Received:May 18, 2026;Revised:September 3, 2026;Accepted: September 15, 2026;Published: October 30, 2026

Macroeconomic and Bank Specific Risk Determinants of Credit Losses in the Philippine Setting: A Panel FMOLS and DOLS Approach

https://doi.org/10.58870/berj.v11i1.93

Maybelle A. Gallardo
College of Accountancy and Business
San Beda University, Manila, Philippines
mgallardo@sanbeda.edu.ph

Ria Marielle M. Bautista
College of Arts and Sciences
San Beda University, Manila, Philippines
rbautista@sanbeda.edu.ph

Abstract

The level of credit losses, which are important indicators of a bank's soundness and its ability to meet long-term obligations and generate income. Despite technological changes and research on reducing bank credit losses, empirical evidence on the long-run interaction between macroeconomic conditions and bank-level risk factors remains limited. This study examines these relationships to inform sustainable banking growth and financial flexibility. Macroeconomic variables include economic activity, unemployment, interest rates, exchange rates, and stock market performance, which can affect borrowers' repayment capacity and loan performance. Bank-level variables include profitability, ability to meet current obligations, capital adequacy, and lending assertiveness, reflecting management quality and risk-taking behavior. The study uses a quantitative, descriptive-correlational design and secondary panel data from five banking subsectors in the Philippines, covering 107 quarters from Q1 1999 to Q3 2025. Panel Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) estimations were used to examine long-run relationships, accounting for non-stationarity and cointegration. Corrective measures were applied to support the reliability of t-statistics and the robustness of standard errors in the Group-Mean Panel FMOLS and DOLS estimations. The Pedroni Panel Cointegration test and panel cointegrating regressions provided strong evidence of long-run equilibrium relationships between non-performing loans across the Philippine banking system and the selected macroeconomic and bank-specific factors. The findings may help banks, regulators, and policymakers improve credit-loss monitoring, support systemic stability, and contribute to inclusive and sustainable economic growth in line with SDGs 8 and 10.

Keywords: credit losses, macroeconomic risk, Philippine banking system, SDG#8, SDG#10

Background of the Study

A country with a secured and effective banking system significantly contributes to the economic development of any country. Banks play a crucial role in starting savings, directing funds to prolific speculations, and granting financial assistance to businesses and households. The most common denominator in determining banking sector soundness is the level of credit losses. It is generally measured through non-performing loan (NPL) ratios. When loans become non-performing, they reduce profitability, weaken capital positions, and restrain the ability to lend. If loan defaults continue to persist, these destabilize the broader financial system.

Effective credit risk management has escalating importance amidst continuing economic uncertainty, fluctuations in financial markets, and changes in borrower profiles. The latter include increased demand for loans, changing creditworthiness, and occurring repayment patterns. Furthermore, macroeconomic stressors such as increasing unemployment, unstable exchange rates, and higher interest rates reduce borrowers' ability to repay and elevate default risk. External shocks such as global financial crises or acts of nature may further weaken the economy, affecting the borrowers as well as banks. Concurrently, bank-specific factors include the grant of loan practices, adequacy of capital, ability to meet short-term obligations, and ability to generate income. It further determines how banking institutions acclimatize to these challenges. Understanding these variables significantly contributes to the early detection of bank credit losses and is essential for evaluating the resilience of the Philippine banking sector.

Empirical studies revealed that monetary decline, higher unemployment, escalating interest rates, and unpredictability of the financial market were associated with an increase in NPLs. These conditions severely impacted both households and firms by lessening income, increasing debt-servicing costs, and weakening financial position.

Banks with sufficient capitalization were generally able to absorb losses and preserve judicious borrowing standards. While banks are involved in rapid credit expansion, capital buffers may be more susceptible to increasing NPLs, especially during times of economic distress. Poor internal management significantly contributes to bank credit losses.

Existing studies probe either macroeconomic or bank-specific determinants in isolation, while others were focused on the short-term connection. In the Philippine context, empirical evidence on the long-run interaction between macroeconomic conditions and bank-level risk factors on various banking subsectors were insufficient. Hence, this gap limits the ability of banks and regulators to fully comprehend the consistent contributors to credit losses. Incorporating the two significant keys in determining credit losses using a single empirical framework shall provide significant insights that yield effective risk management, strengthened economic stability, and promotion of inclusivity and sustainability aligned with the United Nations SDG 8 and SDG 10.

This study has addressed the gap by employing a quantitative, explanatory research design examining the long-run determinants of credit losses in the Philippine banking system. Using panel data and applying Group-Mean Panel Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) methods, the study has estimated the long-run balance of relationships while taking into account for non-stationarity and endogeneity. The results of this study will greatly help multiple stakeholders. Banks may use the results of this research to further enhance their credit risk assessment, strengthen their internal controls, and align lending strategies with prevailing economic conditions. Regulators and policymakers will likewise benefit from this study since the results thereof were supported by evidence in line with supervision and regulation aimed at safeguarding monetary balance.

In reference to the United Nations' Sustainable Development Goals and Laudato Si': Integral Ecological Education, the San Beda University has aligned their Research Theme for AY 2025–2026 with the latter. Strengthening the financial system while promoting inclusivity, which was addressed in this study, has fully supported key human development goals: SDG-8 (Decent Work & Economic Growth) and SDG-10 (Reduced Inequalities).

Table 1.

Linkage of SBU Research Theme with the United Nation's SDG 8 (Decent Work and Economic Growth) and SDG10 (Reduced Inequalities)

SDG			Aims of SDG
08	Decent Work and Economic Growth	8.1 & 8.10	• By creating a model to forecast and manage significant risks, it greatly supports the financial institution. Lower NPL is an essential part for allocating capital efficiently, yielding to decent work and sustainable economic growth.
10	Reduced Inequalities	10.5	• The excessive NPL leads to financial crisis that severely affect the marginalized. The results of this study enhance the banking regulation while monitoring keeps it secured and robust. Source: https://www.udp.org

Statement of Research Problem

This study aims to investigate the main factors affecting credit losses in the Philippine banking system. Specifically, it seeks to answer the following:

1. What is the trend of the level of NPLs across the 5 banking sectors (universal banks, commercial banks, rural banks, thrift banks, and cooperative banks) for the past 25 years (1999Q1-2025Q3)?

2. What is the trend of the selected macroeconomic and bank-specific determinants for the past 25 years (1999Q-2025Q3)?
    a. Macroeconomic determinants
        i. Real Gross Domestic Product
        ii. Inflation Rate
        iii. BSP Policy Rate (Overnight Reverse Repurchase Rate)
        iv. Real Exchange Rate of the Peso (REER)
        v. Philippine Stock Exchange Index (PSEi)

b. Bank-specific determinants
    i. Solvency Ratio (Capital Accounts-to-Assets Ratio)
    ii. Liquidity Ratio (Loans-to-Deposits Ratio)
    iii. Lending Aggressiveness (Loans-to-Assets Ratio)
    iv. Profitability Ratio (Return-on-Equity)

3. Is there a significant long-run equilibrium relationship between the NPL levels across the 5 banking sectors and the selected macroeconomic and bank-specific determinants?

3. What conclusions and proposed policies can be formulated to aid in credit risk management and improve bank health across the Philippine banking system?

Statement of Specific Objectives

1. To determine the existence of a long-run cointegrating relationship between Philippine banking system NPLs and the selected macroeconomic and bank-specific factors.
2. To assess the long-run effect of macroeconomic conditions on NPLs.
3. To evaluate the long-run impact of bank-specific factors on credit losses.
4. To address the identified research gap and provide macroprudential insights for policy formulation

Review of Related Literature

To understand the true drivers of credit losses, existing literature can be synthesized through two primary lenses: external economic pressures and internal institutional behavior.

1. Macroeconomic Environment and Borrower Repayment Capacity

On the macroeconomic front, global and local studies consistently demonstrate that banking sectors remain highly vulnerable to systemic, economy-wide shocks. These external forces directly align with the "Bad Luck" Hypothesis of Berger and DeYoung (1995) and the Financial Intermediation Theory, illustrating how borrower repayment capacity is often disrupted by economic cycles entirely outside a bank's control.

1.1. Cyclical Economic Health and Income Stability

Borrower repayment capacity has been fundamentally linked to an economy's broader cyclical health. Economic expansion, typically represented by Gross Domestic Product (GDP) growth, consistently acts as a natural cushion against credit risk by facilitating business expansion and wage growth (Beck et al., 2013; Le and Le, 2023). Conversely, economic contractions inevitably deteriorate both household and corporate cash flows. Economic downturns and sluggish economic activity directly connect to a corresponding rise in unemployment, which severs income stability and repayment sources for borrowers. Empirical evidence across developed and emerging economies confirms that contracting GDP and elevated unemployment both have had a compounding impact on borrower loan defaults (Goyal et al., 2023; Salas et al., 2024). In the Philippine banking context, robust economic growth has been proven essential in improving borrower resilience and reducing NPL ratios across commercial and savings banks (Punzalan & Leon-Gonzales, 2021). Viray and Bato (2025) further linked debt service to variables such as GDP, inflation, exchange rates, and foreign investment to borrowers' capacity to repay loans.

1.2. Monetary and Financial Market Volatility

Apart from real economic cycles, borrower repayment capacity and credit performance are likewise heavily associated with monetary and financial market volatility, i.e., changes in borrowing cost, inflation, and capital market conditions. Escalating inflation diminishes consumer purchasing power. And when compounded by rising policy rates, debt-servicing costs of households and corporations would be significantly inflated (Albert, et. al., 2012; Viray & Bato, 2025). Empirical studies across different countries confirm that higher lending and interest rates directly correlate with increased NPLs by straining the cash flows of borrowers (Beck et al., 2013; Salas et al., 2024). Moreover, external shocks may further amplify domestic pressures. Fluctuations in the real effective exchange rates expose borrowers to foreign currency distress and financial unpredictability (Khemraj & Pasha, 2009). Similarly, broader capital market conditions such as declining stock prices or stock market downturns as represented by indicators like PSEi reflect systemic monetary stress and

investor uncertainty, with market contractions frequently coinciding with heightened credit risk (Gallardo & Viray, 2025).

2. Bank-Specific Determinants and Institutional Risk Management

While macroeconomic shocks establish the external environment, a bank's resilience can also be determined by its internal balance sheet management in line with the "Moral Hazard," "Bad Management," and "Skimping" hypotheses posited by Berger and DeYoung (1995) and with theories pertinent to financial intermediation and credit risk management. Global and local existing literature explored how internal bank decisions and institutional risk management can reflect a bank's vulnerability against systemic shocks and credit losses.

