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SHORT-RUN DYNAMICS OF INTEREST RATES AND NON-PERFORMING LOANS:

EVIDENCE FROM GHANA'S BANKING SECTOR (2008–2023)

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Short-Run Dynamics of Interest Rates and Non-Performing Loans: Evidence from Ghana's Banking Sector (2008–2023)

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ABSTRACT

This study examines the short-run dynamics between interest rates and non-performing loans (NPLs) in Ghana's banking sector, with particular emphasis on how fluctuations in lending rates influence credit risk and financial stability. Using quarterly data spanning 2008 to 2023, the study applies time-series econometric techniques, including unit root tests and a dynamic autoregressive distributed lag (ARDL) framework, to capture lagged responses and adjustment behaviour in NPLs. The findings reveal a statistically significant short-run relationship between interest rates and NPLs, with increases in lending rates leading to higher credit risk after a lag. Inflation is found to mitigate NPLs in the short term, while credit expansion initially improves loan performance but subsequently contributes to higher default levels, suggesting that NPL dynamics are driven primarily by short-run adjustments rather than persistent long-run relationships. By providing updated empirical evidence on the short-run monetary policy–credit risk nexus in an emerging market context using an extended Ghanaian dataset, the study contributes to the literature on monetary transmission and financial stability. The results highlight the need for monetary authorities to balance inflation control with credit market stability and underscore the importance of coordinated macroeconomic and prudential policies in sustaining credit access, protecting borrower viability, and strengthening the resilience of Ghana's financial system.

Keywords: *Interest rate, Non-Performing Loans, Inflation, credit risk, Financial Stability, ARDL*

1.0 Introduction

In recent years, the importance of financial development and economic growth has become very pronounced; and numerous studies establish how long-term economic growth, and the overall development of a country are largely contingent on the level of financial development, among other critical factors (Girma & Huseynov, 2025). Financial development has long been recognised as a crucial driver of long-term economic growth (Mlambo, 2024; Sugözü & Ünver, 2024). Naude (2009) emphasises that the robustness of a country's financial system determines its ability to withstand and recover from economic crises, as witnessed in the aftermath of the 2008 global financial downturn.

Financial development enhances domestic resource mobilisation, supporting resilience and recovery. Takyi and Obeng (2013) describe financial development as a process that improves the quality, quantity, and efficiency of intermediary services, assessed through measures such as scale, depth, access, efficiency, and stability. A sound financial system fosters capital accumulation, investment diversification, insurance services, and encourages foreign capital inflows and technological innovation (Amjed, & Shah, 2021). In Ghana, the financial sector is extensive, comprising capital markets, investment houses, insurance companies, and a variety of deposit-taking institutions, including banks, microfinance, and rural banks (Mensah, 2014). The World Bank (2023) notes that Ghana's financial system is predominantly bank-based, with the banking sector controlling 75 percent of total financial sector assets, thereby playing a central role in financial intermediation and economic development.

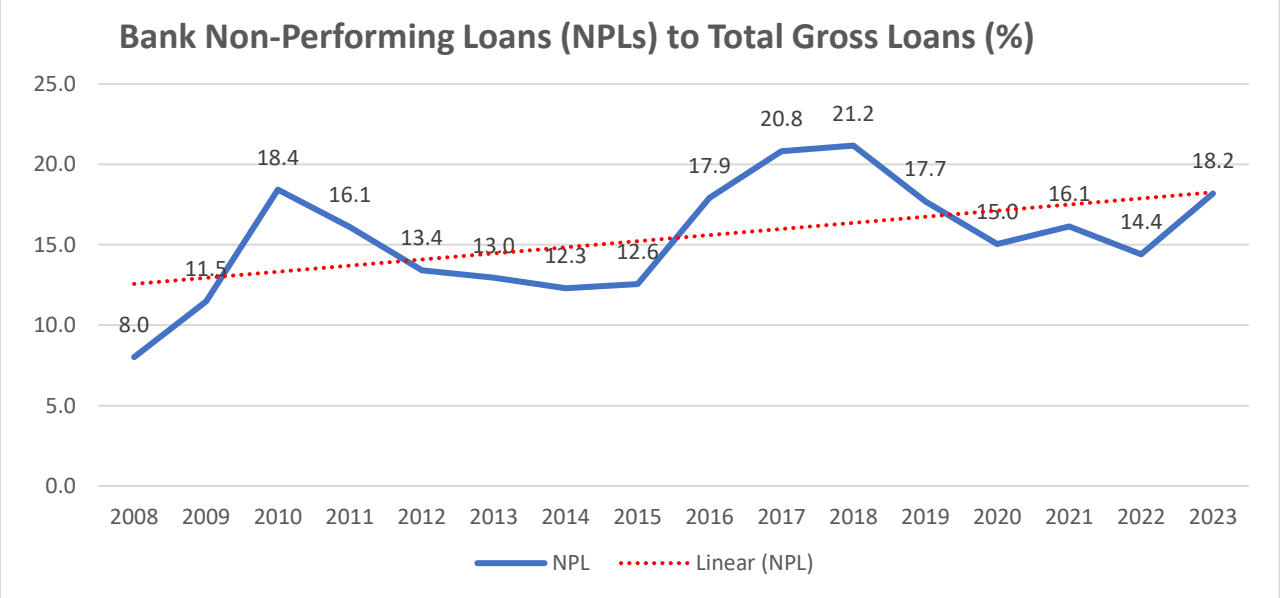
Ghana's banking sector over the years has expanded considerably in terms of total assets and profitability (Gadagbui, & Amoah, 2016). However, non-performing loans have plagued Ghana's banking sector (Fiador, & Sarpong-Kumankoma, 2020). Prior to the financial crises that shook the world economy in 2007–2008, the credit quality of loan portfolios in most countries has remained comparatively stable during the previous ten years. Since then, the global economic recession has caused the average bank asset quality to rapidly worsen (Beck, Jakubik, & Piloiu, 2015). In Ghana, non-performing loans (NPLs) have remained a very topical subject area because of their close association with bank distress; as of December 2024, the banking-sector NPL ratio stood at 21.8 percent up from about 20.6 percent the previous year (Bank of Ghana, 2025). Non-performing loans have remained a very topical subject area because they are always correlated with bank failure (Muniu, 2013). Evidently, in the case of Ghana, loan defaults among commercial banks have been one of the causal factors that led to the financial distress of banks that eventually collapsed or merged during the 2017-2018 financial sector clean-up exercise in Ghana (Benson, 2019).

