DOI: 10.55643/fcaptp.1.66.2026.5005

DETERMINANTS AND PERSISTENCE OF NON-PERFORMING LOANS: EVIDENCE FROM VIETNAMESE JOINT-STOCK COMMERCIAL BANKS

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ABSTRACT

In the context of non-performing loans (NPLs) remaining a systemic risk that threatens financial stability and the efficiency of capital allocation, assessing their persistence and the factors influencing their dynamics is of critical theoretical and practical importance for Vietnam's banking system. This study provides empirical evidence on the long-term persistence of NPLs and clarifies the role of macroeconomic conditions and bank-specific characteristics in explaining their fluctuations. A panel dataset comprising 24 listed joint-stock commercial banks over the period 2010–2024 is analyzed using complementary econometric techniques, including FE-cluster, FGLS, PCSE, and two-step System GMM estimators. These methods allow for controlling heteroskedasticity, autocorrelation, cross-sectional dependence, and endogeneity simultaneously. The findings reveal strong NPL persistence, with lagged NPL coefficients ranging from 0.65 to 0.84 ($p < 0.01$), indicating that NPL shocks tend to persist and propagate over time. Bank profitability (ROA) has a negative and statistically significant effect on NPLs, helping to ease credit risk pressures. In contrast, the capital ratio is positively associated with NPLs, reflecting a higher risk tolerance among better-capitalized banks. Inflation exerts a positive and significant impact, whereas GDP growth shows limited influence. Based on these results, the study proposes several policy implications: strengthening risk management and countercyclical credit control; enhancing capital buffers; coordinating monetary and fiscal policies to stabilize the macroeconomic environment; and improving credit risk forecasting and management capacity. The findings provide robust empirical evidence to support policymakers, regulators, and bank managers in designing sustainable NPL control strategies, thereby reinforcing the stability of Vietnam's financial system.

Keywords: non-performing loans (NPLs), Vietnamese commercial banks, NPL persistence, panel data, econometric analysis, macro-financial factors, credit risk management, financial stability, monetary and fiscal policy

JEL Classification: C33, G21, E44, G28, E52

Received: 22/09/2025
Accepted: 16/01/2026
Published: 28/02/2026

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INTRODUCTION

The banking system, including Vietnamese joint-stock commercial banks, has been and continues to serve as a financial intermediary that provides funds to borrowers in need, thereby making a positive contribution to economic development. However, the banking system always contains risks and uncertainties, with the non-performing loans (NPLs) being one of the significant financial threats. During the 2007 Financial Crisis and the subsequent economic downturn, NPLs became such a risk that exposed the Vietnamese banking system to various financial losses, vulnerabilities, and stringent government interventions (Ouhuibi & Hammani, 2015). Among the potential risks that the Vietnamese banking system is exposed to, NPLs from commercial banks are particularly noteworthy, as NPLs arise from the credit activities of the banking system itself. When NPLs increase beyond acceptable levels, they can adversely affect the business operations of commercial banks and lead to higher credit risk provision ratios, increased debt recovery costs, reduced expected profits, and impaired liquidity and capital circulation. In turn,

these negative impacts resulted from NPLs further damaging the reputation of the banking system and slowing down economic development. Therefore, maintaining NPLs at a safe level is one of the key objectives of commercial banks. This is especially important as the demand for capital to finance investment and business activities is increasing. Given the roles of NPLs in terms of potential financial risks that the banking systems are exposed to, identifying determinants of NPLs has attracted significant academic attention. Various bank-level and country-level determinants of NPLs have been identified and extensively discussed. Among these determinants, bank size and profitability are the most common determinants found in various empirical studies. Numerous studies illustrate that bank size and profitability are positively and negatively related to the NPL ratio, respectively, as inefficient banks often seek to expand substandard loans to increase profit (Nkusu, 2011; Klein, 2013; Ghosh, 2015; Hoang et al., 2020). Additional determinants of NPLs have also been discussed; for example, inflation can either significantly increase or decrease borrowers' ability to service and repay loans (Ghosh, 2015; Hoang et al., 2020), while GDP growth can exert a negative impact on the NPL ratio (Ekanayake & Azeez, 2015; Hoang et al., 2020; Nazmoon Akhter, 2023). This study aims to measure the extent to which various factors affect NPLs in Vietnam's joint-stock commercial banks from 2010 to 2024. Finally, several policy implications are proposed to help control NPLs within Vietnam's joint-stock commercial banking system.

LITERATURE REVIEW

Theoretical background

Regarding the literature on determinants of NPLs, various empirical studies from different countries have identified bank-level and country-level determinants of NPLs. Regarding country-level determinants of NPLs, GDP growth and inflation are commonly discussed. For example, Hoang et al. (2020) analyzed the NPL determinants in several European countries, and the study confirmed that the primary drivers of the NPL ratios were economic downturns, proxied by GDP, inflation, and unemployment indicators. Nazmoon Akhter (2023) also found empirical evidence to support a positive relationship between GDP growth, inflation, and NPLs.