2.1. Solvency and Capital Adequacy

An institution's solvency condition reflects its ability to meet its long-term obligations and unexpected shocks. Empirical studies consistently demonstrate that inadequate capital accounts and low solvency ratios directly correlate with higher NPL ratios (Klein, 2013; Salas et al., 2024). Prudente and Areola (2025) further highlighted the importance of internal efficiency and strategic practices, which advocated maintaining sufficient capital levels. Robust capital buffers are highly significant in absorbing potential losses and maintaining financial stability.

2.2. Liquidity Condition

Liquidity dictates the ability of the company to meet its short-term obligations. Louzis et al. (2010) suggested that banks with feeble liquidity standing experience higher credit losses, especially during economic stress. Contrarily, adequate liquidity allowed banks to withstand the operations and manage unpredictable monetary financial pressures. This study further recommended that maintaining balanced liquidity levels was important in alleviating susceptibility to credit risk.

2.3. Lending Aggressiveness

Lending aggressiveness disclosed the level of a bank's exposure to risk through its main borrowing activities. Higher loan-to-assets ratios indicated greater credit exposure, which is prone to credit losses. Klein (2013) revealed that unnecessary loan growth was associated with higher NPLs since increased exposure led to feebler loan quality over time. The results recommend that

maintaining judicious levels of lending relative to assets is crucial for managing credit risk and preventing aggressive over-extension.

2.4 Profitability and Management Effectiveness

Profitability ratio reflects an institution's ability to generate income as well as its management effectiveness and capacity to absorb losses. Klein (2013) disclosed results that lower profitability was due to higher future NPLs. Recent global studies validated the findings that banks that are more profitable generally manifested lower credit losses (Salas et al., 2024; Goyal et al., 2023). Prudente and Areola (2025) emphasized that sustained return on equity supported better credit risk management and lessened the likelihood of NPLs.

To summarize, the reviewed literature demonstrates that credit losses are collectively shaped by external macroeconomic forces and internal institutional behavior, grounded on the four hypotheses of Berger and DeYoung (1995) and the established theories on financial intermediation and risk management. However, a critical gap persists in the empirical evaluation of the true drivers of credit losses, especially in the Philippine banking context. While past research has mapped out immediate or short-run risk factors, empirical studies on long-run equilibrium relationships between credit losses among specialized banking subsectors and their exogenous and endogenous drivers, as well as suggestive evidence of "bad debt stickiness" prevalent among banks, have been rarely accounted for. Also, the traditional static models often miss structural breaks and are unable to capture how deeply institutions respond to major global crisis shocks such as the 2008-GFC and 2020 COVID-19 pandemic over time. By applying advanced panel cointegration techniques (Group-Mean Panel FMOLS and DOLS) to distinct Philippine banking subsectors, this study is able to present these findings in order to provide a sharper perspective for safeguarding financial stability.

Theoretical Framework/Philosophical Underpinning

This study is grounded on established theories pertinent to financial intermediation and credit risk management, which collectively suggest that credit losses are jointly determined by macroeconomic factors as well as bank-specific conditions. Relevant to this theoretical framework are the four hypotheses proposed by Berger and DeYoung (1995).

The "Bad Luck Hypothesis" suggests that adverse macroeconomic factors such as economic downturns, exchange rate volatility, and unemployment deteriorate the repayment capacity of borrowers and worsen NPLs.

In contrast, the "Bad Management" and "Skimping" hypotheses highlight internal efficiency and have specifically noted that poor loan screening, weak account monitoring, or underinvestment in risk management eventually lead to higher credit losses. Additionally, the "Moral Hazard" hypothesis emphasizes how weakly capitalized banks or those with aggressive lending practices are more likely to engage in excessive risk-taking, which consequently increases bank NPLs.

Integrating these perspectives with financial intermediation and risk management theories provides a comprehensive view of how banks allocate resources while balancing stability and profitability. Financial intermediation theory views banks as essential conduits that transform deposits into loans, a process that requires navigating both systemic economic pressures and internal operational risks. Furthermore, the theories of risk-taking behavior and managerial efficiency suggest that banks with prudent lending strategies and robust capital buffers are better equipped to absorb external shocks. Ultimately, these frameworks indicate that credit losses emerge from the interplay between broad economic forces and specific institutional decisions, providing a clear lens through which to analyze the stability of the Philippine banking system.

Conceptual Framework

Theoretical Drivers & Exogeneous / Endogenous Risk Determinants	Econometric Estimation Strategy	Long-run Equilibrium & Macroprudential Insights for Policy Formulation
Financial Intermediation & Bad Luck (Macroeconomic Factors): Real GDP, Inflation Rate, Unemployment Rate, BSP Policy Rates, REER, PSEI **Risk Management & Internal Behavior (Bank-specific Factors):** Solvency Ratio (Moral Hazard), Liquidity Ratio (Skimping), Lending Aggressiveness, Profitability & ROE (Management)	Panel Unit Root & Pedroni Cointegration Testing Primary Tool: Group-Mean Panel FMOLS Supplementary Tool for Robustness Check; Group-Mean Panel DOLS Structural Breaks & Systemic Shocks (Dummies): 2008 Global Financial Crisis and 2020 COVID-19 Pandemic Corrective Measures: HAC Standard Errors, Bartlett Kernel, Newey-West	Empirical Proof of "Bad Debt Stickiness" & Residual Persistence Forward-Looking Early Warning Indicator Systems Credit "Speed Limits" and Stress-Testing Policy Formulation

Figure 2 maps out the analytical progression of this study from theoretical risk drivers to macroprudential insights for policy formulation. The first phase reflects the theoretical forces that drive credit losses, such as the exogenous macroeconomic shocks, which sought to test the "Bad Luck" Hypothesis and Financial Intermediation Theory, and endogenous bank-specific behaviors, which sought to test the "Moral Hazard", "Skimping" and "Bad Management" Hypotheses and the Risk Management Theory.

As shown in the second phase, these theoretical determinants are then processed through econometric estimation strategies such as the Group-Mean Panel FMOLS (primary tool) and Panel DOLS (supplementary tool) to determine the long-run equilibrium relationship between Philippine banking credit losses and the selected exogeneous (macroeconomic) and endogenous (bank-specific) risk determinants. Additionally, these models had integrated dummy variables to control for structural breaks during major global crises such as the 2008 Global Financial Crisis (GFC) and the 2020 COVID-19 Pandemic.

The third phase reflects how this study also seeks to provide considerable evidence on the existence of "bad debt stickiness" among Philippine banks and advocate for proactive policy measures, including the forward-looking early warning indicator systems and the targeted credit growth "speed limits."

Hypothesis

H_{o1}: Macroeconomic risk factors have no significant impact on credit losses in the Philippine banking system.

H_{o2}: Bank-specific risk factors have no significant impact on credit losses in the Philippine banking system.

H_{o3}: There is no significant long-run co-integrating relationship between macroeconomic risk factors, bank-specific risk factors, and credit losses.

Methodology

This study employed a descriptive research design using a quantitative approach to examine the long-run relationship between macroeconomic risk factors, bank-specific risk factors, and credit losses in the Philippine banking system.

This study relies exclusively on secondary data for the past 25 years, from 1999Q1-2025Q3. All required data were obtained from official government records and publicly available databases. The use of secondary data promotes efficiency in data gathering while ensuring the reliability and consistency of the information used in the study.

Secondary data were gathered from various government agencies such as Bangko Sentral ng Pilipinas, the Philippine Statistics Authority, and the Philippine Stock Exchange. These institutions provide regularly published macroeconomic indicators, financial statistics, and banking sector data widely used in academic research and policy analysis. The study accesses the data through official websites and publications and employs them strictly for scholarly purposes.

Data access is supported by the Freedom of Information Act, and all sources are properly acknowledged. The study complied with ethical standards of transparency, accuracy, and responsible data use.

Data Analysis / Analytical tool

Data analysis was drawn in descriptive statistics to classify trends and patterns in the variables. To estimate the long-run relationships of macroeconomic and bank-specific risk factors on NPLs across the 5 Philippine banking subsectors for the period 1999Q1-2025Q3, the study applied the Group-Mean Panel FMOLS as the primary tool and the Group-Mean DOLS as the supplementary tool for a consistency check. In the similar study of Jalali et al. (2023), which examined the determinants of NPLs across the E7 states, particularly Brazil, China, India, Indonesia, Mexico, Russia, and Turkey, both the Panel FMOLS and DOLS estimation techniques had been utilized for the panel data originating from these countries.

Both approaches were preferred over the Panel Ordinary Least Squares (OLS) because although OLS is super consistent, it still suffers from second-order bias caused by the presence of endogeneity common in

panel data that could not be eliminated asymptotically, resulting in persistent size distortions even in large samples (Pedroni, 2000). Developed by Phillips and Moon (1999), Pedroni (2000 and 2001), and Kao and Chiang (2000), Panel FMOLS corrects for these distortions non-parametrically using a long-run covariance matrix to deliver asymptotically unbiased, nuisance parameter-free estimators. Conversely, Panel DOLS corrects for these biases parametrically by adding leads and lags of the first-differenced regressors. Both models effectively neutralize finite-sample biases arising from endogeneity (two-way or feedback loop effect), serial correlation, and cross-sectional heterogeneity.

To further ensure that the bias of serial correlation (high persistence of residuals) would be addressed and to ensure reliable inferences in a dataset featuring a large time dimension (T=107) and small cross-sections, (N=5), the study implements Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors. This procedure is paired with the Bartlett Kernel and Newey-West automatic bandwidth procedures. Such methods were utilized in coherence with the papers of Pedroni (2000), Pedroni (2001), Dmitrios et al. (2016), Andrews (1991), Kao and Chiang (2000), Philips and Hansen (1990), Newey and West (1994), and Kiefer and Vogeslang (2002).

For the statistical treatment procedures, the following steps were undertaken with the use of EViews 14: (1) unit root testing to verify non-stationarity; (2) Pedroni panel cointegration testing to confirm the presence of long-run equilibrium relationships; (3) lag length selection with the aid of Akaike Information Criterion (AIC); (4) pre-diagnostic testing using Pesaran Cross-sectional Dependence Test and Correlogram Analysis; (5) final model estimation through the Group-Mean Panel FMOLS (primary) and DOLS (supplementary) frameworks; and (6) individual and joint Wald Test to detect evidence of sensitivity of NPLs and Real GDP to crisis-related shocks such as 2008-GFC and COVID-19.

