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THE EFFECT OF MACROECONOMIC VARIABLES ON THE PERFORMANCE OF MORTGAGE-OFFERING BANKS IN TANZANIA

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ABSTRACT

This study investigates the effect of macroeconomic fluctuations on performance of mortgage market in Tanzania in terms of nonperforming loans (NPLs), with a focus on 10 commercial banks over the period 2014 to 2024. Employing panel data analysis, the study examines the impact of lending interest rates (LIs), GDP growth, inflation, and foreign exchange rates on NPLs of mortgage-offering banks while controlling for bank size, customer deposits, and net income. The study adopts Pedroni cointegration tests, panel ARDL models, and Hausman tests to ensure reliability and accuracy in the results. Insights from the analysis partially support the dual trigger hypothesis, emphasizing the interplay between borrower financial strain and broader economic stressors. The findings reveal that GDP and inflation have an insignificant effect on NPLs. However, a one percent appreciation of the Tanzanian shilling against the U.S. dollar is associated with approximately three times higher NPLs, and this exchange rate effect is statistically significant. Lending rate was the most influential factor on NPL with around 12 times higher NPL for each percentage increase in the lending rate. The research contributes to the broader discourse on financial stability by bridging gaps in the literature on emerging markets and suggests bolstering the resilience of Tanzania's mortgage market amid economic fluctuations.

Keywords*:* ARDL model, financial stability, macroeconomic variables, mortgage default, Tanzania.

INTRODUCTION

The global mortgage market is an integral component of the financial system, underpinning economic growth and social stability by enabling property ownership to access financial resources. However, this market operates within a highly dynamic environment influenced by macroeconomic factors such as interest rates, GDP growth, inflation, and exchange rate fluctuations (Koju et al., 2020; Kariuki, 2015). These factors directly affect borrowers' ability to meet mortgage obligations, posing risks to financial institutions and economic stability (Allen & Johnsen, 2008). The debate on the effect of macroeconomic variables on nonperforming loans (NPLs) is yet to be concluded. Klein (2013) and Beck et al. (2015) have on different occasions verified these contradictory observations. Espinoza and Prasad (2010) evaluated 80 (GCC) banks and found that NPLs were positively correlated with increased global financial volatility. Škarica (2014) suggested for a strong correlation between higher NPLs and the economy's recession, employment status, and inflation rate (IR). Using data from 16 Central, Eastern, and South-Eastern Europe (CESEE) countries between 1998 and 2011 at the national level, Klein (2013) observed that NPLs are negatively correlated with credit growth, unemployment, GDP growth, and inflation.

Similarly, the mortgage markets in both developed and emerging economies are shaped by structural and cyclical factors, with macroeconomic variables often acting as key determinants of market performance (Mian & Sufi, 2014). In developed economies, fluctuations in lending rates and GDP have been linked to significant variations in mortgage default rates (Carvalho et al., 2022; Morgan & Ryan, 2024; Koju et al., 2020). For instance, a study by Gerardi et al. (2018) on the U.S. housing crisis emphasized how sharp declines in GDP growth and rising unemployment rates triggered widespread mortgage defaults. Similarly, Mian and Sufi (2014) found that rising interest rates exacerbated defaults by increasing repayment burdens for adjustable-rate mortgage holders. These findings align with the "Double Trigger Hypothesis," which posits that mortgage defaults typically result from a combination of negative equity and cash flow constraints (Bergmann, 2020).

Emerging markets, however, present a different narrative, where additional factors such as exchange rate volatility and inflation often play more prominent roles. Güneş and Apaydın (2021), in their study of Turkey's mortgage market, highlighted how inflation-induced rises in real estate prices and currency depreciation created instability. Limon (2025) in his study in Bangladesh noted that bank-specific factors such as profitability, capital adequacy, and lending practices are important NPL determinants alongside agency costs. This study, however, ignored macroeconomic factors as determinants of NPL and reserved the same for future. Kansheba and Jacob (2020) suggest that macroeconomic volatility, particularly exchange rate fluctuations, was an important determinant of mortgage performance in Tanzania. Tanzania's mortgage market, though nascent, has experienced significant growth over the past decade. The Banking and Financial Institution (Mortgage Financing) Regulations of 2011 provided a regulatory foundation for the mortgage market, yet financing and NPL risks remain. Kansheba and Jacob (2020) emphasized the need for stronger risk-management practices among lenders to mitigate default risks.

