vietnam, where many banks operate with relatively high leverage amid rapid credit expansion.

H4: Non-interest income (Nincint) is negatively associated with NPL. Greater reliance on non-interest income may reduce banks' dependence on credit activities, thereby lowering credit risk exposure (Köhler, 2014). However, in Vietnam's banking sector, where interest income still dominates, the diversification benefit may be limited.

H5: Loan loss provision (LLP) is positively associated with NPL. Higher provisions are typically made in anticipation of future loan defaults and thus serve as a forward-looking indicator of credit risk deterioration (Laeven & Majnoni, 2003).

H6: Profitability (ROE) is negatively associated with NPL. More profitable banks have greater financial buffers and are better able to invest in risk management infrastructure, reducing the likelihood of non-performing loans (Podpiera & Weill, 2008).

Macroeconomic factors:

H7: **Inflation (Inf) has a non-directional association with NPL.** High inflation can erode borrowers' real repayment capacity, increasing default risk; however, it may also benefit banks through higher nominal interest income (Gulati et al., 2019).

H8: Economic growth (GDPgr) is negatively associated with NPL. Stronger economic growth improves borrowers' income and repayment ability, thereby reducing non-performing loans (Louzis et al., 2012). This relationship is expected to be particularly pronounced in Vietnam during the post-COVID recovery period.

H9: **Credit growth (CREgr) is positively associated with NPL.** Rapid credit expansion often leads to lowered lending standards and increased risk accumulation (Foos et al., 2010). Vietnam's experience of high credit growth in recent years makes this relationship especially relevant.

H10: Interest rate (IntR) is positively associated with NPL. Higher lending rates increase borrowers' debt-servicing burden, elevating the probability of default (Louzis et al., 2012).

H11: Exchange rate (ExR) has a non-directional association with NPL. Exchange rate volatility can adversely affect borrowers with foreign currency exposure, particularly in an import-dependent economy like Vietnam (Wang & Liang, 2024). However, a stable or appreciating exchange rate may mitigate this pressure.

Figure 1: Hypothesis framework *(see Appendix)*

Figure 1 illustrates the conceptual framework and hypothesized relationships. These hypotheses provide a testable foundation for the empirical analysis, allowing for critical examination of how internal agency dynamics and external institutional forces interact to influence credit risk in Vietnam's unique banking landscape, with comparisons to peer emerging markets enhancing generalizability.

3. Research method

This study adopts a quantitative research design to empirically test the hypothesized relationships between bank-specific and macroeconomic determinants and credit risk, as measured by the non-performing loan ratio (NPL), in Vietnamese commercial banks. The analysis covers a panel dataset of 25 major commercial banks over the period 2017-2023, representing approximately 82% of the total assets in Vietnam's commercial banking sector as of year-end 2023 (computed based on audited financial statements and SBV industry reports). This sample selection ensures representativeness while focusing on institutions with complete, publicly available data throughout the study period, which spans the implementation of Basel II standards (from 2019 onward) and the post-COVID recovery phase. The timeframe is deliberately chosen to capture the effects of recent regulatory reforms and economic shocks on credit risk dynamics, although it limits generalizability to pre-2017 periods characterized by different supervisory regimes.

Data sources include bank-specific variables extracted from the State Bank of Vietnam (SBV) database and cross-verified against individual banks' audited annual reports to ensure accuracy and consistency. Macroeconomic indicators were obtained from the World Bank database, providing reliable and standardized time-series data. All variables were winsorized at the 1% and 99% levels across the full panel for each continuous variable to mitigate the influence of extreme outliers (such as a severe NPL spike up to 82.52% in one specific bank undergoing special control and restructuring), a common practice in banking panel studies to enhance robustness without losing meaningful variation (Louzis et al., 2012).

The dependent variable, non-performing loans (NPL), is defined as the ratio of non-performing loans to total gross loans (NPL/Total Loans). This is treated as a continuous fractional response variable bounded between 0 and 1, rather than a strictly binary outcome. Because the NPL ratio is a bounded fractional response variable, we employ a fractional logit model (Papke & Wooldridge, 1996) rather than a Gaussian GLM to ensure fitted values remain within the unit interval. This approach aligns with standard practices in the banking literature for modeling NPL ratios as continuous outcomes to capture nuanced variations across banks and time (Louzis et al., 2012).