The model specifications for both panels cointegrating regression estimations are as follows:

PANEL FMOLS MODEL SPECIFICATION -Primary Tool (Model 1 of Appendix 5)	Where:
$$ln(NPL)_{it} = \alpha_i + \delta_{it} + \phi_1 DGFC_t + \phi_2 DCOVID_t + \psi_1(DGFC_t \times RGDP_SA_t) + \psi_2(DCOVID_t \times RGDP_SA_t) + \beta'_{i,1} X_t + \beta'_{i,2} X_{t-k} + \gamma'_{i,1} Z_{it} + \gamma'_{i,2} Z_{it-k} + u_{it}$$	$ln(NPL)_{it}$ = the level of non-performing loans (in logarithmic form) of *i* banking sector at quarter *t* α_i = the individual intercepts of banking subsector *i* δ_{it} = the deterministic time trend component ϕ_1 and ϕ_2 = the coefficient estimates for the standalone deterministic crisis controls, DGFC and DCOVID $DGFC_t$ = the deterministic dummy variable for the 2008 Global Financial Crisis (DGFC) $DCOVID_t$ = the deterministic dummy variable for the 2020 COVID-19 Pandemic (DCOVID) ψ_1 and ψ_2 = the long-run coefficient estimates specifically capturing the sensitivity of NPLs to Real GDP during crisis periods $DGFC_t \times RGDP_SA_t$ = the interaction term between DGFC dummy and Real GDP (Seasonally-Adjusted) $DCOVID_t \times RGDP_SA_t$ = the interaction term between DCOVID dummy and Real GDP (Seasonally-Adjusted) $\beta'_{i,1}$ = the long-run coefficient estimates of the current macroeconomic variables X_t = the vector of macroeconomic variables at current time *t* (e.g., Seasonally-Adjusted Real GDP, Inflation Rate, BSP Overnight RRP Rates, Unemployment Rate, REER, PSEi) $\beta'_{i,2}$ = the long-run coefficient estimates of the *k*-lagged macroeconomic variables (k = 1,…,5) X_{t-k} = the vector of *k*-lagged macroeconomic variables (k = 1,…,5) $\gamma'_{i,1}$ = the long-run coefficient estimates of the current bank-specific variables. $Z_{i,t}$ = the vector of bank-specific variables at current time *t* (e.g., Solvency Ratio, Liquidity Ratio, Lending Aggressiveness Ratio, Profitability Ratio) $\gamma'_{i,2}$ = the long-run coefficient estimates of the *k*-lagged bank-specific variables (k = 1,…,5) Z_{it-k} = the vector of *k*-lagged bank-specific variables (k = 1,…,5) u_{it} = the idiosyncratic error term. Note: Real GDP data series had been seasonally-adjusted with the use of Seasonal-Trend decomposition (LOESS) technique to remove the seasonal spikes or noises that usually recur in time series data to capture the structural impact of economic output growth as one of the drivers of credit losses.

PANEL DOLS MODEL SPECIFICATION-Supplementary Tool (Model 1 of Appendix 5)

$$ln(NPL)_{it} = \alpha_i + \delta_k + \phi_1 DGFC_t + \phi_2 DCOVID_t + \psi_1(DGFC_t \, x \, RGDP_SA_t) + \psi_2(DCOVID_t \, x \, RGDP_SA_t) + \beta'_{i,1} X_t + \gamma'_{i,1} Z_{it} + \sum_{j=-p}^{q} \theta_{ij} \Delta W_{i,t+j} + u_{it}$$

Where:

$ln(NPL)_{i,t}$ = the level of non-performing loans (in logarithmic form) of *i* banking sector at quarter *t*

α_i = the individual intercepts of banking subsector *i*

δ_k = the deterministic time trend component

ϕ_1 and ϕ_2 = the coefficient estimates for the standalone deterministic crisis control, DGFC and DCOVID

$DGFC_t$ = the deterministic dummy variable for the 2008 Global Financial Crisis (DGFC)

$DCOVID_t$ = the deterministic dummy variable for the 2020 COVID-19 Pandemic (DCOVID)

ψ_1 and ψ_2 = the long-run coefficient estimates specifically capturing the sensitivity of NPLs to Real GDP during crisis periods

$DGFC_t \, x \, RGDP_SA_t$ = the interaction term between DGFC dummy and Real GDP (Seasonally-Adjusted)

$DCOVID_t \, x \, RGDP_SA_t$ = the interaction term between DCOVID dummy and Real GDP (Seasonally-Adjusted)

$\beta'_{i,1}$ = the long-run coefficient estimates of the current macroeconomic variables

X_t = the vector of macroeconomic variables at current time *t* (e.g., Seasonally-Adjusted Real GDP, Inflation Rate, BSP Overnight RRP Rates, Unemployment Rate, REER, PSEi)

$\gamma'_{i,1}$ = the long-run coefficient estimates of the current bank-specific variables

$Z_{i,t}$ = the vector of bank-specific variables at current time *t* (e.g., Solvency Ratio, Liquidity Ratio, Lending Aggressiveness Ratio, Profitability Ratio)

u_{it} = the idiosyncratic error term.

PANEL DOLS CORRECTIONS

$\sum_{j=-p}^{q} \theta_{ij} \Delta W_{i,t+j}$ = the additional leads and lags regressors selected by AIC

θ_{ij} = the coefficient estimates of the leads and lags capturing the correlation between the error term and the macroeconomic and bank-specific independent variables to ensure that the long-run coefficient estimates remain unbiased

$\Delta W_{i,t+j}$ = the sum of all the *p*-lagged and *q*-led first-differences of all macroeconomic and bank-specific independent variables (W) for banking subsector *i* at time t shifted by *j*.

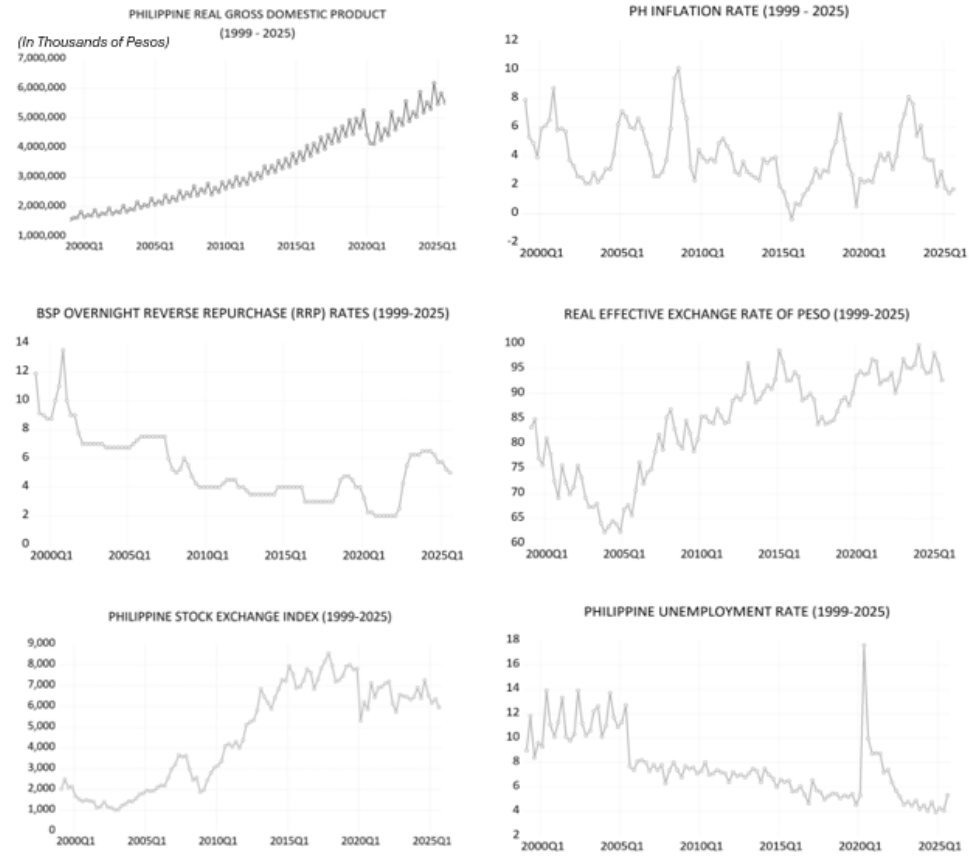
Notes:

1. Real GDP data series had been seasonally-adjusted with the use of Seasonal-Trend decomposition (LOESS) technique to remove the seasonal spikes or noises that usually recur in time series data to capture the structural impact of economic output growth as one of the drivers of credit losses.

2. Following the standard DOLS estimation procedures, the short-run dynamics and endogeneity corrections are handled strictly via the automatic inclusion of the leads and lags of the first-differenced regressors, omitting manual level lags to prevent over-parametrization.

Results and Discussion

Trend Analysis: Macroeconomic Determinants



Over the past 25 years, the Philippine economy maintained a generally upward growth trajectory driven by consumption, investments, and export revenues (Viray & Gallardo, 2025). The Philippines was able to successfully overcome the economic challenges brought about by the 1997 Asian Financial Crisis (AFC) and had demonstrated resilience during the 2008-GFC. Expansionary monetary policy, a steady flow of overseas remittances, and an expanding Business Process Outsourcing (BPO) sector had all aided the economy in dodging a full-blown recession.

Having achieved economic resilience, this eventually paved the way for a "Golden Era" of economic growth from 2010-2019. During Pres.Aquino's administration, the Philippines secured its first investment-grade credit rating upgrade, transitioning from being the "Sick Man of Asia"

to being the "Rising Tiger of Asia" (World Bank, 2013). With the upgrade to investment-grade credit rating, the government was able to secure more financing opportunities especially for its massive infrastructure projects, which fueled the "Build, Build, Build" campaign under Pres.Duterte's administration. However, with the onset of the COVID-19 pandemic in 2020, the upward trajectory of Philippine economic growth faced an abrupt stop, especially due to the implementation of nationwide lockdowns, massive layoffs, and business closures. In 2020, Philippine GDP faced a contraction of -9.5% (Conchada & Tiongco, 2021). Despite a post-pandemic economic recovery having started in 2022, domestic growth again decelerated by mid-2025 due to scandals related to flood control projects and other corruption issues that dampened investor confidence and caused public infrastructure expenditure tightening.

Over the past 25 years, the approach to monetary policy faced a structural shift in line with BSP's primary objective of achieving price stability. In January 2002, BSP shifted to an inflation targeting framework, moving away from its previous monetary targeting approach, which was deemed no longer effective due to the weakening relationship between money supply and prices of volatile commodities that had contributed to high inflation during the late 90s. Despite the significant supply-side and cost-push pressures on domestic prices, the inflation rate had averaged at 3.99% across the past 25-year horizon. Generally, domestic prices had remained stable except when temporary inflationary spikes had occurred as a result of tax reform implementation (i.e., E-VAT Law in 2005; TRAIN Law in 2018) and emergence of global oil and commodity shocks (e.g., Russia-Ukraine War in 2023).