According to Ozili (2019), non-performing loans (NPLs) indicate the credit quality of a bank's loan portfolio and, overall, reflect the credit quality of a nation's or region's banking sector. NPLs are financial assets from which banks no longer receive scheduled interest or instalment payments. This is because the loan is no longer "performing" or generating cash for banks. Joseph, Edson, Manuere, Clifford, Michael, and Kamoyo (2012) define NPLs as, loan that are ninety days or more past their due date or not acquiring interest anymore. According to Badar, Javid, and Zulfiquar, (2013), a loan is considered non-performing if it is in default or on the verge of default. A more precise and time-sensitive definition of non-performing loans (NPLs) considers both the default status and the duration of missed payments. In line with definitions commonly used by central banks, including the Bank of Ghana, a loan is classified as non-performing when the borrower fails to make interest or principal payments for at least 90 days, or when the loan is classified as "substandard," "doubtful," or "loss" based on the lender's credit risk assessment. Several authors adopt this time-bound criterion, noting that the 90-day

period is a standard threshold for determining when a financial asset stops generating income for the lending institution and is therefore considered non-performing (Bank of Ghana, 2017; Corporate Finance Institute, 2023; World Bank, 2023).

High and rising non-performing loan (NPL) levels exert considerable pressure on banks' balance sheets, threatening their lending capacity (Luyeku & Otinga, 2019; Saliba, Farmanesh, & Athari, 2023). While NPLs are not currently destabilising the sector, their feedback effects may impede long-term recovery. According to GlobalEconomy.com (2022), Ghana ranked second among 41 countries for worst NPL performance between 2008 and 2021. Bank of Ghana data show that NPLs surged after the 2007–2008 financial crisis, peaking at 18.4% in 2010 before declining to 12.3% in 2014. However, they rose sharply to 21.2% in 2018, contributing to the 2017–2018 financial sector clean-up. The average NPL value for the period (2008-2025) is 16.21%. Although NPLs dropped to 15.0% by 2020, they climbed again to 16.1% in 2021 following the COVID-19 pandemic and reached 18.2% by the end of 2023, exceeding the average rate for the study period. These persistent levels of NPLs raise concerns over asset quality and threaten banking sector stability, particularly when benchmarked against central bank prudential standards. According to Bank of Ghana guidance, regulated financial institutions are expected to maintain their non-performing loan ratio below 10 percent of gross loans; NPL ratios above this threshold reflect elevated credit risk and non-compliance with prudential norms (Bank of Ghana, 2025). In contrast to this benchmark, Ghana's banking industry recorded NPL ratios around 19.5 percent in late 2025, indicating significant asset quality pressures that could undermine profitability, capital adequacy, and overall sector stability if not resolved.

Figure 1: Non-Performing Loans (NPLs)



Source: Author's Construction in Excel using Data from Bank of Ghana (2024)

The upward trend reflects, in part, the consequences of heightened unemployment and broader labour-market challenges in Ghana, which together with currency depreciation, COVID-19-related economic disruptions, and tight financial conditions weakened borrowers' repayment capacity and contributed to rising non-performing loans (Atuahen, Agyei, & Frimpong, 2024; Bank of Ghana, 2023).

Among the various macroeconomic, industry, and bank-specific factors influencing non-performing loans (NPLs), interest rates have been widely identified as a major determinant (Ahmed, Majeed, Thalassinos, & Thalassinos, 2021; Beck, Jakubik, & Piloiu, 2015). Mwangi (2014) asserts that interest rates impose an implicit cost on credit, which subsequently influences loan defaults. Interest rates, defined as the cost incurred by borrowers for using borrowed funds, affect the financial health of commercial banks by enhancing profitability when loans perform but contributing to default risk when repayments fail (Twesiime, Tushabe, Ninsiima, Tayebwa, & Eze, 2024). In pursuit of profit maximisation, commercial banks typically widen interest rate spreads by increasing lending rates relative to deposit rates (Were & Wambua, 2014).