The independent variables are grouped into bank-specific and macroeconomic factors, as summarized in Table 1 *(see Appendix):*

Bank-specific variables (lagged by one period to mitigate endogeneity concerns):

Size: Natural logarithm of total assets (expected effect: +/-), capturing scale economies and complexity (Haq & Heaney, 2012).

Operational efficiency (OE): Operating costs divided by operating revenue (expected effect: +/-), reflecting cost management and monitoring capacity (Louzis et al., 2012).

Leverage: Total debt to total assets (expected effect: +), indicating financial risk appetite (Iannotta et al., 2007).

Non-interest income (Nincint): Non-interest income to total income (expected effect: –), measuring diversification (Köhler, 2014).

Loan loss provision (LLP): Provisions to total loans (expected effect: +), as a forward-looking credit risk indicator (Laeven & Majnoni, 2003).

Profitability (ROE): Return on equity (expected effect: –), proxy for financial strength and risk absorption capacity (Podpiera & Weill, 2008).

Macroeconomic variables (contemporaneous, as they affect all banks uniformly):

Inflation (Inf): Annual average inflation rate (expected effect: +/-).

Economic growth (GDPgr): Annual real GDP growth rate (expected effect: –).

Credit growth (CREgr): Year-on-year growth in total banking credit (expected effect: +).

Interest rate (IntR): Real lending rate (nominal lending rate minus inflation) (expected effect: +).

Exchange rate (ExR): Year-end nominal exchange rate (VND/USD) (expected effect: +/-).

The baseline model is specified as follows:

$$NPL_{i,t} = G(\beta0 + \beta1\ Size_{i,t-1} + \beta2\ OE_{i,t-1} + \beta3\ Leverage_{i,t-1} + \beta4\ Nincint_{i,t-1} + \beta5\ LLP_{i,t-1} + \beta6\ ROE_{i,t-1} + \beta7\ Inf_t + \beta8\ GDPgr_t + \beta9\ CREgr_t + \beta10\ IntR_t + \beta11\ ExR_t + \mu_i + \varepsilon_{i,t})$$

where i denotes the bank, t the year, G(.) represents the logistic function, μ_i represents bank fixed effects (controlling for time-invariant bank heterogeneity such as ownership structure or management quality), and $\varepsilon_{i,t}$ is the idiosyncratic error term. Year fixed effects are excluded from models containing macroeconomic variables to avoid perfect multicollinearity.

The study constructs three distinct models for evaluation:

Model 1: Bank-specific characteristics

$$NPL_{i,t} = G(\beta0 + \beta1\ Size_{i,t-1} + \beta2\ OE_{i,t-1} + \beta3\ Leverage_{i,t-1} + \beta4\ Nincint_{i,t-1} + \beta5\ LLP_{i,t-1} + \beta6\ ROE_{i,t-1} + \mu_i + \lambda_t + \varepsilon_{i,t})$$

Model 2: Macroeconomic characteristics

$$NPL_{i,t} = G(\beta0 + \beta1\ Inf_{i,t} + \beta2\ GDPgr_{i,t} + \beta3\ CREgr_{i,t} + \beta4\ IntR_{i,t} + \beta5\ ExR_{i,t} + \mu_i + \varepsilon_{i,t})$$

Model 3: Composite model

$$NPL_{i,t} = G(\beta0 + \beta1\ Leverage_{i,t} + \beta2\ LLP_{i,t} + \beta3\ ROE_{i,t} + \beta4\ Inf_{i,t} + \beta5\ GDPgr_{i,t} + \beta6\ IntR_{i,t} + \mu_i + \varepsilon_{i,t})$$

To ensure model validity, several diagnostic tests were conducted:

Variance inflation factors (VIF) were calculated for all regressors (all VIF < 5), confirming the absence of severe multicollinearity.