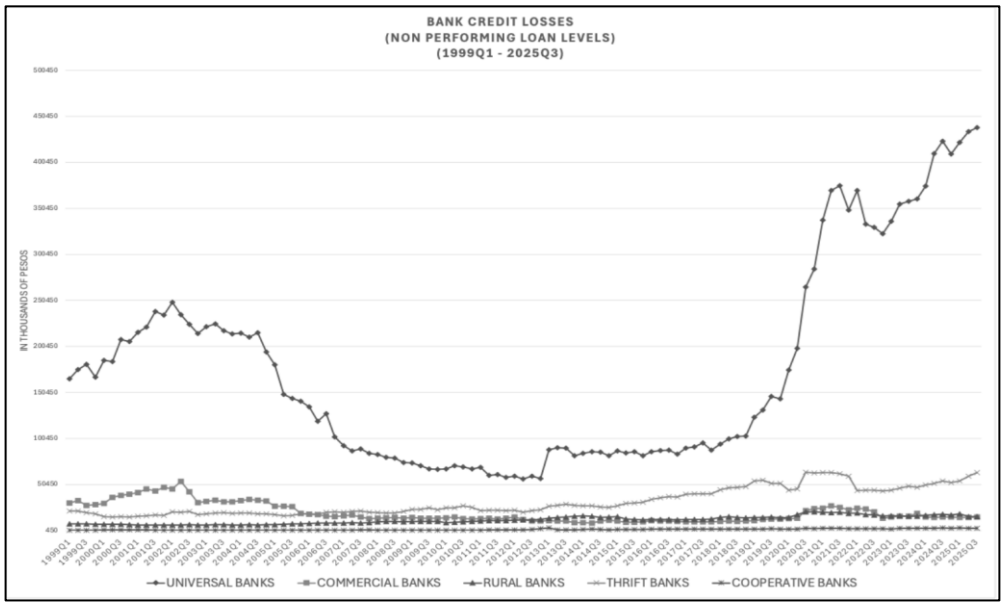
The PSEi reflected the psychological and financial ups and downs of the Philippine economy over the past 25 years. With the aftermath of the 1997 AFC combined with political instability during the early 2000s, PSEi reached a trough of 1,018.4 in 2002. However, fiscal reforms and steady economic growth fueled a historic bull run between 2010-2018, driving the bourse to a record closing peak of 8,558.42 in late 2017 (Viray & Gallardo, 2025). However, PSEi had stagnated starting in 2020. COVID-19 aftermath alongside the corruption scandals in 2025 that slowed down economic growth pushed massive foreign capital outflows that resulted to billions worth of net foreign selling. In 2025, PSEi dipped to 5,953.46 with an undervalued price-to-earnings ratio of 9.4x (PSE, 2026).

Over the 25-year horizon, the domestic labor market faced structural improvements. From 1999-2004, the average unemployment rate was at 11.09%. In 2005, a new formula for the unemployment rate had been adopted in line with the ILO definition. With steady economic growth, the unemployment rate faced a downward trajectory. By late 2019, the unemployment rate had dropped to 4.54%. The unemployment rate, however, reached a temporary all-time high of 17.6% by mid-2020, likely due to nationwide lockdowns, which triggered massive layoffs. Post-pandemic economic recovery alongside rapid digitalization, which spurred new work opportunities, caused the local unemployment rate to drop to pre-pandemic levels in 2025.

Trend Analysis – Bank-Specific Indicators

Figure 10.

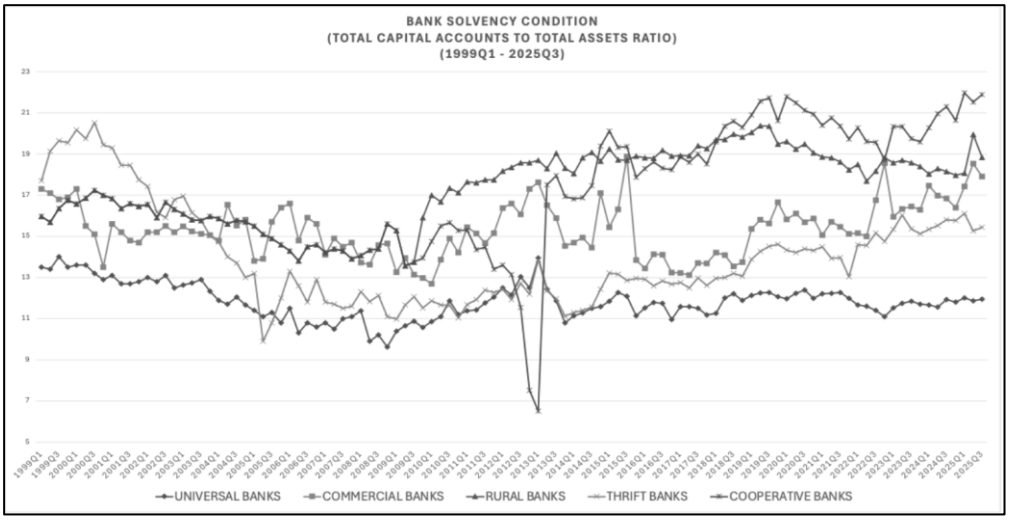
Non-Performing Loan Levels across Philippine Banking Subsectors from 1999Q1 to 2025Q3



Source: Banko Sentral ng Pilipinas

Figure 11.

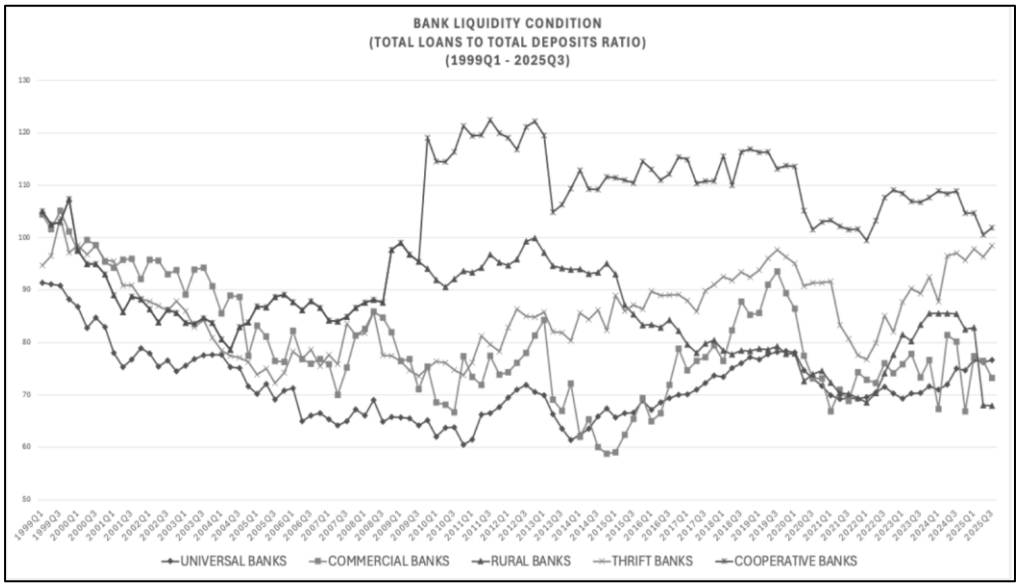
Solvency Ratio Trend across Philippine Banking Subsectors from 199Q1 to 2025Q3



Source: Banko Sentral ng Pilipinas

Figure 12.

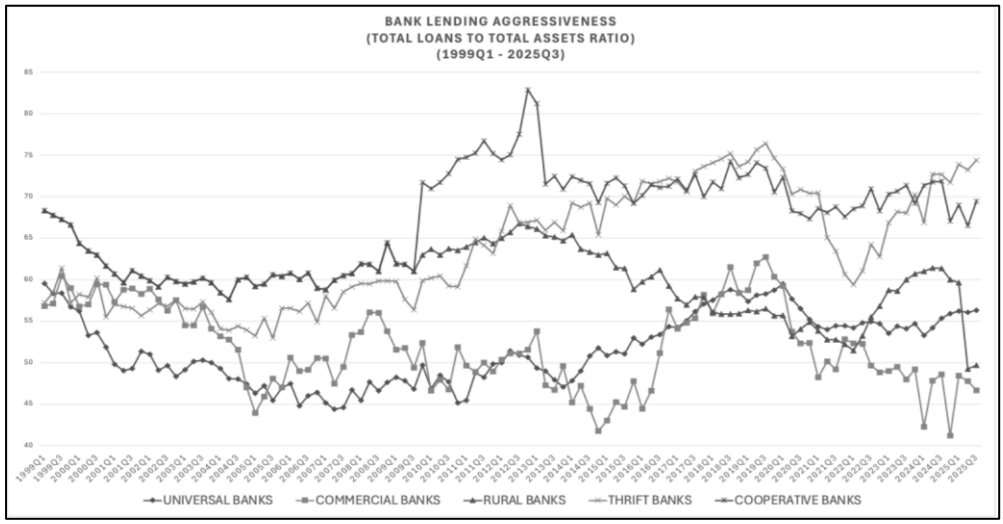
Solvency Ratio Trend across Philippine Banking Subsectors from 199Q1 to 2025Q3



Source: Banko Sentral ng Pilipinas

Figure 13.

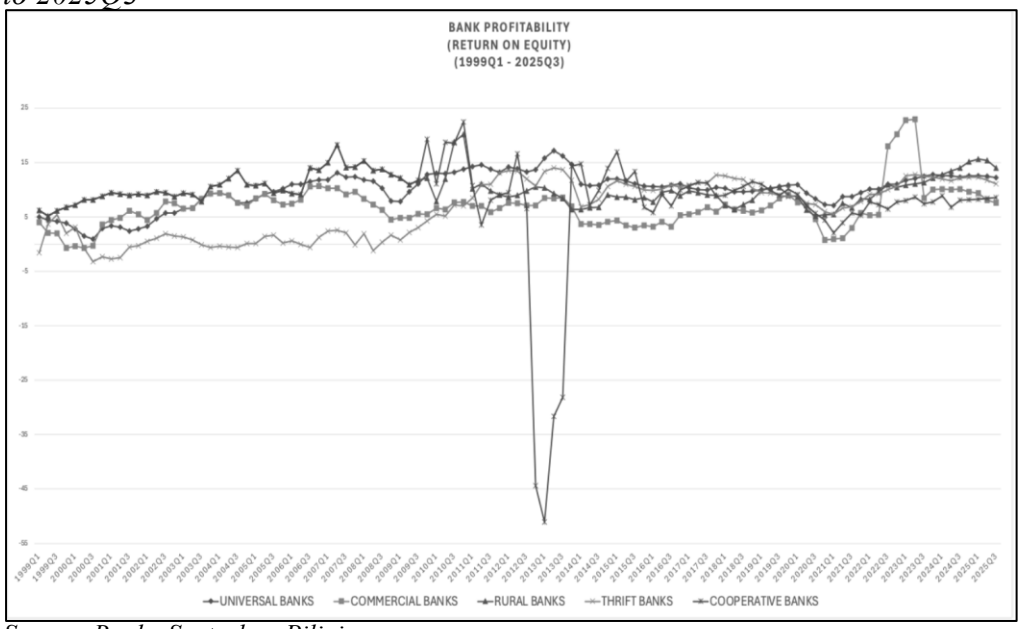
Lending Aggressiveness Trend across 5 Philippine Banking Subsectors from 199Q1 to 2025Q3



Source: Banko Sentral ng Pilipinas

Figure 14.