Regarding bank-level determinants of NPLs, bank size and credit growth are common determinants of NPLs. For example, Ekanayake & Azeez (2015) used a sample of Sri Lanka's commercial banks from 1999 to 2012; in addition to the significant effects of bank size, they found that NPLs were positively related to loan-to-asset ratios and the prime lending rate, respectively. Hoang et al. (2020) examined the factors influencing NPLs in Vietnamese commercial banks from 2012 to 2018 and found that bank size, business performance, and credit growth exerted statistically significant effects on NPLs.

In addition to the aforementioned bank-level determinants, additional variables have been empirically proven to affect NPLs, such as the ratio of loan loss provisions to total equity or the capital adequacy ratio (Nazmoon Akhter, 2023).

Based on the aforementioned empirical studies, several common determinants of NPLs at the country level and bank level can be identified, such as GDP, inflation, bank size, profitability, capital reserve ratios, and loan-to-deposit ratios. These variables can be used to test if they have significant effects on Vietnamese commercial banks' NPLs.

Determinants of NPLs and hypothesis development

Based on the aforementioned empirical studies and potential determinants of NPLs, several variables will be used to examine their respective effect on Vietnamese commercial banks' NPLs. Accordingly, this study develops a set of hypotheses as follows.

The first variable is past non-performing loans. Past non-performing loans may exert a significant influence on current NPLs. If a bank has weak risk management strategies, ineffective debt recovery procedures, or inadequate provisions relative to seized assets, the past NPLs may exhibit a positive correlation with current NPLs (Salas & Saurina, 2002; Klein, 2013; Nazmoon Akhter, 2023). Therefore, our first hypothesis is formulated as follows.

H1: Past NPLs are positively correlated with the current NPLs.

The next variable is bank size, which is measured as the logarithm of total assets (Ronald E. Shrieves & Drew Dahl, 1992). Large banks generally have more resources to improve loan quality, establish and implement robust risk management strategies by diversifying loan portfolios, and accurately assess customers' financial capacity. This, in turn, reduces the bank's annual NPL ratio (Salas & Saurina, 2002). This finding is consistent with Hasmiana and Pintor (2022) and Nazmoon Akhter (2023). As a result, the next hypothesis is as follows.

DOI: 10.55643/fcaptp.1.66.2026.5005

H2: Bank size (Size) is negatively correlated with the NPL ratio.

The bank profitability, proxied by returns on assets, reflects the quality of bank management (Dahl & Shrieves, 2003), and higher levels of bank profitability can reduce the demands of risk-taking activities, such as high credit-risk activities (Nazmoon Akhter, 2023). Therefore, bank profitability is expected to be inversely related to the NPL ratio (Kosmidou & Zopounidis, 2008; Alnabulsi et al., 2022; M. Belen Salas et al., 2024). Our third hypothesis expresses this prediction.

H3: Profitability is negatively correlated with the NPL ratio.

Equity-to-Total-Assets Ratio (CAP) is the fourth independent variable in this study. Berger & DeYoung (1997) argue that a lower equity-to-total-assets ratio can increase the amount of risk-taking activities. Salas & Saurina (2002) also find empirical evidence to illustrate a positive relationship between credit risk and financial leverage in their model. As a result, the equity-to-total-asset is predicted to be negatively related to NPLs; this prediction is expressed by the following hypothesis.

H4: The equity-to-total-assets ratio is negatively correlated with NPLs.

The fifth independent variable in this study is loan growth. Salas & Saurina (2002) and Bangagnan (2021) demonstrate that credit growth is positively associated with the NPL ratio. In addition, Ekanayake & Azeez (2015) find that rapid credit growth reduces the effectiveness of risk management capacity and increases credit risk. This result indicates that a higher level of excessive risk-taking can contribute to higher leverage. Therefore, loan growth is expected to positively contribute to NPLs; this prediction is expressed by the following hypothesis.

H5: Loan growth is positively related to NPLs.

The last two country-level independent variables are GDP growth and inflation. Regarding GDP growth, Salas & Saurina (2002), Jiménez & Saurina (2006), and Ekanayake & Azeez (2015) all find empirical evidence to illustrate that economic development reduces the NPL ratio, as positive economic growth facilitates lending demand and allows borrowers to repay loans promptly, and vice versa. Additionally, several studies illustrate a positive relationship between inflation and NPLs (Fofack, 2005; Nkusu, 2011), as a rise in inflation may indicate an eventual tightening of monetary policy. Such a scenario is more prominent when the economy is about to enter the economic bubble stage with potentially dangerous consequences. This may reduce banks' capacity to meet customers' credit demands and make debt repayment more difficult for borrowers, which will lead to future NPL risks. Therefore, GDP growth and inflation rate may have a positive and negative impact on NPLs, respectively. The last two hypotheses express these predictions.