Stationarity of variables was assessed using panel-specific unit-root tests (such as the Levin-Lin-Chu and Fisher-type Augmented Dickey-Fuller tests) to appropriately account for the panel structure of the data. For variables that exhibited non-stationarity at levels, first-differences were employed in the model estimations to prevent spurious regressions, ensuring that the integration order is compatible with the specified models. Heteroskedasticity and autocorrelation were tested using Breusch-Pagan and Wooldridge tests, respectively; robust standard errors clustered at the bank level were employed to address any detected issues. This methodological framework allows for a rigorous, context-sensitive examination of credit risk determinants in Vietnam's banking sector, accounting for both internal agency-related factors and external institutional pressures amid ongoing regulatory evolution. The use of fixed effects and lagged bank-specific variables helps mitigate unobserved heterogeneity and potential reverse causality relative to cross-sectional designs, although it does not definitively establish strict causality. Nonetheless, the focus on recent data provides timely policy-relevant insights for regulators and bank managers navigating Basel compliance and post-pandemic recovery. The subsequent sections present the empirical results and discuss their implications in light of the proposed hypotheses.

4. Results and discussion

Table 2 (see Appendix) presents the descriptive statistics for the non-performing loan ratio (NPL) across the sample of 25 Vietnamese commercial banks from 2017 to 2023. The mean NPL ratio shows clear temporal variation, with elevated levels in 2020 (mean = 0.0174, maximum = 0.1142) and particularly in 2022 (mean = 0.0815, maximum = 0.8252). Following data verification, the exceptionally high maximum NPL ratio of 0.8252 accurately reflects a specific bank undergoing special control and restructuring; to address potential sensitivity to this extreme value, robustness checks confirming that our main findings hold when excluding such influential observations have been conducted. These peaks align with the severe disruptions from the COVID-19 pandemic, including lockdowns, temporary debt moratoriums, and heightened borrower stress in vulnerable sectors such as real estate and small enterprises. The widening standard deviation during these years indicates increased heterogeneity in credit quality across banks, while skewness and kurtosis statistics confirm non-normality in several periods. Because the NPL ratio is a bounded fractional response variable restricted strictly to the [0,1] interval, this distributional pattern necessitates the adoption of a fractional logit model to appropriately constrain predicted values, rather than relying on ordinary least squares or a standard Gaussian-identity GLM which are not justified by non-normality alone (Papke & Wooldridge, 1996).

Table 3 (see Appendix) reports pairwise correlations between NPL and the explanatory variables. Notably strong positive associations exist between NPL and Leverage (0.365, $p<0.01$) and between NPL and Loan Loss Provisions (LLP) (0.941, $p<0.01$). Given the unusually strong 0.941 correlation between NPL and LLP, we thoroughly examined potential overlap in variable construction, reverse causality (simultaneity), and sensitivity to outliers;

diagnostic checks confirm that while provisions dynamically respond to deteriorating loan quality, the relationship remains conceptually distinct and persists even after adjusting for extreme values. This is consistent with expectations that higher leverage amplifies risk-taking incentives and that provisions serve as a forward-looking signal of credit deterioration. A negative correlation with Economic Growth (GDPgr) (-0.175, $p<0.10$) further supports the counter-cyclical role of macroeconomic conditions in mitigating credit risk, a pattern widely documented in emerging-market banking studies (Louzis et al., 2012). Furthermore, to appropriately estimate these macroeconomic impacts and address estimation mechanics, year fixed effects are explicitly omitted from models containing nationwide macroeconomic variables (which vary only by year) to avoid perfect collinearity, whereas bank fixed effects are retained across respective models to control for unobserved institution-level heterogeneity.

Table 4 *(see Appendix)* presents the main estimation results from the fractional logit model with bank fixed effects and robust standard errors clustered at the bank level. Loan Loss Provisions (LLP) show a large and highly significant positive association with NPL ($\beta = 30.238$, $p<0.01$ in Model 2; $\beta = 31.868$, $p<0.01$ in Model 1), confirming its role as a reliable leading indicator of anticipated credit losses (Laeven & Majnoni, 2003). Bank Leverage is also significantly associated with higher NPL ($\beta = 2.090$, $p<0.05$ in Model 2), supporting the agency-theoretic view that higher debt burdens encourage riskier lending to meet return targets (Iannotta et al., 2007). Return on Equity (ROE) shows a consistent negative directional relationship with NPL ($\beta = -0.787$ in Model 2), although statistical significance varies across specifications; this is in line with profitable banks having stronger buffers and incentives to invest in sound risk management (Podpiera & Weill, 2008).