Profitability Ratio Trend across Philippine Banking Subsectors from 199Q1 to 2025Q3



Source: Banko Sentral ng Pilipinas

Over the past 25 years, NPLs across all Philippine banks grew steadily alongside a massive expansion in total loan portfolio. Universal banks shouldered the highest NPLs likely due to their huge economies-of-scale while the small-scale cooperative banks garnered the lowest NPLs. Nevertheless, bank asset quality was not just driven by macroeconomic factors but also by regulatory reforms that changed the local banking landscape. In 2014, BSP Circular No.772 pushed for more transparency by requiring banks to reintegrate accounts tagged as "Loans-in-Litigation" back into their gross NPL reporting.

Gathered BSP data also revealed how vulnerable smaller banks are to certain shocks. When Super Typhoon Yolanda destroyed a multitude of agricultural livelihoods across the Visayan region in 2014, NPLs among cooperative banks temporarily spiked as agricultural borrowers were unable to pay off their loans with cooperative banks. The localized yet temporary NPL spike among cooperative banks in 2014 was also the result of the mandatory gross NPL reportorial requirement per BSP Circular No. 772 during the simultaneous state-backed mergers (Strengthening Program for Cooperative Banks). To protect the banking system from a systemic downfall during major economic crises such as the 1997-AFC and COVID-19 pandemic, legislative interventions such as the Special Purpose Vehicle Act of 2002 and the Financial Institutions Strategic Transfer of 2021 were implemented to quickly offload NPAs and stabilize banks' balance sheets.

While bank solvency ratios had comfortably exceeded the Basel III requirements, a clear inverse relationship had emerged between economies-of-scale and capital buffers. Universal banks operated with the lowest solvency ratios (averaging 11.84%) leveraging sophisticated internal risk frameworks and diversified earnings streams (Dakila, 2019). Meanwhile, rural and cooperative banks maintained the highest buffers, averaging 17.37% and 17.18%, respectively, to insulate their capital from the high default volatility inherent in rural and small-scale agricultural lending.

Likewise, liquidity profile and lending aggressiveness varied according to bank size. The tightly stretched liquidity position triggered by the 1997-AFC gradually declined within the past 25-year horizon. By late 2025, universal and commercial banks had cooled off their lending aggressiveness (with 51.89% and 51.59% average, respectively) as these banks pivoted towards liquid government treasuries. In the case of thrift and rural banks, state-backed consolidations achieved long-term liquidity stability. Conversely, cooperative banks chose to operate with highly

stretched liquidity and aggressive lending posture, with loan-to-deposit ratios exceeding 100% from 2009-2025 to honor their core mandate of expanding rural credit access.

Empirical Results & Findings

Results of the Panel Data Diagnostic Tests

Appendices 1, 2, 3, 4 and 7 exhibit the results of the conducted diagnosis tests. The correlogram analysis (Appendix 1) confirmed the persistence of residuals from the panel cointegrating regression results, considerably suggestive of 'bad debt stickiness' commonly practiced by banks. Bad debt, as evidenced by NPL levels, remains sticky for relatively longer periods since loan accounts that had been classified as bad debt or as NPLs cannot be reverted instantly in banks' balance sheets. Loan accounts classified as NPLs would usually remain in the balance sheets for several to many quarters because of the slow and lengthy administrative, litigation, and foreclosure procedures prevalent in the local banking system as banks attempt to make efforts to recover from the losses incurred from problematic loan accounts. Also, the practice of 'loan evergreening' has become quite prevalent among Philippine banks. Loan evergreening is a bank practice wherein new loans would be granted to a specific borrower just to pay off the outstanding loans that have already been classified as non-performing instead of collecting actual payment. Similarly, the prevalence of "bad debt stickiness" among global bank data and the presence of serial correlation among banking residuals in the Pakistani region were also mentioned in the NPL studies of Ozili (2019) and Ahmad and Bashir (2013), respectively.

The panel unit root test results (Appendix 2) confirm that there is non-stationarity or presence of unit root among the gathered panel data by the researchers, while the Pedroni panel cointegration test results (Appendix 3) confirm the presence of long-run cointegrating equilibrium relationships between NPLs across Philippine bank subsectors as well as the macroeconomic and bank-specific variables.

Meanwhile, the Pesaran cross-section dependence test results (Appendix 4) confirm that there is no significant cross-section dependence among the selected macroeconomic and bank-specific variables for this study. Consequently, these diagnostic results strongly suggest the use of Panel FMOLs and DOLS (using Group-Mean method) to determine the

long-run impact of the macroeconomic and bank-specific determinants as drivers of credit losses.

Finally, the Wald test results (Appendix 7) provide evidence of crisis-related sensitivity in Real GDP-to-NPL relationship during crisis periods such as the 2008-GFC and COVID-19 pandemic. In the individual Wald tests, the GFC interaction term was significant under both Panel FMOLS and DOLS. However, for the COVID-19 interaction term, the results were mixed. The positive COVID-19 interaction is only significant under Panel DOLS thereby suggester a weaker inverse relationship during the pandemic. In the joint Wald tests, the joint effect under Panel DOLS is highly significant at 1% while it is only significant at 10% under Panel FMOLS. Hence, evidence of crisis sensitivity is stronger during 2008-GFC whereas the COVID-19-related and joint findings remain dependent on the estimation method used.

Panel FMOLS & DOLS Estimation Results

Appendix 5 presents the Group-Mean Panel FMOLS estimation results (primary estimation tool) while Appendix 6 presents the Group-Mean Panel DOLS estimation results (supplementary tool)
which reveal the long-run equilibrium relationship between NPLs of the 5 Philippine banking subsectors – universal, commercial, thrift, rural and cooperative banks and the selected macroeconomic and bank-specific determinants.

Figure 15a.

Summary of Statistically Significant Long-Run Determinants of Philippine Bank NPLs

Variable	FMOLS Long-Run coefficient Estimates	FMOLS p-value	FMOLS significance	DOLS Long-Run Coefficient Estimates	DOLS p-value	DOLS significance
A. Contemporaneous variables and crisis interactions significant in at least one estimator						
Real GDP (RGDP_SA)	1.0503	0.0031	1% (***)	0.6088	0.4206	*NS*
BSP Overnight RRP rate (BSPRRP)	0.0395	<0.0001	1% (***)	0.0290	0.0304	5% (**)
Unemployment rate (UNEMP)	0.0193	<0.0001	1% (***)	0.0369	0.0385	5% (**)
Real effective exchange rate (REER)	0.1709	0.2717	*NS*	0.6493	0.0372	5% (**)
Philippine Stock Exchange Index (PSEI)	-0.0989	0.0646	10% (*)	-0.2035	0.0203	5% (**)
Capital accounts-to-assets ratio	-0.0148	0.0963	10% (*)	-0.0458	0.0580	10% (*)
Return on equity (ROE)	-0.0053	0.2685	*NS*	-0.0263	0.0001	1% (***)
Loans-to-deposits ratio (LDR)	-0.0118	0.0009	1% (***)	0.0320	<0.0001	1% (***)
Loans-to-assets ratio (LAR)	0.0243	0.0001	1% (***)	0.0434	0.0015	1% (***)
DGFC x RGDP_SA	-3.4309	0.0373	5% (**)	-6.0038	0.0110	5% (**)
DCOVID x RGDP_SA	-0.0564	0.8824	*NS*	0.8706	0.0353	5% (**)

Figure 15b.

Summary of Statistically Significant Long-Run Determinants of Philippine Bank NPLs

Variable	FMOLS Long-Run coefficient Estimates	FMOLS p-value	FMOLS significance	DOLS Long-Run Coefficient Estimates	DOLS p-value	DOLS significance
B. Statistically significant FMOLS lagged-level regressors						
Inflation rate, 1-quarter lag [INF(-1)]	-0.0185	0.0006	1% (***)	-	-	*Not estimated*
Inflation rate, 4-quarter lag [INF(-4)]	0.0173	0.0021	1% (***)	-	-	*Not estimated*
Inflation rate, 5-quarter lag [INF(-5)]	-0.0109	0.0632	10% (*)	-	-	*Not estimated*
BSP RRP rate, 5-quarter lag [BSPRRP(-5)]	0.0288	0.0002	1% (***)	-	-	*Not estimated*
REER, 5-quarter lag [REER(-5)]	-0.3118	0.0439	5% (***)	-	-	*Not estimated*
Real GDP, 1-quarter lag [RGDP_SA(-1)]	-0.7044	0.0062	1% (***)	-	-	*Not estimated*
Real GDP, 2-quarter lag [RGDP_SA(-2)]	-0.3808	0.0424	5% (***)	-	-	*Not estimated*
Real GDP, 4-quarter lag [RGDP_SA(-4)]	-0.2102	0.0004	1% (***)	-	-	*Not estimated*
PSEI, 3-quarter lag [PSEI(-3)]	-0.1040	0.0694	10% (***)	-	-	*Not estimated*
Unemployment, 1-quarter lag [UNEMP(-1)]	0.0188	<0.0001	1% (***)	-	-	*Not estimated*
Unemployment, 3-quarter lag [UNEMP(-3)]	0.0103	0.0145	5% (***)	-	-	*Not estimated*
LAR, 1-quarter lag [LAR(-1)]	-0.0174	0.0088	1% (***)	-	-	*Not estimated*
LAR, 2-quarter lag [LAR(-2)]	-0.0114	0.0812	10% (***)	-	-	*Not estimated*
LAR, 5-quarter lag [LAR(-5)]	-0.0109	0.0615	10% (***)	-	-	*Not estimated*
LDR, 2-quarter lag [LDR(-2)]	0.0127	0.0017	1% (***)	-	-	*Not estimated*
LDR, 5-quarter lag [LDR(-5)]	0.0084	0.0180	5% (**)	-	-	*Not estimated*
CAPASS, 1-quarter lag [CAPASS(-1)]	-0.0256	0.0143	5% (***)	-	-	*Not estimated*
CAPASS, 5-quarter lag [CAPASS(-5)]	0.0272	0.0064	1% (***)	-	-	*Not estimated*
ROE, 2-quarter lag [ROE(-2)]	-0.0186	0.0006	1% (***)	-	-	*Not estimated*
ROE, 5-quarter lag [ROE(-5)]	-0.0156	0.0001	1% (***)	-	-	*Not estimated*

Notes:
1. **** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; NS = not statistically significant at 10%.*
2. *Panel DOLS Model 1 reports contemporaneous cointegrating regressors and crisis interactions; its automatic leads and lags of first differences are correction terms and are not reported as manual lagged-level coefficients.*

Source: Estimates under Model 1 of Appendices 5 and 6.