In Ghana, these dynamics have been particularly pronounced in the post-COVID period. Following the pandemic-induced shock in 2020, the government and central bank adopted expansionary fiscal and monetary policies to support economic activity (Bank of Ghana, 2021; IMF, 2023). While these measures aided short-term recovery, they contributed to rising inflationary pressures from the second half of 2021, amplified by exchange rate depreciation, global supply-chain disruptions, and the Russia–Ukraine conflict. In response, the Bank of Ghana embarked on a sustained monetary tightening cycle between 2021 and 2023, raising the Monetary Policy Rate aggressively to contain inflation. This tightening transmitted directly into higher short-term money market rates, the Ghana Reference Rate (GRR), and commercial lending rates, significantly increasing borrowing costs across the economy (Bank of Ghana, 2023; IMF, 2024).

Recent data from the Bank of Ghana (2022) show that the average commercial lending rate rose sharply from 20.16 percent in January 2022 to 24.27 percent by July 2022, with further increases projected later in the year. The Institute of Economic Affairs, Ghana (2022) attributes this escalation to inflationary pressures, global shocks, and heightened risk perceptions within the banking sector. Industry groups, including the Association of Ghana Industries (AGI), have expressed concern that elevated lending rates discourage private investment and weaken firms' repayment capacity. While monetary tightening has contributed to moderating inflation, its pass-through to lending rates has heightened short-run credit risk, and credit supply, particularly for small and medium-sized enterprises.

Despite regulatory reforms and capital strengthening initiatives, rising NPLs remain a persistent challenge globally and domestically (Ozili, 2015). Elevated NPL levels place significant pressure on bank balance sheets, constrain lending activity, and reflect deteriorating credit quality (Ozili, 2019). Chiesa and Mansilla-Fernandez (2021) further argue that increasing NPLs erode capital buffers and reduce loan supply. In Ghana, these pressures persist despite the comprehensive banking sector clean-up undertaken in 2017, which addressed governance failures, insider abuses, and regulatory weaknesses (Obuobi, Nketiah, Awuah, & Amadi, 2019). Against this backdrop of repeated monetary tightening and elevated lending costs, examining the short-run dynamics between interest rates and NPLs is critical for understanding credit risk transmission and informing policies aimed at safeguarding financial stability and supporting sustainable economic growth.

This study contributes to the literature by empirically examining the magnitude of the relationship between interest rates and NPLs in Ghana, bridging a notable knowledge gap. In light of numerous monetary tightening and global economic uncertainty that was prevalent in 2022 through 2023, analysing the short-run behaviour of NPLs provides critical insights into credit risk management and financial system resilience in emerging economies like Ghana.

This study therefore examines the short-run dynamics between interest rates and non-performing loans (NPLs) in Ghana, focusing on how rising rates affect borrowers' repayment capacity and credit risk. Higher interest rates particularly strain SMEs, weaken banks' asset quality, and restrict private sector growth. By revealing these linkages, the study informs monetary policy and financial stability strategies. The paper reviews relevant literature, outlines the methodology, presents findings, and offers policy recommendations.

2.0 Prior Studies, and Hypotheses

2.1. Nexus Between NPLs, Macroeconomic Factors, and Bank-Specific Variables

Empirical research consistently identifies both macroeconomic and bank-specific factors as key drivers of non-performing loans (NPLs). Klein (2013) categorises these determinants into two broad groups: macroeconomic conditions, such as GDP growth and unemployment, and bank-level factors, such as internal management efficiency. Abel (2018) reveals a bidirectional relationship between cost efficiency and NPLs, attributing the rise in bad loans partly to poor management practices. This relationship is further reinforced by studies on the banking sector by Louzis, Vouldis, and Metaxas (2012), and Hossain, Rahman, Golder, & Kabir, (2025) who highlight how weak internal controls exacerbate NPL formation. Interestingly, Kokkinis, and Miglionico, (2020). find that high-cost efficiency can paradoxically increase NPLs if risk monitoring resources are inadequate.

A growing body of empirical literature confirms that both bank-specific and macroeconomic factors play a central role in explaining non-performing loan (NPL) dynamics across banking systems. A comprehensive panel study of 1,631 banks across 111 countries shows that loan growth, GDP growth, and cost-income ratios consistently emerge as robust determinants of NPLs, underscoring the enduring relevance of traditional credit risk drivers across diverse institutional settings (Salas, Lamothe, Delgado, Fernández-Miguélez, & Valcarce, 2024). While such global analyses offer valuable general insights, they may understate short-run adjustment dynamics that are particularly salient in country-specific contexts such as Ghana's.