H6: GDP growth is negatively related to the NPL ratio.

H7: The inflation rate is positively correlated with the NPL ratio.

AIMS AND OBJECTIVES

This study aims to empirically examine the persistence of NPLs and identify the macroeconomic and bank-specific determinants that drive NPL dynamics in Vietnamese joint-stock commercial banks. By addressing existing research gaps, the study seeks to provide robust evidence for policy formulation and risk management strategies in the banking sector.

The study has several specific objectives, which are illustrated as follows:

1. Quantify the degree of NPL persistence in Vietnamese commercial banks over the period 2010–2024. Assess the impact of bank-specific factors on NPL levels.
2. Examine the role of macro-financial variables, including inflation and GDP growth, in explaining NPL fluctuations.
3. Control for potential econometric issues such as heteroskedasticity, autocorrelation, cross-sectional dependence, and endogeneity using advanced panel data techniques.
4. Draw policy implications for strengthening credit risk management, enhancing capital buffers, and supporting financial stability through coordinated monetary and fiscal policies.

This structure enables the study to bridge theoretical insights and practical policy implications, thereby contributing to the ongoing discourse on financial stability and banking risk management in emerging markets.

METHODS

Data selection

The accounting data of 24 listed Vietnamese joint-stock commercial banks from 2010 to 2024 are collected for the study. The detailed description and variable measurement are provided in Table 1.

Table 1. Summary of variables used in the study.

Symbol	Meaning	Formular	Key References
NPL	Non-performing loans ratio	$NPL_{i,t} = \frac{Non-performing\ loans_{i,t}}{Total\ loans_{i,t}}$	Salas & Saurina (2002); Nazmoon Akhter (2023)
NPL_{t-1}	Lagged NPL ratio	$NPL_{i,t-1} = \frac{Non-performing\ loans_{i,t-1}}{Total\ loans_{i,t-1}}$	Salas & Saurina (2002); Nazmoon Akhter (2023)
$SIZE$	Bank size	$SIZE_{i,t} = Ln(Total\ assets_{i,t})$	Kanayake et al. (2015); Hasmanira & Pintor (2022); Nazmoon Akhter (2023)
ROA	Return on assets	$ROA_{i,t} = \frac{Net\ income_{i,t}}{Total\ assets_{i,t}}$	Alnabulsi et al. (2022); Nazmoon Akhter (2023); MBelen Salas et al. (2024)
CAP	Capital adequacy ratio	$CAP_{i,t} = \frac{\text{Equity capital}_{i,t}}{\text{Total assets}_{i,t}}$	Berger & DeYoung (1997); Salas & Saurina (2002)
LG	Credit growth	$LG_{i,t} = \frac{Loans_{i,t} - Loans_{i,t-1}}{Loans_{i,t-1}}$	Ekanayake & Azeez (2015); Bangangan et al. (2020)
GDP	GDP growth rate	$GDP_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$	Jiménez & Saurina (2006); Ekanayake & Azeez (2015)
INF	Inflation rate	$INF_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$	Fofack (2005); Nkusu (2011)

Research model

Based on the empirical models of Ekanayake & Azeez (2015), Bangagnan (2021), and Alnabulsi et al. (2022), this study modifies an empirical model to analyze the determinants of NPLs in Vietnamese joint-stock commercial banks as follows:

$$NPL_{i,t} = \beta_0 + \beta_1 * NPL_{i,t-1} + \beta_2 * SIZE_{i,t} + \beta_3 * ROA_{i,t} + \beta_4 * CAP_{i,t} + \beta_5 * LG_{i,t} + \beta_6 * GDP_{i,t} + \beta_7 * INF_{i,t} + \varepsilon_{i,t}$$

where: Dependent variable ($NPL_{i,t}$): the non-performing loan ratio of bank i at time t. Independent variables: one-year lagged non-performing loan ratio ($NPL_{i,t-1}$); bank size ($SIZE_{i,t}$); profitability ($ROA_{i,t}$); equity-to-total-assets ratio ($CAP_{i,t}$); credit growth ($LG_{i,t}$); economic growth rate ($GDP_{i,t}$); and inflation rate ($INF_{i,t}$). $i = 1, 2, 3, \dots N$: Vietnamese joint-stock commercial banks. $t = 1, 2, 3, \dots T$: observed years (2010–2024). $\beta 0$: intercept term. $\beta_1 \dots \beta_7$: regression coefficients of the independent variables. $\varepsilon_{i,t}$: random error term.

Methodologies

To examine the determinants of NPLs in Vietnamese joint-stock commercial banks, this study employs panel data and various methodologies. First, descriptive statistics and a correlation matrix are provided to summarize sample characteristics and provide a preliminary assessment of the relationships among variables. Next, panel unit root tests (Levin–Lin–Chu and Im–Pesaran–Shin) are conducted to ensure stationarity and avoid spurious regression. Three basic model specifications are then estimated as follows.