In line with the "Bad Luck" Hypothesis proposed by Berger and DeYoung (1995) and the Financial Intermediation Theory, the selected macroeconomic determinants, such as economic condition, monetary policy rate, inflation rate, exchange rate, stock market index, and unemployment rate, all have a significant long-run impact on credit losses.

Economic condition as represented by real GDP has a significant long-run effect on NPLs. Contemporaneous real GDP registered to have had a very highly statistically significant and direct impact on credit losses with p-values of less than 1% for all 3 models. Specifically, if contemporaneous real GDP expands by 1%, Philippine bank NPLs may approximately rise by 1.05%, in the long-run. In times of favorable economic conditions, banks may tend to overstate the repayment capacity of aspiring loan borrowers and approve more bank loan applications, taking on a more aggressive stance with their lending practices. In effect, banks' aggressive lending approach in times of economic expansions could result in worsened credit losses. Conversely, if 1-quarter, 2-quarter, and 4-quarter lagged real GDP contracts by 1%, NPLs in the Philippine banking system would significantly rise by 0.70%, 0.38% and 1.21% respectively, in the long run. There appears to be a delayed response of bank NPLs during times of economic distress when borrowers consequently manifest deteriorating loan repayment capacity. Recognition of problem credit in banks' books may also take time due to administrative and legal bottlenecks, which is also associated and coherent with the empirical findings suggestive of "bad debt stickiness" among Philippine banks (Appendix 1). The results of the studies by Punzalan and Leon-Gonzales (2021) and Le and Le (2023) support the significant and direct impact of economic expansion or favorable economic conditions on the level of credit losses. However, the significant and inverse relationship between economic condition and credit losses is coherent with the findings in the study of Beck and Piloiu (2013) and Salas et al. (2024), among others.

With respect to the crisis-sensitivity of Real GDP-to-NPLs to major shocks, it can be noted that the interaction term between the 2008-GFC control variable and Real GDP registered to be significant with a negative impact on NPLs. Specifically, within the GFC, a 1% GDP contraction was associated with a likely 2.38% net increase in NPLs. Years before the GFC, the BSP had already executed efforts to strengthen bank supervision (SPV Act of 2002) and tighten risk management (Basel II implementation in 2007). Toxic assets (subprime mortgaged-backed securities) were even kept away from local banks. Thus, when a banking-sector crisis such as the

2008-GFC swept away various offshore financial markets, the local banking system was shielded from potential systemic failure despite the crisis having resulted to weakened economic activity and borrowers' loan repayment capacity. Simply put, the adverse impact on Philippine bank NPLs brought about by the economic distress during the GFC could have been much worse if not for the prudent regulation implemented by the BSP. Nevertheless, the interaction term between the COVID-19 control variable and Real GDP reported to have an insignificant and inverse impact on bank credit losses. Such a result is likely due to the fact that COVID-19 pandemic is a health and mobility crisis, not a banking-sector driven crisis like the 2008-GFC. Hence, the economic contraction during the COVID-19 pandemic may be associated with worsened bank credit losses but not of statistically detectable impact. Extraordinary government and BSP measures had also been implemented during that time (Bayanihan Acts 1 & 2 – grace period extensions for loan payment due dates, FIST Act of 2021, etc.), which softened recognition of problem loans in banks' accounting books even if GDP had contracted sharply.

Monetary policy rate, specifically the contemporaneous as well as the 5-quarter lagged BSP Overnight RRP rates have a positive and highly significant long run impact on the NPLs of Philippine banks. Monetary policy rates set by the BSP serve as a direct compass and benchmark for all the other market interest rates in the financial system, including bank lending rates. As the BSP implements a contractionary monetary policy stance by raising BSP Overnight RRP rates, borrowing costs rise, thus making loan repayment more challenging for borrowers. Contrarily, when the BSP implements a more accommodative monetary policy stance by decreasing BSP Overnight RRP rates, NPLs would likely decrease as the burden of debt servicing among borrowers had been eventually eased. The lagged impact of monetary policy on credit losses and bank health can most likely be linked to the transmission mechanism of monetary policy, wherein it would take a maximum of 2 years for the impact of monetary policy to be fully felt within the economy. The significant impact of interest rates and credit losses can be corroborated by the findings in the papers of Punzalan and Leon-Gonzales (2021), Beck and Piloiu (2013), and Salas et al. (2024).

Inflation rate also had shown to have a significantly direct long-run impact on the NPLs of Philippine banks, more particularly the 4-quarter lagged inflation rate. If the 4-quarter lagged inflation rate increases by 1%, Philippine banks' NPLs would also significantly worsen by 0.02% in the long run, on average. Volatility in the prices of basic goods and services,

particularly oil and agricultural commodities, can disrupt the future cash flows and net earnings of loan borrowers thereby adversely affecting their loan repayment capacity.

Exchange rates, represented by REER, have an inverse and significant long-run impact on Philippine banks' NPLs. Specifically, as the 5-quarter lagged REER increases by 1%, current NPLs among Philippine banks would tend to significantly decrease by 0.31% in the long run. Such finding can be linked to the delayed transmission (about 15-months/5-quarters) of peso appreciation on borrowers, particularly those exposed to foreign currency-denominated debt and those enterprises reliant on importation of production inputs. The significant negative coefficient of the REER indicates that if the peso had appreciated 15-months prior, bank asset quality would most likely be improved and NPLs would eventually be decreased. A stronger Philippine peso translates to lower imported-input costs, thereby improving debt-servicing capacity of borrowing enterprises. Conversely, peso depreciation may raise production costs and debt-servicing burden of borrowers resulting to increased financial distress and higher levels of NPLs.

There is also strong evidence in the empirical results that there is a direct and significant long-run equilibrium relationship between unemployment rate and the NPLs of the Philippine banks. In the long run, if contemporaneous, 1-quarter, and 3-quarter lagged unemployment rate worsen by 1%, NPLs in the Philippine banking system would also significantly worsen by 0.02%, 0.02%, and 0.01%, respectively. In times of economic distress when there are most likely elevated levels of joblessness, the repayment capacity of loan borrowers could also be eroded, and therefore, the NPL balances in the accounting books of banks would most likely increase.

The stock market index, particularly the PSEi, was also reported to have a significant and negative long-run equilibrium relationship with NPLs across the 5 Philippine banking subsectors. Specifically, if contemporaneous and 3-quarter lagged PSEi climbs by 1%, the NPLs among the 5 Philippine banks would likely significantly decrease by 0.10%%, in the long run. Such empirical results suggest that a bullish local stock market is significantly tied to the improvement in the bank health as loan borrowers, through their increased stock market gains, tend to also have greater capacity to repay their bank loans. Conversely, if the PSEi reflects bearish conditions, profitability in stock market investments

declines, which can also be tied to the decline in the loan repayment capacity of bank loan borrowers.

With respect to the selected bank-specific determinants such as solvency condition, liquidity condition, lending aggressiveness and profitability of the 5 Philippine banking subsectors, there was also evidence from the empirical results that there is a long-run equilibrium relationship between the aforesaid bank-specific determinants and the level of credit losses consistent with the risk management theory and the "Bad Management," "Skimping" and "Moral Hazard" hypotheses of Berger and DeYoung (1995).

The solvency condition was revealed to have a significant long-run impact on the level of credit losses among the 5 Philippine banks. On average, if the contemporaneous, and 1-quarter lagged solvency ratio would improve by 1%, NPLs among the Philippine banking system would significantly decrease by 0.02% and 0.03%, respectively, in the long run. Notably, 5-quarter lagged solvency ratio registered to have a highly significant and direct impact on bank credit losses. Although a strong and resilient solvency condition brought about by a bank's utilization of more sophisticated risk management tools aligned with stricter international standards (Basel III framework) can help cushion the banks against economic shocks, however, as time passes (say about after 15-months/5-quarters), banks tend to become more confident in their solvency condition and become more aggressive in their lending practices, which can also result to increase in credit losses and deterioration of bank asset quality.

Empirical findings in this study also show that a bank's liquidity condition plays a significant role in mitigating credit risk and safeguarding bank health in the long run. On average, as the contemporaneous bank liquidity ratio improves by 1%, the NPLs in the 5 Philippine banking subsectors would decrease significantly by 0.01% in the long run. Hence, a low and modest liquidity ratio suggests that a bank's conservative approach (i.e., by choosing to diversify its asset portfolio and by investing in more liquid assets) can significantly help mitigate the risk of credit loss. Interestingly, over time, bank's liquidity condition could have a more direct impact on the level of credit losses among banks because of the significant and positive long-run coefficient estimates of the 2-quarter and 5-quarter lagged liquidity condition variables. To shed insight, a higher loans-to-deposits ratio would suggest that a bank may eventually prioritize more

profitability by generating more lending activities relative to deposits, depicting a more aggressive approach.

Lending aggressiveness was also revealed to have a long-run direct and significant impact on the level of credit losses across Philippine banks. Specifically, on average, if the contemporaneous lending aggressiveness or risk-taking behavior of banks rises by 1%, the NPLs across the 5 Philippine subsectors would highly significantly worsen by 0.02%, on average, in the long run. Therefore, a more aggressive approach to lending can indeed highly significantly worsen bank health and asset quality. However, the 1-quarter, 2-quarter, and 5-quarter lagged variables of bank lending aggressiveness showed a significant and negative impact on bank NPLs. Hence, it is also possible that over time, if a local bank could eventually choose to take on a more conservative approach in its marketing practices in pursuit of better loan portfolio quality, credit losses would be mitigated and bank asset quality could see improvement.

Bank's profitability had also been reported to have a significant and inverse long run equilibrium or cointegrating relationship with the level of credit losses in the Philippine banking system. On average, if the 2-quarter and 5-quarter lagged bank profitability ratios improve by 1%, the NPLs across the 5 Philippine banking subsectors would significantly decrease by 0.02% in the long run. Thus, it can be inferred that over time (say after 5-quarters/15-months), increased bank profitability may eventually raise the confidence among banks to take on more risky lending practices, which in effect can likely lead to more credit losses.

It should be noted that the Group-Mean Panel DOLS results provide supplementary but not uniform support for the primary tool, Group-Mean Panel FMOLS results. While Panel FMOLS had identified the significant long-run equilibrium relationships between Philippine bank NPLs and the contemporaneous and lagged terms of all macroeconomic and bank-specific determinants, some estimates under the Panel DOLS have differed in direction or significance. This is likely due to the the parametric and 'more penalizing' nature of Panel DOLS and its distinct specifications: Panel FMOLS includes lagged-level regressors whereas Panel DOLS uses leads and lags of first-differences as correction terms. Hence, the findings on factors such as liquidity ratio lending aggressiveness, COVID-19-Real GDP interaction term remain sensitive to the estimation method used. Nonetheless, under both Panel estimations, the same significant direction

for the BSP Policy Rate, Unemployment, PSEi, Solvency Ratio and GFC-Real GDP interaction term had been produced.