Moral hazard behaviour remains a critical channel through which bank-specific characteristics influence NPL accumulation. Empirical evidence shows that lower capital buffers can lead banks to take on greater credit risk, consistent with theoretical predictions of moral hazard in banking (Abbas, Ali, Moudud-Ul-Huq, & Naveed, 2021). Subsequent studies reinforce this view, highlighting the role of capital adequacy and internal risk controls in shaping credit outcomes (Jimenez & Saurina, 2002; Salas *et al*., 2024). Although some evidence suggests that large, well-funded banks may relax lending discipline (Ghosh, 2015), findings are not uniform across jurisdictions, as shown by Louzis, Vouldis, and Metaxas (2012) for Greece. Recent panel evidence from selected Ethiopian private commercial banks further demonstrates that capital adequacy and loan loss reserves significantly affect NPL levels, reaffirming the importance of moral hazard and risk management capacity (Demssie & Kassaye, 2025). However, the institutional specificity of such studies limits direct cross-country comparability, reinforcing the need for context-specific analysis.

On the macroeconomic front, deteriorating economic conditions have been widely associated with rising NPLs. Empirical studies document that slower GDP growth, rising unemployment, and broader economic downturns significantly elevate default risk (Climent-Serrano, 2019; Kuzucu & Kuzucu, 2019). High NPL ratios, in turn, constrain credit supply and impede

economic development (Singh, Basuki, & Setiawan, 2021), while weak credit standards and inadequate borrower monitoring further exacerbate asset quality deterioration (Ivanovic, 2016). Evidence also indicates that elevated NPLs impair bank efficiency and heighten systemic vulnerabilities (Vouldis & Louzis, 2018).

Ghana-specific evidence aligns with these broader findings. Using monthly data and an ARDL bounds testing framework, Okyere and Mensah (2022) show that inflation and GDP growth reduce NPLs, whereas higher lending rates increase them in the short run. While informative, the reliance on lower-frequency data highlights the need for higher-frequency and short-run modelling to capture rapid monetary and macro-financial adjustments.

Exchange rate movements, interest rate adjustments, and inflation play a critical role in shaping non-performing loan dynamics. Exchange rate depreciation tends to deteriorate asset quality, particularly in economies with material foreign-currency exposures (Longaric, 2022). Rising lending rates are consistently associated with higher NPLs across emerging market banking systems, reflecting weakened borrower repayment capacity (Warue, 2013; Bas & Kara, 2021; Sheefeni, 2015). Inflation exerts an ambiguous effect, as it may temporarily ease real debt burdens while increasing financing costs when nominal income growth lags (Filipović, 2024). Stress-testing evidence further confirms the sensitivity of NPLs to interest rate and asset price shocks, although conventional VAR frameworks may understate short-run and nonlinear adjustment processes (Undji & Sheefeni, 2024).

Recent systematic reviews emphasise the growing importance of regulatory quality and fintech adoption in shaping NPL outcomes, suggesting that institutional and technological contexts increasingly mediate the interaction between banking systems and the real economy (Ozili, 2025). Cross-country evidence confirms that persistent NPLs generate spillovers beyond the banking sector, dampening growth and credit expansion and threatening macroeconomic stability (De Bock & Demyanets, 2012).

Furthermore, multi-country panel system GMM analysis across developing and developed contexts found that deeper institutional environments interact with macroeconomic and bank-specific fundamentals to influence NPLs, reinforcing the need to consider governance and policy frameworks alongside economic variables (Beck, Jakubik, & Piloiu, 2015). This evidence complements your focus on policy channels shaping short-run NPL dynamics in Ghana.

Also, the relationship between interest rates and non-performing loans is grounded in established theories of classical banking and financial instability theories. The Monopoly or Klein–Monti framework posits that banks with market power can set lending rates above marginal costs, increasing debt-servicing burdens and default risk, particularly in concentrated banking systems (Klein, 1971; Monti, 1972). Complementing this, Minsky's Financial Instability Hypothesis explains how prolonged periods of stability encourage risk-taking and speculative borrowing, which becomes unsustainable when interest rates rise or liquidity tightens (Minsky, 1972). Together, these theories highlight how monetary conditions, bank pricing behaviour, and borrower risk interact to shape short-run non-performing loan dynamics, especially in emerging banking systems such as Ghana's. Based on the above empirical and theoretical considerations, the following hypotheses are proposed:

H1: Lending rates have a significant short-run effect on non-performing loans (NPLs).
H2: Inflation reduces NPLs in the short run by easing real debt burdens.
H3: Private sector credit initially lowers NPLs but may raise them later.
H4: Exchange rate depreciation is linked to higher NPLs,

Collectively, the literature offers a comprehensive framework linking macroeconomic and bank-specific factors to NPLs. These insights are critical for shaping effective monetary, regulatory, and financial sector policies. Building on this foundation, the next section outlines the methodology employed to examine the short-run dynamics between interest rates and non-performing loans in Ghana's banking sector.