The Tanzania's economy has experienced moderate GDP growth, averaging 6% annually from 2014 to 2020, driven by sectors such as construction, agriculture, and mining (World Bank, 2022b). However, external shocks, including the COVID-19 pandemic, caused GDP growth to decelerate to 2% in 2020 before rebounding in subsequent years (World Bank, 2022a). Macroeconomic volatility in Tanzania is further compounded by inflation and exchange rate dynamics. IRs have fluctuated between 3% and 5% over the past decade, driven by global commodity prices and domestic supply chain constraints Bank

of Tanzania (2022). At the same time, the Tanzanian Shilling has faced consistent depreciation against major currencies, increasing the cost of servicing foreign-denominated debts, including some mortgages. Such conditions make Tanzanian borrowers particularly vulnerable to adverse macroeconomic shocks, aligning with findings from studies in other developing economies (Güneş & Apaydın, 2021).

By 2022, mortgage loans constituted a growing percentage of total loans issued by commercial banks in Tanzania (Bank of Tanzania, 2022). Despite this growth, the market remains susceptible to macroeconomic fluctuations. Interest rates in Tanzania, for example, have remained relatively high at around 16% and volatile, limiting affordability for borrowers and increasing NPL risks (Bank of Tanzania, 2023). This study contributes to policy discourse by providing insights into how macroeconomic variables can enhance the performance of mortgage-offering banks. Since the global mortgage market operates within a complex interplay of macroeconomic variables, in Tanzania, where the mortgage market is still maturing, these dynamics are particularly pronounced. By integrating theoretical perspectives and empirical evidence, this study provides an analysis of the factors shaping performance of mortgage-offering banks, offering lessons for policymakers and financial institutions.

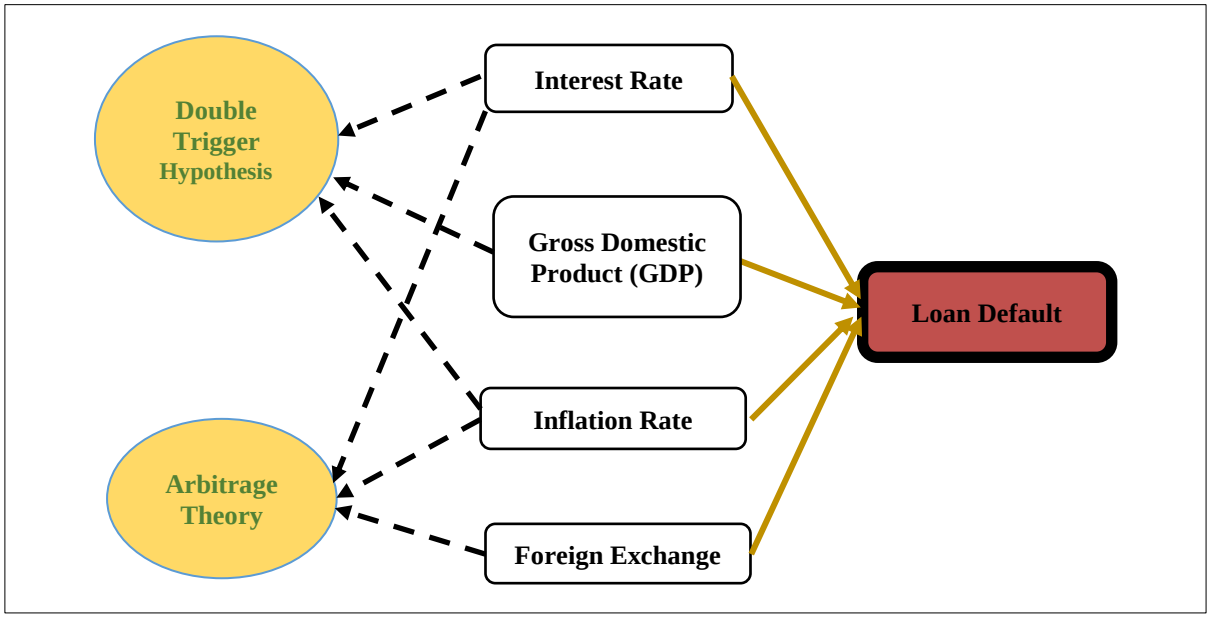
The theoretical framework guiding this study combines the Double Trigger Hypothesis and Arbitrage Pricing Theory (APT) to provide a comprehensive understanding of how macroeconomic factors affect NPL. The Double Trigger Hypothesis, proposed by Bergmann (2020) asserts that two concurrent factors are necessary for mortgage default: negative equity and financial distress. Negative equity occurs when a borrower owes more on their mortgage than the property is worth, while financial distress refers to the borrower's inability to meet financial obligations due to job loss, illness, or other financial or economic shocks. According to this theory, these two factors act as "triggers" that initiate the default process. While the Double Trigger Hypothesis emphasizes individual borrower circumstances, it also highlights the influence of broader macroeconomic conditions that can exacerbate financial distress, such as rising unemployment or a downturn in the housing market.