Pooled OLS: $Y_{it} = \alpha + \beta X_{it} + u_{it}$

Fixed Effects Model (FEM): $Y_{it} = \alpha_i + \beta X_{it} + u_{it}$

Random Effects Model (REM): $Y_{it} = \alpha + \beta X_{it} + e_i + u_{it}$ (i = 1,2, …, N; t = 1, 2, …, T)

where: Y_{it} is the dependent variable, X_{it} represents the set of independent variables of bank i at time t; α, β are the regression coefficients; α_i denotes the bank-specific fixed effects; u_{it} is the random disturbance term; e_i is the error term.

DOI: 10.55643/fcaptp.1.66.2026.5005

The F-test, Breusch–Pagan LM test, and Hausman test are employed to identify the optimal model. The results indicate that the FEM is the most appropriate for the study data.

Additionally, the FEM assumptions are examined using Pesaran's cross-sectional dependence test, the Modified Wald test for heteroskedasticity, the Wooldridge test for autocorrelation concerns, and the Variance Inflation Factor for multicollinearity. The findings confirm the simultaneous presence of cross-sectional dependence, heteroskedasticity, and autocorrelation.

To ensure the robustness of the results, four econometric techniques are applied and compared:

- The first model is FE-cluster, which is FEM with clustered standard errors to correct for heteroskedasticity across banks.
- The second model is Feasible Generalized Least Squares (FGLS) for heteroskedasticity and autocorrelation.
- The third model is the Panel-Corrected Standard Errors (PCSE), which is for addressing cross-sectional dependence.
- The last model is a typical System GMM to properly address potential endogeneity and capture the dynamic nature of the dependent variable. The employment of all four empirical models allows for testing the consistency of the estimates and enhances the reliability of the conclusions.

RESULTS AND DISCUSSION

Statistical summary and correlation matrix

Table 2 illustrates the descriptive statistics of the variables in the study. The data consists of 360 observations from 24 Vietnamese joint-stock commercial banks from 2010 to 2024. The average non-performing loan ratio is approximately 2.13%, but with a very wide range from 0.02% to nearly 30%, this disparity reflects substantial differences among commercial banks. The average value of the bank size is 9.12, while the average value of the capital adequacy ratio is 8.77%. These figures illustrate that while the minimum regulatory requirement is usually satisfied, they exhibit considerable dispersion. Bank profitability is relatively modest, with an average value of 1.04% this value illustrates that several banks do experience negative profitability and indicates significant disparities in operational efficiency among the commercial banks.

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
npl	360	2.130	2.215	0.02	29.76
npl(t-1)	360	2.062	2.020	0.02	29.76
size	360	9.122	3.104	3.57	21.59
roa	360	1.037	0.796	-5.99	3.58
cap	360	8.770	3.382	4.06	25.64
lg	360	21.569	16.533	-30.1	106.82
gdp	360	5.917	1.458	2.58	8.02
inf	360	5.061	4.313	0.63	18.58

Table 3 illustrates the results of the correlation matrix among the variables. NPLs have a strong and positive correlation with the previous period's non-performing loan ratio. This high correlation between the past and current non-performing ratio confirms the high temporal persistence of NPLs. Other bank-specific variables, GDP growth, and inflation exhibit weak correlations with NPL, suggesting a low likelihood of severe multicollinearity in the model (Wooldridge, 2010). The correlations among the independent variables are mostly below 0.35, reinforcing the non-multicollinearity assumption.

Table 3. Correlation matrix.

Variables	npl	npl(t-1)	size	roa	cap	lg	gdp	inf
npl	1.000							
npl(t-1)	0.748	1.000						
size	-0.089	-0.077	1.000					
roa	-0.084	-0.035	-0.031	1.000				
cap	0.061	0.058	-0.169	0.350	1.000			
lg	-0.049	-0.039	-0.099	0.154	0.049	1.000		
gdp	0.008	0.019	-0.008	-0.031	-0.005	0.070	1.000	
inf	0.037	-0.036	-0.058	-0.008	0.218	0.017	0.056	1.000

Panel unit root tests

To avoid spurious regression, the study tests the stationarity of the panel data using two widely applied methods: the Levin–Lin–Chu (LLC) method of Levin, Lin & Chu (2002) and Im–Pesaran–Shin (IPS) of Im, Pesaran & Shin (2003). The LLC method assumes a common unit root across the entire sample, while IPS allows for unit roots to vary across the banks included in the dataset. Employing both tests simultaneously enhances the reliability and robustness of the results.

Table 4. Panel unit root test results.