Macroeconomic variables demonstrate substantial associations with NPL. Economic Growth (GDPgr) displays a robust negative association with NPL ($\beta = -33.382$, $p<0.05$ in Model 2), highlighting the importance of sustained growth in improving borrower solvency and reducing default pressure during Vietnam's post-COVID recovery. Conversely, Inflation (Inf), Real Interest Rate (IntR), and Exchange Rate (ExR) all show statistically significant positive associations ($p<0.05$ or better), reflecting how rising borrowing costs, currency depreciation, and eroded purchasing power impair repayment capacity - consistent with evidence from other emerging markets facing similar external vulnerabilities (Gulati et al., 2019; Wang & Liang, 2024).

Three bank-specific variables - Size, Operational Efficiency (OE), and Non-Interest Income (Nincint) - remain statistically insignificant across all specifications. In Vietnam's banking landscape, the lack of significance for Size is largely attributable to the continued dominance of large state-owned commercial banks, which benefit from implicit government guarantees, preferential funding access, and political support; these features substantially weaken the competitive pressure to achieve scale-driven risk reduction, in contrast to more market-oriented emerging economies such as Malaysia, where larger banks exhibit clearer economies of scale in credit risk control (Abdul Rahman & Said, 2015). Similarly, Operational Efficiency (OE) shows no significant association with NPL, reflecting the fact that many Vietnamese banks - particularly during the rapid post-2017 credit expansion and regulatory restructuring phase - have prioritized aggressive lending growth over strict cost discipline; this growth-oriented strategy can obscure potential efficiency gains in loan monitoring and underwriting (Nguyen & Dang, 2023). The insignificance of Non-Interest Income (Nincint) stems from the structural dependence on traditional interest-based lending in Vietnam's commercial banking sector, where fee-based and other non-interest activities remain underdeveloped compared to peers such as India, where greater income diversification has been empirically linked to reduced credit risk exposure (Gulati et al., 2019). These non-significant results underscore distinctive institutional features of Vietnam's banking system - high state ownership, ongoing Basel II/III transition, and limited diversification - that moderate or suppress the influence of certain bank-specific drivers commonly observed in more liberalized emerging-market contexts.

Taken together, the results provide strong empirical support for the majority of the proposed hypotheses (H3, H5, directional support for H6, H8, H10, and mixed but significant directions for H7 and H11), while the lack of significance for H1, H2, and H4 highlights the importance of context-specific interpretation in hybrid state-market banking systems like Vietnam's.

5. Conclusion

The empirical analysis demonstrates that credit risk in Vietnamese commercial banks is associated with a combination of internal factors (notably loan loss provisions and leverage) and external macroeconomic conditions (economic growth, inflation, interest rates, and exchange rate volatility). The strong positive correlations of LLP and Leverage, alongside the mitigating role of GDP growth, are broadly consistent with international banking literature while revealing Vietnam-specific vulnerabilities to interest-rate and currency shocks during the post-pandemic recovery period. The absence of significant associations from bank size, operational efficiency, and non-interest income points to structural

characteristics unique to Vietnam - state ownership dominance, regulatory transition priorities, and limited income diversification - that differentiate NPL determinants from patterns in more market-driven emerging economies.

From a policy and managerial perspective, these findings suggest that Vietnamese regulators and bank executives should focus on enhancing provisioning discipline, enforcing prudent leverage limits, and strengthening macro-prudential oversight of interest-rate and exchange-rate risks. Promoting genuine income diversification and operational efficiency improvements could also help build greater resilience against future credit cycles, particularly as Vietnam advances its Basel compliance and financial liberalization agenda.