Conclusion

Over the past 25 years studied, it can be confirmed that credit losses in the Philippine banking system are significantly shaped by both macroeconomic conditions and internal institutional behavior even in the long run. Empirical evidence gathered through Pedroni panel cointegration test strongly suggests that there exists a long-run equilibrium relationship between NPLs across the Philippine banking system as well as the selected macroeconomic & bank-specific variables. Empirical findings from the Panel cointegrating regression results confirm the significant long-run impact of all the macroeconomic indicators such as Real GDP, monetary policy rate, inflation rate, real effective exchange rate and the PSEi on NPLs across the Philippine banking system coherent with the Financial Intermediation Theory and Berger and DeYoung's (1995) "Bad Luck" Hypothesis.

Moreover, empirical evidence through the aforesaid Panel cointegrating regression results corroborates the significant long-run impact of all the bank-specific variables, namely, solvency condition, liquidity condition, lending aggressiveness and profitability, on the level of credit losses among the 5 Philippine banking subsectors. Such results are aligned with the Credit Risk Management theory and Berger and DeYoung's (1995) "Bad Management". "Skimping" and "Moral Hazard" Hypotheses.

The significant delayed or lagged effects of the selected macroeconomic and bank-specific determinants of credit losses, together with the correlogram results (Appendix 1) provide suggestive evidence consistent with the notion of 'bad debt stickiness' among Philippine banks, as NPLs would remain for longer periods in banks' accounting books. Such a finding is also coherent with the presence of endogeneity bias (feedback loop/two-way effect) typically common in bank panel data.

Recommendation

For the banks, regulators, and policymakers, the identified macroeconomic determinants, e.g., policy rate, exchange rate volatility, and unemployment rate, can be incorporated in their regular stress-testing frameworks to determine the long-run impact of these macroeconomic

variables on bank credit losses. In the event that the results of the macroeconomic stress-tests performed by banks have shown that the aforesaid macroeconomic indicators have a significant long-run impact on NPLs, banks can be mandated to perform sensitivity analyses tailored fit to these risk factors. The findings of the study, particularly regarding the long-run equilibrium relationship, may also be used to develop an early-warning indicator system that tracks key macroeconomic factors (e.g., GDP trends, inflationary pressures, rising unemployment levels, increasing policy rates/borrowing costs, currency volatility, etc.) to pre-emptively identify periods when credit losses are likely to rise.

Given that the study's findings are also in line with the "Moral Hazard" and "Bad Management" Hypotheses of Berger and DeYoung (1995), banks can implement internal limits on extending lending in times of economic expansion since the empirical findings of the study have shown that bank-specific factors such as lending aggressiveness tend to have a significant and positive long-run impact on NPLs. In doing so, banks can establish 'speed limits' on credit growth in order to prevent the accumulation of poor quality bank assets during favorable economic conditions. Also, since solvency and liquidity conditions were reported to be key long-run determinants of NPLs, banks should prioritize maintaining buffers that exceed BSP's minimum requirements, especially during periods of high economic uncertainty, so as to ensure that banks are capable of absorbing systemic shocks without immediate deterioration in loan quality. Lastly, banks should adopt an integrated approach that reconciles internal management decisions such as ROE or internal hurdle rate targets with external macroeconomic conditions. The long-run equilibrium relationships found in this study can be used to forecast how adjustments in interest rate or exchange rate or changes in the other selected macroeconomic indicators could possibly impact bank portfolios.

For the future researchers, since the study focuses on the macroeconomic and bank-specific determinants, future research could incorporate environmental, social, and governance (ESG) risk scores or climate vulnerability indicators as potential long-run determinants of credit losses across the Philippine banking system. Furthermore, given the rise of fintech and digital banking services that can provide easy credit access via digital wallets, a future study could be conducted that seeks to explore the determinants of NPLs specifically among digital banks to check if drivers of credit losses in the newly emerged banking subsector differ significantly from those of the traditional banks.

References

Adonis, M. J. (2025, September 25). More foreigners buying Philippine stocks since CMEPA, says PSE. Philippine Daily Inquirer. https://business.inquirer.net/548989/more-foreigners-buying-ph-stocks-since-cmepa-says-pse

Ahmad, F., & Bashir, T. (2013). Explanatory power of macroeconomic variables for non-performing loans: Evidence from Pakistan. *World Applied Sciences Journal*.

Albert, J. R. and Ng, T. H. (2012) Assessing the resilience of ASEAN banking systems: the case of the Philippines. ADB Working Paper Series on Regional Economic Integration No. 93.

Aldaba, R. M. (2005). The Philippine fiscal crisis: Issues, reforms, and prospects (Discussion Paper Series No. 2005-25). Philippine Institute for Development Studies.

Andrews, D. W. K. (1991), Heteroskedasticity and autocorrelation consistent covariance matrix estimation, *Econometrica* 59, 817–854.

Apergis, N. et al. (2007). Financial deepening and economic growth linkages: a panel data analysis," *Review of World Economics* (weltwirtschaftliches archiv), springer;institut für weltwirtschaft (kiel institute for the world economy), 143(1), 179-198.

ASEAN+3 Macroeconomic Research Office. (2024, March 6). Addressing high inflation in the Philippines – the role of policy mix. AMRO Asia. https://amro-asia.org/addressing-high-inflation-in-the-Philippines-the-role-of-policy-mix

Bangko Sentral ng Pilipinas (2002 November 11) KB Npls as of September 2002 fall anew (Press Release). [www.BSP.gov.ph/publications/media.asp?id=692&yr=2002](http://www.BSP.gov.ph/publications/media.asp?id=692 &yr=2002)

Bangko Sentral ng Pilipinas (2002) Status report on the Philippine financial system second semester 2002.

Bangko Sentral ng Pilipinas (2008) Status report on the Philippine financial system second semester 2009.

Bangko Sentral ng Pilipinas (2012) Status report on the Philippine financial system second semester 2012.

Bangko Sentral ng Pilipinas. (2000). Annual Report 2000: Report on economic and financial developments. https://www.BSP.gov.ph/Pages/MediaAndResearch/PublicationsAndReports/AnnualReport2000.aspx

Bangko Sentral ng Pilipinas. (2002). Circular No. 351: Amendments to the definition of non-performing loans.

Bangko Sentral ng Pilipinas. (2002). The adoption of inflation targeting in the Philippines (Monetary Policy Series No. 1).

Bangko Sentral ng Pilipinas. (2005). A status report on the Philippine financial system: second semester 2005.

Bangko Sentral ng Pilipinas. (2006). A status report on the Philippine financial system: second semester 2006.

Bangko Sentral ng Pilipinas. (2006). Revised capital adequacy framework (Circular No. 538). https://www.BSP.gov.ph/Regulations/Issuances/2006/c538.pdf

Bangko Sentral ng Pilipinas. (2009). Report on economic and financial developments: first quarter 2009.

Bangko Sentral ng Pilipinas. (2012). Circular No. 772: Amendments to the definition of Non-Performing Loans (NPLs). https://www.BSP.gov.ph/Regulations/Issuances/2012/c772.pdf

Bangko Sentral ng Pilipinas. (2012). Strengthening program for cooperative banks (SPCB) Plus (Memorandum No. M-2012-048). https://www.BSP.gov.ph/Regulations/Issuances/2012/m048.pdf

Bangko Sentral ng Pilipinas. (2013). Basel III capital adequacy framework (Circular No. 781). https://www.BSP.gov.ph/Regulations/Issuances/2013/c781.pdf

Bangko Sentral ng Pilipinas. (2014). Circular No. 855: Guidelines on sound credit risk management practices; Amendments to relevant provisions of the manual of regulations for banks. https://www.BSP.gov.ph/Regulations/Issuances/2014/c855.pdf

Bangko Sentral ng Pilipinas. (2014). Status report on the Philippine financial system: first semester 2014.

Bangko Sentral ng Pilipinas. (2014). Status report on the Philippine financial system: second semester 2014.

Bangko Sentral ng Pilipinas. (2018). Monetary policy report: 2018 inflation trends.

Bangko Sentral ng Pilipinas. (2021). Central banking in the new normal: BSP unbound. https://www.BSP.gov.ph/Media_And_Research/Learning%20Materials/Q12021.pdf

Bangko Sentral ng Pilipinas. (2021). Implementation of Republic Act No. 11523, otherwise known as the Financial Institutions Strategic Transfer (FIST) Act. https://www.BSP.gov.ph/Regulations/Issuances%20of%20Policy%20Exposure%20Drafts/Draft_Circular_RA11523.pdf

Bangko Sentral ng Pilipinas. (2023). Manual of regulations for banks (MORB): Appendix to Section X102 (Pre-requisites for the Grant of a Universal Bank Authority).

Bangko Sentral ng Pilipinas. (2023). Manual of regulations for banks (MORB): Part Three - Sections X301 to X322 (Loans, Investments and Special Credit).

Bangko Sentral ng Pilipinas. (2023). Manual of regulations for banks (MORB): Section X178 (Credit Risk Management; Statement of Policy).

Bangko Sentral ng Pilipinas. (2023). Visual monetary policy report (February 2023).

Bangko Sentral ng Pilipinas. (2024). Monetary policy report: December 2024. https://www.BSP.gov.ph/Price%20Stability/MonetaryPolicyReport/CondensedVersion_December2024.pdf

Bangko Sentral ng Pilipinas. (2025). Quarterly report on Philippine portfolio investments: Q3 2025.

Bangko Sentral ng Pilipinas. (2025). Summary of monetary policy decisions. https://www.BSP.gov.ph/SitePages/PriceStability/MonetaryPolicyDecision.aspx

Basel Committee on Banking Supervision. (2011). Basel III: A global regulatory framework for more resilient banks and banking systems. Bank for International Settlements.

Bayoumi, T., Harmsen, R., & Turunen, J. (2011). What explains movements in the Real Effective Exchange Rate? (Working Paper No. 11/139). International Monetary Fund.

Beck, R, Jabukik, P. and Piloiu, A. (2013) Nonperforming loans what matters in addition to the economic cycle? European Central Bank Working Paper Series No. 1515.

Berger A, & DeYoung, R. (1995). Problem loans and cost efficiency in commercial banks. *Journal of Banking and Finance*, 21, 849-870.

Chan, S. L., & Pua, A. A. Y. (2010). Is the Special Purpose Vehicles Act responsible for the decline in NPL ratios? *DLSU Business & Economics Review*, 19(2). https://doi.org/10.3860/ber.v19i2.1469

Chinn, M. D. (2006). A primer on real effective exchange rates: Determinants, overvaluation and undervaluation. *Open Economies Review*, *17*(1), 115-143.