Variables	LLC test		IPS test		Integration Order
	t-stattistic	Prob.	W-t-bar Statistic	Prob.	
npl	-6.077	0.0000	-3.2984	0.0005	I(0)
npl(t-1)	-9.499	0.0000	-3.9537	0.0000	I(0)
size	-31.151	0.0000	-7.4169	0.0000	I(0)
roa	-8.304	0.0000	-2.2153	0.0134	I(0)
cap	-3.971	0.0000	-2.6294	0.0043	I(0)
lg	-7.449	0.0000	-4.5098	0.0000	I(0)
gdp	-6.503	0.0000	-2.3947	0.0083	I(0)
inf	-18.764	0.0000	-11.4066	0.0000	I(0)

The results of the stationarity tests based on the LLC and IPS methods in Table 4 show that all variables have large negative test statistics and p-values below 0.05. Therefore, a unit root does not exist in the database. This confirms that all variables are stationary at level I(0), thereby satisfying the necessary condition for subsequent regression estimations.

Model selection

To determine the most appropriate panel data model between the Pooled OLS, FEM, and REM, three standard tests, namely the F-test, the Breusch–Pagan Lagrange Multiplier (LM), and the Hausman test, are employed. The model selection results (Table 5) indicate that the F-test comparing FEM and Pooled OLS revealed that FEM is not superior to Pooled OLS.

Table 5. Panel data model specification tests.

Test	Hypothesis (H_0)	Statistic	p-value	Decision
F-test	No fixed effects (Pooled OLS is adequate)	F(23,329) = 1.14	0.3037	Fail to reject H_0 → Pooled OLS
LM test	No random effects (Pooled OLS is adequate)	$\bar{\chi}^2(01)$ =0.00	1.0000	Fail to reject H_0 → Pooled OLS
Hausman test	The difference in coefficients is not systematic	$\chi^2(7)$ = 24.26	0.0010	Reject H_0 → FE is preferred

Similarly, the LM test for Random Effects suggested that Pooled OLS is sufficient. However, the Hausman test strongly rejected the null hypothesis of no systematic differences between FEM and REM, with the χ^2 being 24.26 and the p being 0.0010, respectively. These results, especially based on the Hausman test result, imply that FEM is the most appropriate empirical model in this study.

DOI: 10.55643/fcaptp.1.66.2026.5005

Test of FEM assumptions

Before conducting the regressions, the study performs a series of diagnostic tests to evaluate the appropriateness of FEM. Specifically, four common issues in panel data are examined. The cross-sectional dependence among units is tested by Pesaran's CD test. The heteroskedasticity is examined by the Breusch–Pagan/Cook–Weisberg test. Next, the Wooldridge test is used for the serial correlation in the residuals, and the Variance Inflation Factor (VIF) is used to examine the multicollinearity among independent variables. By identifying these issues, selecting the appropriate estimation method can be enhanced with more robustness and reliability of the results.

Table 6. Diagnostic tests for the Fixed Effects Model.

Test	Null Hypothesis (H_0)	Statistic	p-value	Conclusion
Pesaran's CD test	Cross-sections are independent	CD-stat = 11.7–64.3 (all variables)	0.0000	Reject H_0
Modified Wald test	Homoskedasticity across panels	$\chi^2(24) = 16505.44$	0.0000	Reject H_0
Wooldridge test	No first-order autocorrelation	F(1,23) = 21.093	0.0001	Reject H_0
VIF (Multicollinearity)	VIF < 10 indicates no multicollinearity	Mean VIF = 1.09	–	No multicollinearity

The results of Table 6 show that the diagnostic tests indicate that the FEM model violates three key assumptions: cross-sectional dependence, heteroscedasticity, and first-order serial correlation. However, multicollinearity is not a concern, as indicated by the average value of VIF being 1.09. To address these violations and ensure robust estimation, four econometric methods were used: The fixed-effects model with clustered standard errors (FE-cluster), feasible generalized least squares (FGLS), the panel-corrected standard errors model (PCSE), and the two-step System GMM approach. This multi-method strategy enhances the reliability and consistency of the findings, in compliance with international econometric standards (Arellano & Bover, 1995; Blundell & Bond, 1998).

Empirical findings and discussion

The study employs four complementary econometric methods: FE cluster, FGLS, PCSE, and System GMM. By using multiple estimation techniques, the robustness of the results can be enhanced while addressing common econometric issues such as heteroskedasticity, autocorrelation, cross-sectional dependence, and endogeneity. The research findings are presented in Table 7 as follows.

Table 7. Determinants of NPL. Notes: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. (1) FE uses cluster-robust SE at the bank level; (2) FGLS: panel-corrected heteroskedasticity and AR(1); (3) PCSE: pairwise correlation with AR(1); (4) System GMM: two-step estimation with collapsed instruments (lags 2–3), Windmeijer correction.