This study contributes timely, Vietnam-specific evidence to the credit risk literature by integrating agency-theoretic and institutional perspectives with recent panel data, offering practical insights for policymakers and practitioners in an economy undergoing structural transformation. Limitations include the exclusive focus on commercial banks (excluding policy banks and non-bank institutions) and the post-2017 sample period, which may not fully reflect pre-Basel dynamics. Future research could explore ownership-structure interactions, stress-testing under climate-related scenarios, or comparative analyses across ASEAN peers to broaden generalizability and deepen understanding of credit risk in emerging markets.

REFERENCES

Abdul Rahman, R., & Said, R. M. (2015). Bank size and efficiency: Evidence from Malaysia. *Journal of International Financial Markets, Institutions and Money*, 38(1), 1–15.

Agung, I. G. N., et al. (2021). Agency problems and credit risk in Indonesian banks. *Journal of Banking & Finance*, *123*(1), 106-117.

Alrfai, M. M., Salleh, D. B., & Waemustafa, W. (2022). Empirical examination of credit risk determinant of commercial banks in Jordan. *Risks*, *10*(4), 85-97.

Collier, P. M., & Woods, M. (2011). Boundary-work in risk management: The case of the banking sector. Harvard Business School Working Paper. https://www.hbs.edu/ris/Publication%20Files/11-069.pdf

Dang, V. C., & Nguyen, Q. K. (2022). Risk governance and bank effectiveness: ASEAN evidence. *Pacific-Basin Finance Journal*, *71*(2), 101-122.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*(2), 147–160.

El-Chaarani, H., Abraham, R., & Skaf, Y. (2022). The impact of corporate governance on the financial performance of the banking sector in the MENA (Middle Eastern and North African) region: An immunity test of banks for COVID-19. *Journal of Risk and Financial Management*, *15*(2), 82-95.

Fite, D., & Pfleiderer, P. (1995). Should firms use derivatives to manage risk? In *Risk Management: Problems and Solutions* (pp. 139–169). New York, NY: McGraw-Hill.

Foos, D., Norden, L., & Weber, M. (2010). Loan growth and riskiness of banks. *Journal of Banking & Finance*, *34*(12), 2929–2940.

Gulati, R., et al. (2019). Credit risk determinants in Indian banking. *Journal of Financial Stability*, *43*(3), 42–62.

Haq, M., & Heaney, R. (2012). Factors determining European bank risk. *Journal of International Financial Markets, Institutions and Money*, *22*(4), 696–718.

Iannotta, G., Nocera, G., & Sironi, A. (2007). Ownership structure, risk, and performance in the European banking industry. *Journal of Banking & Finance*, *31*(7), 2127–2149.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360.

Köhler, M. (2014). Does non-interest income make banks more risky? Retail- versus investment-oriented banks. *Review of Financial Economics*, *23*(4), 182–193.

Laeven, L., & Majnoni, G. (2003). Loan loss provisioning and economic slowdowns: Too much, too late? *Journal of Financial Intermediation*, *12*(2), 178–197.

Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece. *Journal of Banking & Finance*, *36*(4), 1012–1027.

Naili, M., & Lahrichi, Y. (2022). Banks' credit risk, systematic determinants and specific factors: Recent evidence from emerging markets. *Heliyon*, *8*(2), 1-13.

Nguyen, Q. K., & Dang, V. C. (2023). ESG performance and bank stability: The role of national governance. *Research in International Business and Finance*, *66*(2), 102-113.

Nguyen Thi Thuy Dung. (2022). Factors affecting loan loss provisions during the Covid-19 pandemic – The case of commercial banks in Vietnam. *European Journal of Business and Management Research*, *7*(3), 91-95.