3. METHODOLOGY

3.1. Study Design

This study adopts a quantitative approach, underpinned by positivist philosophy, which asserts that reality is stable and observable through objective analysis (Levin, 1988). Given the structure of the data, the ARDL model was deemed most appropriate for this analysis. The analysis is motivated by the view that changes in monetary conditions and macroeconomic fundamentals affect banks' asset quality primarily through short-term transmission channels rather than long-run equilibrium relationships.

Considering the dynamic nature of credit risk and the possibility of delayed responses of NPLs to macroeconomic shocks, the study adopts an Autoregressive Distributed Lag (ARDL) framework. The ARDL approach allows the dependent variable to depend on its own past realizations as well as current and lagged values of explanatory variables, making it particularly suitable for capturing short-run adjustment dynamics and persistence effects.

3.2 Empirical Model Specification and Study Variables

In examining non-performing NPLs and interest rate nexus, the study adopted and modified the model used by Sheefeni (2016) and Beck Jakubik and Piloiu (2013), who expressed non-performing loan as a linear function of interest rate, inflation, exchange rate, GDP per capita, domestic credit to the private sector by banks, and so on. The model is specified as follows:

The baseline ARDL model is specified as:

$$NPL_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \, NPL_{t-i} + \sum_{j=0}^{q} \beta_j \, X_{t-j} + \varepsilon_t$$

Where: NPL_tdenotes non-performing loans, $X_t$is a vector of explanatory variables including Average commercial interest rate, and relevant macroeconomic controls such as inflation, exchange rate, GDP per capita, and domestic credit to the private sector by banks, p and q represent optimal lag lengths, and $\varepsilon_t$is a white-noise error term. α_0 is the constant while α_i and β_j are respectively the coefficients of the dynamic factor (lag of NPL) and the explanatory variables.

The a priori expectations of the model relate directly to the direction of the estimated coefficients. The coefficient of the average lending rate is expected to be positive, as higher interest rates increase the debt-servicing burden on borrowers, thereby raising non-performing loans (Beck, Jakubik, & Piloiu, 2013; Sheefeni, 2016). Inflation is anticipated to have a negative effect, since moderate inflation reduces the real value of debt and eases repayment capacity (Okyere & Mensah, 2022). For the exchange rate, depreciation of the domestic currency is expected to increase the cost of servicing foreign-denominated debt, leading to a positive relationship with NPLs (Warue, 2013). GDP per capita is expected to reduce NPLs, implying a negative coefficient, because higher income levels improve borrowers' ability to meet their loan obligations (Adusei, 2018). Domestic credit to the private sector may have a mixed sign: moderate credit expansion can lower NPLs by supporting productive investment, but excessive lending may increase defaults due to relaxed credit standards (Singh, Basuki, & Setiawan, 2021; Demssie, Kassaye, & Legesse, 2025). Finally, the error term (ε_t) captures unobserved factors and shocks and is assumed to have no directional effect.

In sum, these expectations provide a theoretical benchmark for interpreting the estimated coefficients and understanding the short-run dynamics between interest rates, macroeconomic variables, and NPLs in Ghana's banking sector

3.3 Data Sources

Quarterly data spanning from Q1 2008 to Q4 2023 were used for the study. Specifically, Non-Performing Loans (NPL) and Average Commercial Lending rate (ALR) data were sourced from the Bank of Ghana (BoG) online database, while data on inflation (INF), exchange rate (EXC), GDP per capita (GDPC), and Domestic Credit to Private Sector by banks (CPS) were obtained from World Development Indicators. Apart from the ALR, which was in quarterly form, the rest of the variables were in annual form. To this end, Diz (1970) interpolation, which is a linear algorithm, was employed to interpolate the annual data into a quarterly series. The conversion of data into quarterly series was congruous as it helped meet an adequate number of observations suitable for time series analysis.

3.4 Estimation Procedure

The estimation procedure begins with stationarity testing, recognising that most macroeconomic time series have unit roots (Nelson & Plosser, 1982). The study employs the Augmented Dickey–Fuller (ADF) test for simplicity and the Phillips–Perron (PP) test for robustness against autocorrelation. Results confirm stationarity at levels I(0) and first differences I(1), as shown in Table I. These findings validate the use of the Autoregressive Distributed Lag (ARDL) model to analyse the short-run dynamics between interest rates and non-performing loans in Ghana.

Table I.: Unit root test after first difference

		Augmented Dickey-Fuller		Phillips-Perron		
	Variable	Level	First Difference	Level	First Difference	Order of integration
1	Non-Performing Loans (NPL)	-3.1915 (0.0260)	-3.4055 (0.0150)	-3.586878 (0.0092)	-3.395284 (0.0154)	I(0)
2	Average Commercial Lending Rate (ALR)	-2.0353 (0.2713)	-4.4699 (0.0007)	-1.979638 (0.2948)	-4.612594 (0.0004)	I(1)
3	Inflation (INF)	-3.4506 (0.0134)	-3.5763 (0.0095)	-1.825686 (0.3645)	-3.642830 (0.0079)	I(1)
4	Exchange Rate (EXR)	-0.0924 (0.9448)	-3.4617 (0.0129)	0.035146 (0.9575)	-3.512673 (0.0113)	I(1)
5	GDP per capita (GDPC)	-0.9694 (0.7579)	-3.0452 (0.0370)	0.841904 (0.7989)	-3.105784 (0.0320)	I(1)
6	Domestic Credit to the Private Sector by banks (CPS)	-1.9638 (0.0314)	-4.0543 (0.0025)	-3.051723 (0.0368)	-4.040167 (0.0027)	I(0)