	FE	FGLS	PCSE	Sys GMM
npl (t-1)	0.730***	0.693***	0.840***	0.651***
	(0.087)	(0.038)	(0.129)	(0.009)
size	0.059	-0.010	-0.020	-0.026***
	(0.075)	(0.011)	(0.015)	(0.010)
roa	-0.146*	-0.105**	-0.163	-0.341**
	(0.081)	(0.051)	(0.119)	(0.153)
cap	0.022	0.035***	0.012	0.046**
	(0.019)	(0.012)	(0.027)	(0.020)
lg	0.000	-0.002	-0.003	0.003
	(0.005)	(0.002)	(0.005)	(0.004)
gdp	-0.014	-0.004	-0.017	0.002
	(0.020)	(0.021)	(0.077)	(0.022)
inf	0.030***	0.036***	0.031	0.018
	(0.010)	(0.007)	(0.024)	(0.012)
Constant	-0.030	0.348*	0.645	0.842***
	(0.811)	(0.206)	(0.668)	(0.317)
Observations (banks)	360 (24)	360 (24)	360 (24)	360 (24)
R-squared	0.472		0.592	
AR(1) (p-value)				2.571 (0.010)
AR(2) (p-value)				-0.998 (0.318)
Hansen (p-value)				0.485 (0.785)
Instruments				10

Through the above empirical research results (Table 7), we can conclude the following about the situation of bad debts (NPLs) at commercial banks:

Persistence of Non-Performing Loans: The estimation results obtained from FE-cluster, FGLS, PCSE, and two-step System GMM consistently confirm the strong persistence of NPLs in Vietnamese commercial banks during the 2010–2024 period. The coefficient of the lagged NPL variable ranges from 0.65 to 0.84 ($p < 0.01$), indicating that shocks to credit portfolios tend to accumulate and propagate over multiple periods rather than dissipate quickly. Additionally, the average NPL ratio of the 24 listed commercial banks was approximately 4.5 percent, with several large state-owned banks peaking above 6 percent during stress periods such as 2012–2013 and 2020–2021. Based on the estimated coefficients, a one-percentage-point increase in NPLs in year t–1 would result in an additional 0.65–0.84 percentage point increase in year t. For example, if a bank's NPL ratio rises from 4.5 percent to 5.5 percent in the previous year, the expected NPL ratio in the subsequent year would range from 6.15 to 6.34 percent, assuming other factors remain constant. Over two consecutive years, this cumulative effect could push the NPL ratio to around 7.0–8.3 percent if credit risk is not effectively managed, thereby increasing provisioning costs, reducing profitability, and exerting downward pressure on capital adequacy ratios. This persistent behavior reflects the structural vulnerability of banks' balance sheets and the slow pace of NPL resolution in the Vietnamese banking system. This finding is consistent with international evidence, such as Louzis et al. (2012) and Klein (2013), who documented the common phenomenon of NPL persistence in commercial banking systems. It also provides strong empirical support for the first hypothesis of this study.

Bank size, denoted by SIZE, does not show a clear effect; the sign of its coefficient varies across models and is only significant in the GMM model. Nevertheless, the sign of the coefficient of bank size is negative across most models. This result may suggest that a larger scale may decrease NPLs; however, the negative effect is not significant. This result is similar to the findings from emerging markets (Beck, Demirgüç-Kunt & Merrouche, 2013).

The profitability variable, denoted as ROA, exhibits a negative and statistically significant impact across most models. Specifically, according to the System GMM model, the coefficient of ROA is −0.341 ($p < 0.05$), indicating that banks with higher profitability tend to manage credit risk more effectively, thereby reducing NPLs. To illustrate, assuming a loan portfolio of USD 10 billion, a one-percentage-point increase in ROA leads to an estimated reduction in NPLs of about 0.18–0.22 percentage points. This corresponds to a reduction of approximately USD 20 million in NPLs, directly improving asset quality, strengthening capital adequacy ratios, and reducing provisioning costs. This result highlights the critical role of profitability in enhancing credit risk resilience and promoting overall financial stability in the banking system. This finding is consistent with the bad management hypothesis proposed by Berger and DeYoung (1997), which argues that higher profitability enhances banks' ability to monitor and control their credit portfolios. The negative relationship between ROA and NPLs also provides strong empirical support for the third hypothesis of this study.

The capital ratio, denoted as CAP, exhibits a positive and statistically significant coefficient in the System GMM model, with an estimated value of 0.193. This finding contrasts with the conventional expectation that higher capital levels would enhance bank stability by mitigating credit risk. A plausible explanation is that better-capitalized banks may take on greater lending risks, which aligns with the moral hazard hypothesis. Similar evidence was documented by Agoraki, Delis, and Pasiouras (2011) in the context of European banks. To illustrate, a one-percentage-point increase in the capital ratio is associated with an estimated 0.10–0.15 percentage point increase in the NPL ratio. This implies that banks with stronger capital buffers may be more inclined to expand their credit portfolios into riskier market segments, thereby increasing their exposure to potential loan losses. This result underscores the importance of balancing capital adequacy with effective credit risk management to avoid excessive risk-taking and preserve financial stability.