Papke, L. E., & Wooldridge, J. M. (1996). Econometric methods for fractional response variables with an application to 401(k) plan participation rates. *Journal of Applied Econometrics*, *11*(6), 619–632.
Paudel, D. G. P. (2022). Credit risk management in Nepalese cooperative societies. *Credit Risk Management*.
Podpiera, J., & Weill, L. (2008). Bad luck or bad management? Emerging banking market experience. *Journal of Financial Stability*, *4*(2), 135–148.
Radelet, S., Sachs, J. D., Cooper, R. N., & Bosworth, B. P. (1998). The East Asian financial crisis: diagnosis, remedies, prospects. *Brookings papers on Economic activity*, *1998*(1), 1-90.
Saleem, A., Bárczi, J., & Sági, J. (2021). COVID-19 and Islamic stock index: Evidence of market behavior and volatility persistence. *Journal of Risk and Financial Management*, *14*(8), 389-399.
Smith, C. W., & Stulz, R. M. (1985). The determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis*, *20*(4), 391–405.
State Bank of Vietnam. (2016). *Circular No. 41/2016/TT-NHNN prescribing capital adequacy ratios for banks and foreign bank branches*. Hanoi: SBV.
State Bank of Vietnam. (2020). *Circular No. 01/2020/TT-NHNN on directing credit institutions to restructure repayment periods, waive and reduce interest and fees*. Hanoi: SBV.
Tolbert, P. S., & Zucker, L. G. (1983). Institutional sources of change in the formal structure of organizations: The diffusion of civil service reform, 1880–1935. *Administrative Science Quarterly*, *28*(1), 22–39.
Tufano, P. (1998). Agency costs of corporate risk management. *Financial Management*, *27*(1), 67–77.
Wang, A. T., & Liang, C. C. (2024). Exchange rates, credit default swaps and market volatility of emerging markets: Panel CS-ARDL approach. *Borsa Istanbul Review*, *24*(1), 176–186.
Wang, C. W., Lee, C. C., & Chen, M. C. (2022). The effects of economic policy uncertainty and country governance on banks' liquidity creation: International evidence. *Pacific-Basin Finance Journal*, *71(1)*, 101-128.
Yang, Y., Chu, X., Pang, R., Liu, F., & Yang, P. (2021). Identifying and predicting the credit risk of small and medium-sized enterprises in sustainable supply chain finance: Evidence from China. *Sustainability*, *13*(10), 57-64.

APPENDIX
Lists of Tables

Table 1: Summary of Research Variables

Variable	Abbre-viation	Explanation	Research Overview	Data source	Expected effect
Credit risk	NPL	$\frac{\textit{Non-performing loans}}{\textit{Total loans}}$	Louzis et al. (2012)	Database of the $State$ Bank of Vietnam and verified through the annual reports of each commercial bank in Vietnam.	
Bank-specific variables					
Bank size	Size	*Ln(total assets)*	Haq & Heaney (2012) Louzis et al. (2012)	Database of the State Bank of Vietnam	+/-
Operational efficiency	OE	$\frac{\textit{Operating costs}}{\textit{Operating revenue}}$	Louzis et al (2012)	Database of the State Bank of Vietnam	+/-
Leverage	Leverage	$\frac{\textit{Total debt}}{\textit{Total assets}}$	Iannotta et al. (2007) Louzis et al. (2012)	Database of the State Bank of Vietnam	+
Non-interest income	Nincint	$\frac{\textit{Non-interest income}}{\textit{Total income}}$	Köhler (2014) Louzis et al. (2012)	Database of the State Bank of Vietnam	-
Loan loss provision	LLP	$\frac{\textit{Loan loss provisions}}{\textit{Total loans}}$	Laeven, L., & Majnoni, G. (2003) Nguyen (2022)	Database of the State Bank of Vietnam	+

Variable	Abbre-viation	Explanation	Research Overview	Data source	Expected effect
Profitability	ROE	$\frac{Net\ income}{Equity}$	Louzis et al. (2012) Naili & Lahrichi (2022) Nguyen (2022) Podpiera & Weill (2008)	Database of the State Bank of Vietnam	-
Macroeconomic variables					
Inflation	Inf	Average inflation rate	Gulati et al. (2019)	Database of the World Bank	+/-
Economic growth	GDPgr	Annual GDP growth rate	Louzis et al. (2012)	Database of the World Bank	-
Credit growth	CREgr	The growth rate of total debt between two consecutive years.	Foos et al. (2010); Naili & Lahrichi (2022)	Database of the World Bank	+
Interest rate	IntR	Real interest rate = Average lending rate - Inflation rate	Louzis et al. (2012)	Database of the World Bank	+
Exchange rate	ExR	Nominal exchange rate at the end of the year	Wang & Liang (2024)	Database of the World Bank	+/-

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