Source: Author's computation using EViews 10 econometric software

The ARDL model developed by Pesaran, shin and smith (2001) was employed as the estimation technique. Given that non-performing loans (which is the regressand) is stationary at levels (I(0)), this study does not interpret the ARDL framework as evidence of cointegration. Instead, ARDL is employed as a flexible dynamic modelling approach to capture short-run adjustments and lagged responses between interest rates, macroeconomic variables, and NPLs.

Considering the fact that cointegration analysis presupposes the existence of non-stationary variables, the study does not test for or infer long-run equilibrium relationships. Instead, ARDL is employed as a flexible dynamic modelling tool to capture lagged effects, adjustment behaviour, and persistence in NPLs. This approach is consistent with the methodological guidance of Pesaran *et al*. (2001) when the dependent variable is stationary at levels.

Optimal lag lengths for the ARDL model are selected using standard information criteria, including the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). The chosen lag structure ensures parsimony while adequately capturing the dynamic responses of NPLs to changes in interest rates and macroeconomic conditions. Table II below presents the lag selection criteria, with lag two selected based on the Schwarz Information Criterion (SC). The selection considered five criteria: the Sequential Likelihood Ratio (SLR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), SC, and Hannan-Quinn Information Criterion (HQIC), using the rule of choosing the lag with the smallest SC or AIC value. Consequently, lag two was employed for subsequent estimations.

Table II: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-634.9239	NA	76.46896	21.36413	21.57356	21.44605
1	5.797627	1131.941	1.36e-07	1.206746	2.672787	1.780195
2	90.90124	133.3290*	2.73e-08*	-0.430041*	2.292606*	0.634936*
3	108.2571	23.71972	5.59e-08	0.191429	4.170684	1.747934
4	123.2165	17.45259	1.36e-07	0.892783	6.128645	2.940817

*** indicates lag order selected by the criterion**
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The dependent variable (NPL) is stationary at levels, hence there is no stochastic trend to cointegrate with. This is also confirmed by the ARDL bounds test result in Table III which indicates an inconclusive outcome on cointegration as the F-critical (3.55) falls within the bounds.

Table III: ARDL Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
			Lower Bound	Upper Bound
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.553557	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: Researcher's Computation using BoG & WDI data (2024)

Post-estimation diagnostics were conducted to assess the quality of the specification along with several dimensions. These consist of stability test (using the CUSUM test and CUSUM square test), normality (using the p-value of the Jargue-Bera), serial correlation (computed using Breush-Godfrey Serial Correlatioin LM Test), heteroskedasticity test (using the Breusch-Pagan-Godfrey test), and specification test using the Ramsey RESET test. Per the results, all required threshold under the post-estimation diagnostics have been met.

4.0 Discussion of Findings

4.1 Dynamic ARDL Estimates

Table IV reports estimates from the dynamic ARDL specification, focusing on the adjustment behaviour of non-performing loans (NPLs) in response to interest rate movements and macroeconomic conditions in Ghana. The coefficient on the average lending rate (ALR) is positive but statistically insignificant, indicating that changes in lending rates do not exert a sustained influence on NPLs beyond short-run adjustment effects. This suggests that banks and borrowers adapt over time through mechanisms such as loan restructuring, portfolio rebalancing, and improved credit risk management. Similar adaptive dynamics are documented by Vatansever and Hepsen (2013) for Turkey. Other macroeconomic variables, including inflation, exchange rates, GDP per capita, and domestic credit to the private sector, also show no statistically significant effects, reinforcing the view that NPL dynamics are primarily driven by short-run shocks rather than permanent macroeconomic conditions. These findings highlight the importance of macroprudential regulation and bank-level risk management, rather than reliance on monetary policy alone, in mitigating credit risk.

Table IV: Dynamic ARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ALR	-0.461125	0.658767	-0.699982	0.4872
INF	0.436331	0.454876	0.959231	0.3422
EXR	0.801398	0.911960	0.878764	0.3838
LNGDPPC	0.831137	5.777477	0.143858	0.8862
CPS	0.345597	0.734074	0.470793	0.6399
C	8.145262	47.84897	0.170229	0.8655

Source: Author's computation using EViews 10

Table V: Short-Run Dynamic ARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NPL(-1))	0.605755***	0.057427	10.54820	0.0000
D(ALR)	-0.499378***	0.126659	-3.942705	0.0003
D(ALR(-1))	0.403749***	0.110688	3.647618	0.0006
D(INF)	-0.119504***	0.034863	-3.427770	0.0012
D(CPS)	-0.557862***	0.113197	-4.928252	0.0000
D(CPS(-1))	0.402104***	0.110562	3.636928	0.0007
ECM(-1)*	-0.078142***	0.014788	-5.284014	0.0000