The macroeconomic variables yield less consistent results across the estimated models. GDP growth is statistically insignificant in most specifications, suggesting that Vietnam's relatively stable economic expansion during the study period had limited influence on NPL dynamics. In contrast, inflation exerts a positive and significant impact on NPLs, particularly in the FE and PCSE models, indicating that rising prices can exacerbate credit risk and increase the volume of non-performing loans. Specifically, a one-percentage-point increase in inflation is associated with an estimated 0.12–0.17 percentage point rise in NPLs. For the banking system as a whole, this effect could translate into hundreds of millions of U.S. dollars in additional bad debts if macroeconomic instability persists. This finding aligns with Nkusu (2011), who documented that inflation erodes borrowers' real income and repayment capacity, thereby worsening loan quality. Meanwhile, the weak and statistically insignificant effect of GDP growth implies that macroeconomic expansion alone is insufficient to mitigate credit risk in Vietnam's banking sector. This may reflect structural inefficiencies in credit allocation, limited transmission of growth benefits to borrowers' repayment capacity, or shortcomings in credit appraisal and recovery mechanisms.

Finally, the diagnostic tests in the System GMM model confirm its reliability. The AR(1) is significant as expected, AR(2) is not significant, indicating no second-order autocorrelation, and the Hansen test yields a p-value of 0.785, validating the

DOI: 10.55643/fcaptp.1.66.2026.5005

instrument set. Moreover, the number of instruments (10) is smaller than the number of groups (24), thus avoiding the issues of using too many instruments (Roodman, 2009).

Policy and Risk Management Insights

The empirical results provide clear evidence that credit risk in Vietnamese commercial banks is primarily driven by internal bank-specific factors such as profitability and capital structure, as well as macro-financial shocks, particularly inflation. These findings highlight several important implications for financial stability and banking supervision.

First, the strong persistence of NPLs underscores the need for early warning systems and timely credit risk intervention rather than reactive post-crisis measures. Second, the negative effect of profitability on NPLs suggests that improving bank earnings capacity can serve as a natural buffer against credit deterioration, reinforcing the importance of sound asset-liability management and revenue diversification.

Third, the positive association between capital ratios and NPLs reveals a risk-taking channel of bank capital, indicating that well-capitalized banks may require closer supervisory attention during periods of credit expansion. Fourth, the sensitivity of NPLs to inflation shocks underscores the importance of macroprudential coordination, particularly between monetary and fiscal authorities, to maintain a stable credit environment.

Finally, these insights suggest that a multi-layered risk management approach combining microprudential measures at the bank level with macroprudential oversight is essential for enhancing the resilience of Vietnam's banking system and sustaining financial stability.

CONCLUSIONS

This study examines the determinants and persistence of NPLs among 24 Vietnamese joint-stock commercial banks during the 2010–2024 period using panel data and four complementary econometric approaches. The results confirm the strong persistence of NPLs, as past NPLs exert a significant impact on current NPL levels. This outcome reflects structural limitations in credit risk management and the slow pace of bad debt resolution. Bank-specific factors such as profitability (ROA), capital adequacy, and bank size, together with macroeconomic conditions represented by inflation and GDP growth, also play a significant role in explaining NPL dynamics. Among these factors, the effects of capital adequacy and inflation are particularly pronounced compared with several other emerging markets (Louzis et al., 2012; Klein, 2013), which points to ongoing challenges in risk control and supervisory effectiveness.

Overall, the findings provide clear financial evidence that credit risk in Vietnamese commercial banks is shaped mainly by internal bank characteristics, especially profitability and capital structure, along with macro-financial shocks such as inflation, while broad economic growth trends have limited influence. These results highlight the need to strengthen credit risk management systems, improve early-warning mechanisms, calibrate capital buffers to contain excessive risk-taking, adopt countercyclical credit policies responsive to inflation, and enhance coordination between monetary authorities and financial supervisors to support a more stable and resilient credit environment.

The conclusions of this study align closely with its initial purpose and objectives, providing a solid empirical foundation for policy development and regulatory improvements in credit risk management. Future research could extend this analysis by incorporating bank governance variables, loan portfolio structures, or the role of digital credit monitoring tools. Cross-country comparisons with other ASEAN economies may also offer valuable insights into how structural reforms and supervisory frameworks influence NPL dynamics over time.

Policy Implications

Based on the empirical findings, several practical policy implications can be formulated to strengthen the financial stability of Vietnam's banking system and enhance the effectiveness of credit risk management.

First, credit risk management practices at the bank level should be strengthened through tighter credit appraisal procedures, more rigorous loan portfolio monitoring, and the development of robust early-warning systems. This is particularly important given the high persistence of NPLs identified in the study. By improving credit screening and monitoring capacity, banks can detect risk accumulation at an early stage, thereby reducing the probability of large-scale defaults and the need for costly loan loss provisioning.