In contrast, the APT, developed by Ross (1976), offers a broader, systemic framework for understanding how economic variables affect asset prices, including housing. The APT suggests that asset prices, such as real estate values, are determined by multiple macroeconomic factors, including GDP growth, inflation, and interest rates. This theory posits that changes in these factors affect mortgage markets by influencing both property values and borrowers' ability to repay loans. APT is particularly valuable in this context because it captures the cumulative impact of economic conditions on the mortgage market, integrating multiple factors that might simultaneously affect both the supply and demand for housing.

The conceptual framework in Figure 1 integrates the two perspectives discussed earlier, illustrating how macroeconomic variables and individual borrower circumstances interact to influence mortgage defaults. For instance, a sudden increase in interest rates could reduce borrowers' affordability while simultaneously decreasing property values, thus triggering both factors required for mortgage default according to the Double Trigger Hypothesis. This integrated approach helps to explain the complexities of mortgage market performance under varying macroeconomic conditions. Despite extensive research on macroeconomic factors and NPL, most studies focus on developed economies, with limited attention to emerging markets. While Güneş and Apaydın (2021) and Kansheba and Jacob (2020) provide valuable insights, more research is needed to understand the unique challenges faced by nascent mortgage markets in Africa and Asia. This study, therefore, complements the limited studies in Sub-Saharan African that have focused on macroeconomic determinants of mortgage uptake.

Figure 1

Theoretical Framework



Source. Authors' construction, 2024.

The macroeconomic variables in Figure 1 were selected to provide a comprehensive and multifaceted view of the factors that influence mortgage default rates in Tanzania. By analyzing their short- and long-term effects, this study aims to uncover the key economic conditions that affect borrowers' ability to meet their mortgage obligations. LIs are crucial as they directly impact loan affordability, especially for borrowers with variable-rate mortgages. When rates increase, repayment becomes more challenging, potentially leading to higher default rates. GDP growth reflects the overall economic health and employment levels (Rendon & Bazer, 2021), which in turn affect borrowers' income stability and repayment capacity. A growing economy generally supports increased income and lowers default risk, while a recession can have the opposite effect (Koju et al., 2020). Inflation, particularly high inflation, erodes household purchasing power, which strains budgets and reduces the ability to meet financial obligations, especially for those on fixed incomes.

Apart from macroeconomic factors, bank-specific controls could explain variations in NPL (Sanga, 2022). Hoxha et al. (2025) observes that bank net interest margin, bank overhead costs to total assets, bank credit to deposits, and bank capital to total assets have a positive impact on profitability, an indicator that such factors could be NPL reducing. The positive effect of return on asset based on earnings before interest and taxes (EBIT)/total assets ratio (EBITTA) and net income/total assets (NITA) on bank NPL has also been reported by Carvalho et al. (2022). Carvalho et al. (2022) further noted that sales/total assets (SATA) and firm size as reflected in total asset value (TAV) tend to reduce NPL risk. These bank-specific variables are included in this study as controls of the bank-specific behavior toward NPL.

The remaining section of this paper is organized as follows. In the next section, the methods employed in data collection and analysis are explained in detailed followed by the results section where descriptive statistics are provided first followed by trend analysis regarding NPL across banks. Thereafter results of regression models are explained with emphasis on both the general findings and specific results for

each bank that was studied. A separate section on the discussion of the finding is provided next with the intention to link the results with the existing body of knowledge both theoretical and empirical researches. The last section provides a conclusion and a reflection on possible policy direction for Tanzania banks and the banking sector as a whole.