Cigaral, I. N. P. (2026, January 2). Gov't bonds lured foreign funds in 2025 as Philippine stocks lagged. Philippine Daily Inquirer. https://business.inquirer.net/567141/govt-bonds-lured-foreign-funds-in-2025-as-ph-stocks-lagged

Cleveland, R. B. et al. (1990). Stl: a seasonal-trend decomposition procedure based on loess. *Journal of Official Statistics*. 6, No. 1, 1990, pp. 3-73

Conchada, M. I. P. and Tiongco, L. R. (2021). Monitoring the Philippine economy year-end report for 2020. (Policy Brief Monitoring the Philippine Economy VI, No. 8). De La Salle University Angelo King Institute for Economic and Business Studies. https://www.dlsu-aki.com/uploads/1/0/2/2/102266760/aki_policy_brief_volume_vi_no. _8_june_2021.pdf

Dakila F. and Claveria, R. (January 2006) The impact of BSP policy interest rates on market interest rates. Bangko Sentral Review 3 no. 1 pp.1-5.

Dakila, Jr., F. G. (2019). The development of financial markets in the Philippines and its interaction with monetary policy and financial stability (BIS Papers No. 113). Bank for International Settlements. https://www.bis.org/publ/bppdf/bispap113_p.pdf

De Castro, R. C. (2005). The 2004 national elections: The gathering fiscal storm over the Philippines. *American Asian Review*, *23*(4), 159-183.

Department of Finance. (2021, February 18). DOF thanks Congress for swift approval of FIST bill. https://www.dof.gov.ph/dof-thanks-congress-for-swift-approval-of-fist-bill/

Diokno, B. E. (2005). The Philippine fiscal crisis: Root causes and possible solutions. University of the Philippines School of Economics.

Divina Law. (2021). Using one's FIST (FIST Act of 2021). https://www.divinalaw.com/dose-of-law/using-ones-fist-fist-act-of-2021/

Dmitrios, A., Helen, L., & Mike, T. G. (2016). Non-performing loans in the euro area: are core-periphery banking markets fragmented? Working Paper No. 219. Bank of Greece.

Elgohary, E., & Abdelazyz, R. (2023). The impact of COVID-19 on information technology industry: A comparison study between the top digital countries in Middle East and Egypt. International Journal of Computing and Digital Systems, 13(1), 495-505.

Gallardo, M., & Viray, Jr., E. (2025). The Philippine Stock Exchange Index (PSEi) and its Selected Macroeconomic Indicators: Catalyst for Sustainable Economic Growth. *Bedan Research Journal*, *10*(1), 82–116. https://doi.org/10.58870/berj.v10i1.81

Gazi, M. A. I., et al. (2022). Impact of COVID-19 on financial performance and profitability of banking sector in special reference to private commercial banks: Empirical evidence from Bangladesh. *Sustainability*, *14*(10), 6260. https://doi.org/10.3390/su14106260

Gochoco-Bautista, M. S. (1999). The past performance of the Philippine banking sector and challenges in the postcrisis period. In Rising to the challenge in Asia: A study of financial markets (10). Asian Development Bank. https://aric.adb.org/pdf/aem/external/financial_market/Philippines/phil_bnk.pdf

Goyal, S., Singhal, N., Mishra, N., & Verma, S. K. (2024). The impact of macroeconomic and institutional environment on non-performing loans of developing and developed countries. *Future Business Journal*, *9*(45).

Guinigundo, D. C. (2006). The Philippine financial system: issues and challenges. Bank for International Settlement Papers, (28). https://www.bis.org/publ/bppdf/bispap28t.pdf

Guinigundo, D. C. (2010). The impact of the global financial crisis on the Philippine financial system – an assessment. Bank for International Settlements (Ed.), The global crisis and financial intermediation in emerging market economies (BIS Papers No. 54, pp. 317–342). https://www.bis.org/publ/bppdf/bispap54.htm

Guinigundo, D. C. (2017). Strengthening the Philippine financial system: the role of Basel III. Bangko Sentral ng Pilipinas.

Habito, C. F. (2009). Anatomy of the 2008 food and fuel price crisis in the Philippines. Asian Development Bank / Philippine Institute for Development Studies (PIDS).

Hays PLC. (2021). COVID-19 and beyond: IT jobs and the growth sectors that need them most. https://web.hays.ie/web/hays-ie-technology/blog/-/blogs/it-jobs-and-growth-sectors

International Monetary Fund. (2021). Real Effective Exchange Rate (REER) methodology. IMF Data. https://data.imf.org

International Monetary Fund. (2023). Banking system reform: Philippines. IMF eLibrary. https://www.elibrary.imf.org/display/book/9781557758613/ch06.xml

Kao, C., & Chiang, M. H. (2000). On the estimation and inference of a cointegrated regression in panel data. *Advances in Econometrics*, 15, 179-222.

Khemraj, T. & Pasha, S. (2009). The determinants of nonperforming loans: an econometric case study of Guyana.

Kiefer, N. M., & Vogelsang, T. J. (2002). Heteroskedasticity–Autocorrelation Robust Standard Errors Using The Bartlett Kernel Without Truncation. *Econometrica*, *70*(5), 2093-2095. https://doi.org/10.1111/1468-0262.00366

Klein, N. (March 2013) Nonperforming loans in cesee: determinants and macroeconomic performance. IMF Working Paper 13/17.

Klein, P. O., & Weill, L. (2018). Bank profitability and economic growth (BOFIT Discussion Papers No. 15/2018). Bank of Finland, Institute for Economies in Transition.

Le, C. D. H., & Le, A. H. (2023). Macroeconomic determinants of non-performing loans: A quantile regression approach–Evidence from Vietnam's banking system. *Journal of Eastern European and Central Asian Research*, *10*(5).

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

National Economic and Development Authority. (2017). Philippine development plan 2017-2022. https://pdp.neda.gov.ph/wp-content/uploads/2017/01/PDP-2017-2022-07-20-2017.pdf

National Statistical Coordination Board. (2004). Resolution No. 15, series of 2004: Adopting a new definition of unemployment. Republic of the Philippines.

Newey, W. D. & West, K. D. (1994). Automatic lag selection in covariance matrix estimation. *Review of Economics Studies*, 61, 631-653.

Ozili, Peterson. (2019). Non-performing loans and financial development: new evidence. *The Journal of Risk Finance*. 20.

Parcon-Santos, H.C., et al. (2024). The impact of foreign equity infusion on the profitability and asset quality of Philippine rural banks: A preliminary analysis (Discussion Paper Series No. 2024-25). Bangko Sentral ng Pilipinas. https://www.BSP.gov.ph/Sites/researchsite/Publications/BSP-Discussion-Papers/DP202425.pdf

Pedroni, P. (2000). Fully modified OLS for heterogeneous cointegrated panels (Working Papers 2000-03). Department of Economics, Williams College. https://ideas.repec.org/p/wil/wileco/2000-03.html

Pedroni, P. (2001). Purchasing power parity tests in cointegrated panels. *The Review of Economics and Statistics*, *83*(4), 727-731.

Philippine Deposit Insurance Corporation. (2014). Annual report 2014: Protecting the depositing public.

Philippine Deposit Insurance Corporation. (2014). Implementing guidelines for the Strengthening Program for Cooperative Banks (SPCB) Plus. https://www.pdic.gov.ph/files/spcb_implementing_guidelines_and_annexes.pdf

Philippine Deposit Insurance Corporation. (2021). Technical notes on bank performance indicators.

Philippine Statistics Authority. (n.d.). Labor force survey (LFS): Unemployment rate statistics (1999-2023). OpenSTAT. https://openstat.psa.gov.ph/

Philippine Statistics Authority. (n.d.). Summary inflation report consumer price index (2012=100 / 2018=100). Government of the Philippines.

Philippine Stock Exchange. (2025). Monthly foreign trading summary: September 2025. https://www.pse.com.ph/market-reports/september-2025/

Philippine Stock Exchange. (2026). Annual market report: Performance of the PSEi in FY 2025. https://www.pse.com.ph/annual-reports/2025/

Phillips, P., & Hansen, B. (1990). Statistical inference in instrumental variables regression with i(1) processes. Review of Economic Studies, 57, 99-125.

Phillips, P. C. B., & Moon, H. R. (1999). Linear regression limit theory for nonstationary panel data. *Econometrica*, *67*(5), 1057-1112.

Prudente, J., & Areola, E. M. (2025). Are green entrepreneurial technology and sustainable practices related to employees' performance? A basis for BPO techno-stewardship action plan. *Bedan Research Journal*, *10*(1), 194–219. https://doi.org/10.58870/berj.v10i1.85

Punzalan, R., & Leon-Gonzales, R. (2021). Microeconomic and macroeconomic determinants of non-performing loans: The case of Philippine commercial and savings banks (BSP Working Paper Series No. 2021-01). Bangko Sentral ng Pilipinas.

Reside, R. E., Jr. (2006). Fiscal determinants of growth in the Philippines. Asian Development Bank.

Salas, M. B., Lamothe, P., Delgado, E., Fernández-Miguélez, A. L., & Valcarce, L. (2024). Determinants of nonperforming loans: A global data analysis. *Computational Economics*, *64*(5), 2695–2716.

Senate Economic Planning Office. (2023, January). Inflation in 2022 (Policy Brief PB-23-01). Senate of the Philippines.

Simply Wall St. (2026, April 7). Filipino (PSEi) market analysis & valuation. https://simplywall.st/markets/ph

Standard & Poor's. (2013, May 2). Republic of the Philippines upgraded to 'BBB-' on improved fiscal flexibility. S&P Global Ratings.

Tetangco, A. M., Jr. (2011). Address at the signing of the Memorandum of Agreement for the Strengthening Program for Cooperative Banks. Bangko Sentral ng Pilipinas.

Unicapital Securities. (2025, April 15). PSEi target and P/E forecasts for 2025. BusinessWorld. https://www.bworldonline.com/banking-finance/2025/04/15/unicapital-maintains-psei-target/

World Bank. (2004). Philippines: Meeting infrastructure challenges. World Bank Group. https://openknowledge.worldbank.org

World Bank. (2009). Philippines quarterly update: July 2009. World Bank Group.

World Bank. (2013). Philippines economic update: Accelerating reforms to sustain growth. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/215321468102879553/Philippines-economic-update-accelerating-reforms-to-sustain-growth

World Bank. (2023). Philippines economic update: Dealing with high inflation. World Bank Group. https://openknowledge.worldbank.org/

World Bank. (2024). Philippines economic update: Sustaining the recovery. World Bank Group. https://www.worldbank.org/en/country/Philippines