R-squared	0.880950	Mean dependent var	0.211689
Adjusted R-squared	0.867963	S.D. dependent var	0.989501
S.E. of regression	0.359554	Akaike info criterion	0.898100
Sum squared resid	7.110346	Schwarz criterion	1.138260
Log likelihood	-20.84110	Hannan-Quinn criter.	0.992393
Durbin-Watson stat	2.456178		

Note: (***) 1% Significant level; **(**)** 5% Significant level; **(*)** 10% Significant level
Source: Author's computation using EViews 10

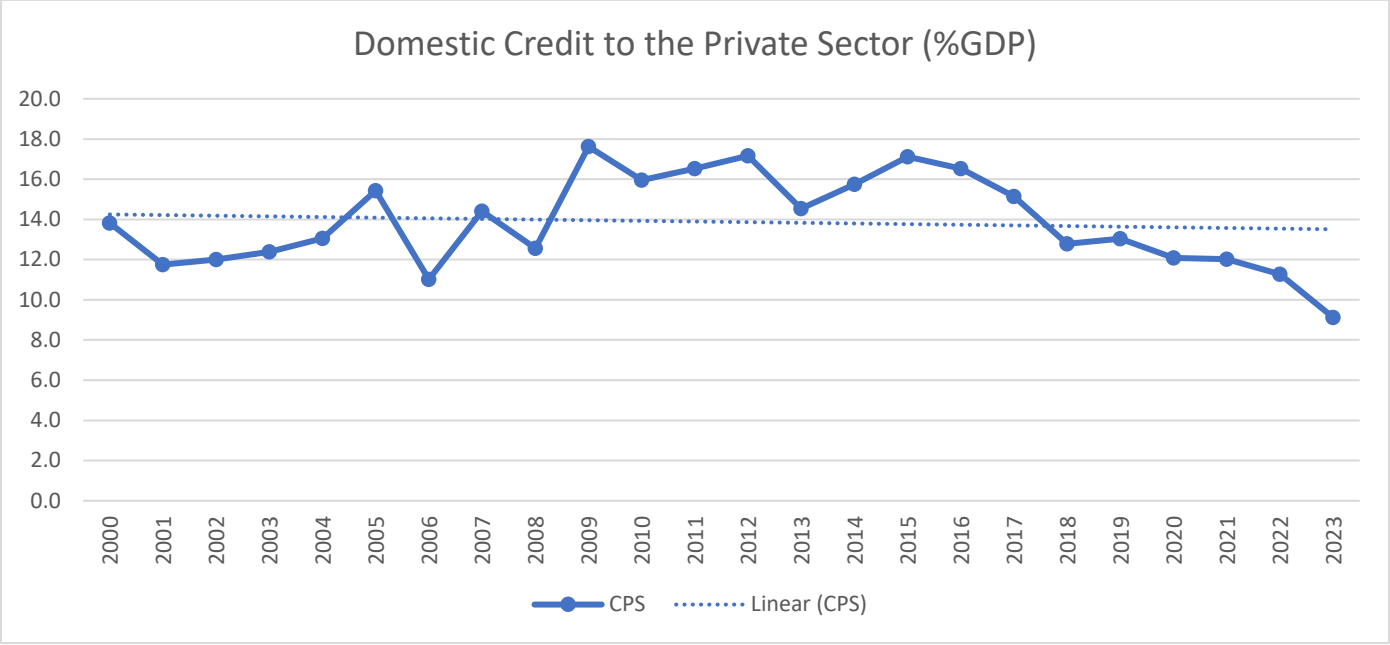
The short-run dynamic ARDL results, as presented in Table V, reveal that interest rates (ALR), inflation (INF), and credit to the private sector (CPS) significantly affect non-performing loans (NPLs) in Ghana in the short-run. However, exchange rate did not have any effect on NPL in the short-run, and this contravenes Hypothesis 4. Specifically, the independent variable ALR had a dynamic impact on NPLs. D(ALR) has a coefficient of -0.4994, which is statistically significant at the 1% level. This negative sign initially suggests that an immediate increase in lending rates is associated with a temporary reduction in NPLs, likely reflecting short-term credit-tightening and borrower discipline. However, the lagged change in ALR D(ALR(-1)), representing the previous quarter's lending rate change, has a positive coefficient of 0.4037 that is also significant at the 1% level. This finding indicates that increases in lending rates in the previous quarter contribute to an increase in NPLs in the current quarter. Thus, the effect of rising interest rates on credit risk is not immediate, but materializes with a delay, weakening borrowers' repayment capacity over time. This finding confirms Hypothesis 1 and also corroborates the observations of Louzis, Vouldis, and Metaxas (2012), and Bahruddin & Masih (2018), who find that interest rate changes have statistically significant short-run effects on NPLs. However, they contrast with Asiama and Amoah (2018), who posited that policy rates do not significantly impact NPLs in the short run.