METHODOLOGY

This study utilizes a panel data analysis approach to examine the relationship between macroeconomic factors and mortgage defaults across 10 Tanzanian banks over the period 2014 to 2024. This methodological framework combines cross-sectional data from 10 Tanzanian banks with time-series observations. This approach enables the examination of both temporal and cross-sectional variations, enhancing the precision of estimates compared to purely cross-sectional or time-series analyses (Berrington, 2006). Panel data methods are particularly useful for addressing unobserved heterogeneity and detecting dynamic relationships among variables, making them well suited for analyzing mortgage market performance. By obtaining data from 10 banks, that is, 6 largest banks from the list of 10 banks ranked in Table 2 and 4 other small banks, out of a total of 31 mortgage-offering banks by 2024, the study expounds critical relationship between NPL and macroeconomic variables. This study, however, did not capture the performance of the other 21 banks that though small in size may change some findings of this study.

The study relies exclusively on secondary data sourced from published financial statements found on the websites of the respective banks as summarized in Table 1. The dependent variable, NPL, represents the loans outstanding specific to each bank, as derived from their quarterly and annual financial statements in both percentage and amount in Tanzania Shilling (TZS). NPL quantifies the proportion of loans that borrowers have failed to repay out of the gross loan amount issued for each bank, offering a direct measure of market stability for mortgage-offering banks. The independent variables encompass four critical macroeconomic indicators. The LI, sourced from the Bank of Tanzania (BOT), reflects the cost of borrowing, influencing borrowers' ability to repay loans. Gross Domestic Product (GDP) growth, obtained from the National Bureau of Statistics (NBS), measures the overall economic performance, which can affect employment and income levels, subsequently impacting loan repayment capacity. The IR, also provided by the NBS, captures price level changes that can strain household finances and influence default rates. Lastly, the Foreign Exchange Rate (LN_ER), sourced from the BOT, indicates the average exchange rate of the Tanzanian shilling against the US dollar, which can impact mortgage repayment for loans tied to foreign currency or influenced by imported goods prices. Although there are other macroeconomic variables such as unemployment and population dynamics that are central in NPL fluctuations, they were not included in the current analysis because they are considered to be highly correlated with GDP and inflation and their inclusion would have limited value addition.

Table 1

Description of Variables

Variable	Indicator	Source Institution
Dependent variable		
Quarterly NPL	The percentage of NPLs specific to each bank quarterly (NPL)	Bank Financial Statements
Independent variables		
Lending interest rate	Quarterly LI in percentage (lendinginterest)	Bank of Tanzania
GDP growth	Quarterly GDP growth rate in percentage (lngdpg)	National Bureau of Statistics (NBS)
Inflation rate	Quarterly IR in percentage (inflation)	National Bureau of Statistics (NBS)
Foreign exchange	Log transformed of quarterly average exchange rate (lner)	Bank of Tanzania
Total asset value	Natural log of transformed quarterly total asset value in million TZS (lntav)	Bank Financial Statements
Customer deposits	Natural log of transformed quarterly customer deposits in million TZS (lndep)	-do-
Net income	Natural log of transformed quarterly net income in million TZS, shifted by adding the average to eliminate negative values for log transformation purposes (lnsni)	-do-

Source. Authors' construction, 2025.

The study focused on 10 out of 31 mortgage-offering commercial banks that collectively represent a significant portion of Tanzania's mortgage market (BoT, 2023b). These banks were selected because of availability of data on continuous basis since 2014 and the fact that they represent large and small banks in Tanzania with the largest six banks having around 75% of the market share (BoT, 2023a). Six of the banks that offer mortgage products are also among the top 10 largest banks in Tanzania as shown in Table 2. The 4 small mortgage-offering banks that have never featured in the top 10 largest banks as per Table 2 but were included in the study are Amana Bank Limited (AMANA), I&M Tanzania Limited (I & M), Bank of Baroda (BOB), and International Commercial Bank Tanzania Ltd (ICB).

Table 2

Ten Largest Banks in Tanzania Based on Total Assets Value in 2022 and 2023

Rank 2023	Bank Name	Total Assets in Bil USD 2022	Total Assets in Bil USD 2023
1	CRDB Bank (CRDB)	4.9	5.6
2	NMB Bank (NMB)	4.2	5.2
3	National Bank of Commerce (NBC)	1.2	1.5
4	Exim Bank (EXIM)	1	1.3
5	Azania Bank (AZANIA)		0.9
6	Diamond Trust Bank (DTB)	0.68	0.8
7	People's Bank of Zanzibar (PBZ)	0.59	0.8
8	Standard Chartered Bank (SCB)	0.56	0.9
9	Stanbic Bank (STANBIC)	0.56	0.6
10	Absa Bank (ABSA)	0.46	0.6

Source. Authors' construction based on https://www.tanzaniainvest.com/banks, 2025.