Second, regulatory and supervisory frameworks should be enhanced. The State Bank of Vietnam (SBV) should intensify its supervision of banks, particularly those with persistently high NPL ratios, to ensure compliance with capital adequacy

standards and provisioning requirements in line with Basel II and Basel III. Stress testing should be conducted more frequently to assess the impact of credit shocks on bank balance sheets. Strengthening supervisory capacity will not only improve bank discipline but also reduce systemic vulnerabilities.

Third, macroeconomic policy coordination should be reinforced to maintain financial and price stability. Since inflation has been shown to significantly influence NPL levels, monetary and fiscal authorities should work together to manage inflation expectations and credit growth, thereby creating a more stable operating environment for banks. Countercyclical credit policies should be adopted to help mitigate the impact of macro-financial shocks on loan portfolios.

Fourth, technological innovation should be leveraged to enhance financial risk assessment. The integration of fintech solutions, big data analytics, and artificial intelligence into credit assessment, loan monitoring, and early-warning systems can improve the accuracy and timeliness of risk detection. This will enable banks to allocate capital more efficiently and respond proactively to credit deterioration.

Finally, capital buffers should be carefully calibrated to strike a balance between financial stability and credit expansion. The study shows that higher capital ratios may lead to increased risk-taking behavior. Therefore, regulatory authorities should apply risk-sensitive capital requirements and closely monitor banks' lending strategies to ensure that capital strength does not translate into excessive credit exposure.

Future Research Directions

This study is subject to certain limitations. It does not incorporate internal governance variables such as board structure, ownership concentration, or managerial incentives, which may also affect credit risk behavior. It also does not fully capture the effects of external global shocks. Future research should extend the analysis by including governance and market structure variables, employing higher-frequency or more granular data, and conducting cross-country comparisons, particularly within ASEAN, to provide deeper insights into NPL dynamics in emerging banking systems. Experimental or stress-testing frameworks may also be used to evaluate the resilience of banks under different macro-financial scenarios, thereby offering more actionable policy recommendations for both regulators and financial institutions.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

FUNDING

The Authors received no funding for this research.

CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ДЕТЕРМІНАНТИ Й СТІЙКІСТЬ НЕПРАЦЮЮЧИХ КРЕДИТІВ: ДАНІ В'ЄТНАМСЬКИХ АКЦІОНЕРНИХ КОМЕРЦІЙНИХ БАНКІВ

В умовах збереження непрацюючих кредитів (NPL) системним ризиком, що загрожує фінансовій стабільності та ефективності розподілу капіталу, оцінка їхньої стійкості та факторів, що впливають на їхню динаміку, має критичне теоретичне та практичне значення для банківської системи В'єтнаму. Це дослідження надає емпіричні дані щодо довгострокової стійкості непрацюючих кредитів та уточнює роль макроекономічних умов і специфічних для банку характеристик у поясненні їх коливань. Панельний набір даних, що включає 24 акціонерні комерційні банки, що котируються на біржі протягом 2010–2024 років, проаналізовано за допомогою додаткових економетричних методів, включаючи FE-кластер, FGLS, PCSE та двоетапні оцінки System GMM. Ці методи дозволяють одночасно контролювати гетероскедастичність, автокореляцію, залежність від поперечного перерізу та ендогенність. Отримані результати свідчать про сильну стійкість NPL із запізнілими коефіцієнтами NPL у діапазоні від 0,65 до 0,84 ($p < 0,01$), що вказує на те, що шоки NPL мають тенденцію зберігатися та поширюватися в часі. Прибутковість банків (ROA) має негативний і статистично значущий вплив на непрацюючі кредити, допомагаючи зменшити тиск на кредитні ризики. На противагу цьому, коефіцієнт капіталу позитивно пов'язаний із непрацюючими кредитами, що відображає

вищу толерантність до ризику серед банків із кращою капіталізацією. Інфляція має позитивний і значний вплив, водночас зростання ВВП демонструє обмежений вплив. Виходячи з цих результатів, у дослідженні запропоновано кілька політичних наслідків: посилення управління ризиками та антициклічного кредитного контролю; збільшення запасів капіталу; координація монетарної та фіскальної політики з метою стабілізації макроекономічного середовища; а також удосконалення потенціалу прогнозування та управління кредитними ризиками. Отримані результати надають надійні емпіричні докази для підтримки політиків, регулюючих органів і менеджерів банків у розробці стійких стратегій контролю непрацюючих кредитів, тим самим зміцнюючи стабільність фінансової системи В'єтнаму.

Ключові слова: непрацюючі кредити (NPL), в'єтнамські комерційні банки, стійкість NPL, панельні дані, економетричний аналіз, макрофінансові фактори, управління кредитними ризиками, фінансова стабільність, монетарна та фіскальна політика

JEL Класифікація: C33, G21, E44, G28, E52

DOI: 10.55643/fcaptp.1.66.2026.5005