In practical terms, as banks experience a delayed deterioration in asset quality following interest rate hikes, they may respond by further tightening credit conditions or reducing their exposure to riskier borrowers. This dynamic has the potential to restrict access to credit for SMEs and emerging businesses, which could curtail private investment and impede economic growth. This is particularly relevant in Ghana's post-pandemic economic recovery efforts.

Furthermore, inflation (INF) exhibits a statistically significant negative effect on NPLs, with a coefficient of -0.1195. This suggests that higher inflation, by eroding the real value of outstanding debt, may temporarily ease the debt servicing burden for borrowers, thus reducing default risks in the short run. The negative short-run coefficient on inflation validates Hypothesis 2, suggesting that higher inflation erodes real debt, temporarily easing borrower obligations — a result consistent with Nkusu (2011)

Credit to the private sector (CPS) also exerts a critical influence. D(CPS) records a negative coefficient of -0.5579 (significant at the 1% level), implying that expanding credit to the private sector initially reduces NPLs by boosting liquidity and supporting investment. Additionally, the plausible reason for the negative relationship between CPS and NPL in this study could be attributed to the risk-loving nature of most banks prior to the banking clean-up exercise between 2017-2018, where less profitable banks take a higher credit risk by lending heavily to the private sector. The initial reduction in NPLs from expanding private sector credit, followed by a subsequent rise in defaults, aligns with Hypothesis 3. This dynamic underscores the risk of unchecked credit growth (Sheefeni, 2015). However, the trend decreased from 2017, where the supply of domestic credit to the private sector declined marginally. See *Figure 2* for further details. However, lagged CPS (D(CPS(-1)) shows a positive coefficient of 0.4021, suggesting that unchecked or poorly screened credit expansion may later contribute to an increase in loan defaults.

Figure 2: Domestic Credit to the Private Sector (%GDP)



Source: World Development Indicators (2024)

The lagged level term (ECM(-1)) in the dynamic specification captures the speed at which deviations in NPLs from their historical patterns diminish following shocks. The negative and statistically significant coefficient indicates mean-reverting behaviour, suggesting that increases in NPLs tend to be corrected over time as banks adjust lending practices, intensify recovery efforts, and benefit from improved macroeconomic conditions.

This adjustment process in this context is not convergence toward a long-run equilibrium but rather as evidence of short-run stabilization dynamics within the banking system. The R-squared value of 88.1% demonstrates that the short-run model captures a high proportion of the variation in NPLs, confirming the robustness of the estimates.

5.0 Summary, Conclusion, and Policy Implications

This study examined the short-run dynamics between non-performing loans (NPLs) and interest rates in Ghana's banking sector using a dynamic ARDL framework with quarterly data spanning 2008 to 2023. Consistent with the stationarity properties of NPLs, the analysis focused on lagged responses, persistence, and adjustment behaviour rather than long-run equilibrium relationships. The findings show that interest rate movements exert statistically significant effects on NPLs in the short run, with both contemporaneous and delayed impacts. In particular, increases in lending rates initially appear to ease credit risk but subsequently contribute to higher NPLs as debt-servicing pressures materialise over time. Inflation exhibits a short-run mitigating effect on NPLs, reflecting temporary relief to borrowers through nominal income adjustments, while domestic credit to the private sector improves loan performance in the short term but contributes to credit deterioration with a lag. Granger causality tests further confirm a bi-directional interaction between interest rates and NPLs, underscoring the dynamic and mutually reinforcing nature of monetary conditions and credit risk.

From a policy perspective, these results highlight the importance of recognising the short-run transmission of monetary policy to bank asset quality. While interest rate adjustments remain

a central tool for inflation management, aggressive or poorly sequenced tightening can amplify credit risk by increasing borrowing costs and weakening repayment capacity, particularly for interest-sensitive sectors. This is especially relevant in the Ghanaian context, where sharp policy rate increases in 2022 coincided with persistent inflationary pressures and rising stress in loan portfolios. The findings therefore reinforce the need for the Bank of Ghana to distinguish carefully between supply-side and demand-driven inflationary pressures, ensuring that monetary responses do not inadvertently undermine financial stability.

The study further highlights the role of prudent credit management. Although credit expansion can support economic activity and repayment capacity in the short run, rapid or poorly supervised growth in private-sector lending may elevate systemic risk over time. This calls for strengthened underwriting standards, forward-looking credit risk assessments, and enhanced macroprudential oversight, particularly during periods of accommodative financial conditions.

Finally, the analysis is subject to certain limitations. The use of industry-level data may conceal heterogeneity across banks, and the exclusion of variables such as unemployment and sector-specific shocks may limit the scope of macroeconomic controls. Future research could extend this analysis using bank-level panel data and richer macro-financial indicators to better capture cross-bank differences in credit risk transmission.

In summary, the study demonstrates that NPL dynamics in Ghana are shaped predominantly by short-run interest rate movements, credit conditions, and inflation developments rather than by persistent long-run relationships. Policymakers should therefore adopt a balanced and carefully calibrated framework that integrates monetary policy, macroprudential regulation, and credit risk management to safeguard financial sector resilience while supporting sustainable economic growth.

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