The stationarity of variables was examined using the both Pesaran CADF test for cross-sectional dependence and the Fisher-type unit root test for panel-independent variables as per Table 3. Panel stationarity tests were conducted to ensure the reliability of the panel time series analysis in cases of cross-sectional dependence. Since the macroeconomic variables are only time dependent and are constant across panels, the traditional assumption of cross-sectional independence is assumed and the Fisher-type test is utilized. The null hypothesis in the Fisher's test is that "all series are nonstationary" while the alternative is "at least one series in the panel is stationary." Both unit root test results as presented in Table 3 revealed a mixed order of integration among the variables, with some being stationary at level and others requiring first differencing. This finding justified the use of the panel ARDL model, which is particularly suited to datasets with mixed integration orders, ensuring the robustness of the subsequent analyses.

Table 3

Unit Root Test Results

Variable	At Level				At First Difference	
	With Constant		With Constant & Trend			
	t-bar	sig	t-bar	sig	t-bar	sig
Pesaran CADF						
NPL	−1.971	0.261	−2.200	0.079	−5.791	0.000
Total Asset Value	−2.006	0.224	−1.569	0.761	−5.930	0.000
Total Customer Deposits	−0.758	1.000	−1.072	0.991	−6.114	0.000
Net Income	−4.674	0.000				
Fisher Type						
GDP Growth	−13.818	0.000				
Inflation	−10.602	0.000				
Exchange rate	−4.854	0.000				
Lending interest	0.935	0.823	2.972	0.998	−33.960	0.000

Notes.

a: Null Hypothesis: the variable has a unit root.

b: Probability based on MacKinnon (1996) one-sided *p* values.

Source. Authors' construction, 2025.

The cross-sectional dependence in Table 4 was found to be significant for all the bank-specific variables thus calling for second generation stationarity test that in this case the Pesaran CADF, that is, cross-sectionally augmented Dickey–Fuller tests was utilized. In this test, the null hypothesis of cross-sectional independence is tested against the alternative of cross-sectional dependence.

Table 4

Cross-Sectional Dependence Test

Variable	CD-test	*p* value	Average joint T	Mean ρ	Mean abs(ρ)
GDP growth	3.119	0.002	44.00	0.07	0.37
Inflation	22.708	0.000	44.00	0.51	0.74
Exchange rate	23.053	0.000	44.00	0.52	0.70
Lending interest	40.647	0.000	44.00	0.91	0.91
Natural log of NPL	5.103	0.000	44.00	0.11	0.32
Natural log of total asset value	23.932	0.000	44.00	0.54	0.80
Natural log of customer deposits	16.922	0.000	44.00	0.38	0.67
Natural log of end of net income	44.047	0.000	44.00	0.99	0.99

Notes.
Under the null hypothesis of cross-section independence, CD ~ N(0,1).
p-values close to zero indicate data are correlated across panel groups.
Source. Authors' construction, 2025.

Given the stationarity test results as detailed in Table 3 a panel ARDL model for macroeconomic determinants of NPL can be specified as per Equation 1.

$$NPL_{it} = \beta_{0i} + \sum_{j=1}^{p} \beta_{1i} NPL_{it-j} + \sum_{k=0}^{q} \beta_{2i} LI_{it-k} + \sum_{l=0}^{q} \beta_{3i} IR_{it} + \sum_{m=0}^{q} \beta_{4i} GDP_{it-m} + \sum_{n=0}^{q} \beta_{5i} LN\_ER_{it-n} + \epsilon_{it},$$

(Equation 1)

where,

β_{0i} is the individual-specific effect,
NPL is the Nonperforming loan,
ER is the exchange rate,
GDP is the gross domestic product,
LI is the level of inflation,
$\beta_{1i}, \beta_{2i}, \beta_{3i}, \beta_{4i}\ and\ \beta_{5i}$are the coefficients to be estimated, and
ϵ_{it} is the error term.

Short-run dynamics were modeled using the error correction representation of the ARDL model, as shown in Equation 2. This framework captured the speed of adjustment to long-run equilibrium and short-term deviations caused by macroeconomic fluctuations. A full ARDL model with cointegration (ECM) was specified as per Equation 2.

$$\Delta NPL_t = \beta_{0i} + \sum_{j=1}^{p} \beta_{1j} \Delta NPL_{t-j} + \sum_{j=1}^{q} \beta_{2j} \Delta LI_{t-j} + \sum_{j=1}^{q} \beta_{3j} \Delta IR_{t-j} + \sum_{j=1}^{q} \beta_{4j} \Delta GDP_{t-j} + \sum_{j=1}^{q} \beta_{5j} \Delta LN\_ER_{t-j} + + \sum_{j=1}^{q} \beta_{6j} \Delta LN\_\mathrm{TAV}_{t-j} + + \sum_{j=1}^{q} \beta_{7j} \Delta LN\_DEP_{t-j} + + \sum_{j=1}^{q} \beta_{8j} \Delta LN\_SNI_{t-j} + \lambda ECT_{t-1} + \varepsilon_t,$$

(Equation 2)

where,

β_{0i} denotes time invariant individual bank-specific effect,

Δ denotes the first difference operator,

$LN_$TAVs the natural log of quarterly total asset value,

LN_DEP is the natural log of quarterly customer deposits,

LN_SNI is the natural log of quarterly net income,

$ECT = NPL_{t-j} - \emptyset X_t$ is the error correction term indicating the extracted residuals of the regression of long-run equation and $\emptyset = \frac{\sum_{j=0}^{q} \alpha_i}{\alpha}$ is the long-run relationship coefficient,

$\lambda = 1 - (\sum_{j=1}^{p} \delta_j)$ the speed of adjustment to the long-run equilibrium with a negative sign suggesting convergence,

$\beta_{1j}, \beta_{2j,} \beta_{3j}, \beta_{4j}, \beta_{5j}, \beta_{6j}, \beta_{7j}, \beta_{8j}$ represents short-run coefficients, and

Other variables remain as defined in equation 1

The selection of optimal lag lengths for the ARDL model, as shown in Table 5, was determined using the Akaike Information Criterion (AIC). The optimal lag was observed to be 3 given the lowest AIC score of around −32.115, which was also supported by other optimality criteria as reported in Table 5. These lags are critical for accurately capturing both the short- and long-term dynamics of the relationships between macroeconomic variables and NPLs. By carefully balancing model complexity and predictive accuracy, the chosen lags allow for a nuanced analysis of how immediate and delayed effects shape NPL.

Table 5

Optimal Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	4501.151	NA	1.92e-17	−24.304	−24.251	−24.283
1	5808.309	2571.922	1.87e-20	−31.2341	−30.91679	−31.108
2	6017.645	406.226	6.92e-21	−32.231	−31.649	−31.999
3	6177.681	306.2293*	3.34e-21*	−32.960*	−32.115*	−32.624*

Notes.

* 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

HQ: Hannan-Quinn information criterion

Source. Authors' construction, 2025

The Hausman test was employed to select between the Pooled Mean Group (PMG) and the Mean Group (MG) estimator while the AIC was used for optimal lag selection. The Hausman test supported the use of the PMG estimator, confirming long-run homogeneity across banks while accommodating short-run heterogeneity as per Table 6.

Table 6

Correlated Random Effects—Hausman Test

Test cross-sectional random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-sectional random		0.000	4	1
Cross-sectional test variance is invalid. Hausman statistic set to zero.				
Cross-sectional random effects test comparisons:				
Variable	Fixed	Random	Var (Diff.)	Prob.
LN_ER	0.115	0.115	0.000	NA
LENDING_INTEREST	0.805	0.805	0.000	NA
INFLATION	0.851	0.851	0.000	1.000
GDP	−0.396	−0.396	0.000	NA

Source. Authors' construction, 2025.

RESULTS

Descriptive Statistics

The results of this study present an analysis of the interplay between macroeconomic fluctuations and performance of Tanzania mortgage banks. The descriptive statistics summarized in Table 7 provide an overview of the variables under study, including NPLs and key macroeconomic indicators such as GDP growth, IRs, LIs, and foreign exchange rates. The data highlights the central tendencies and variations across these variables over the 2014–2023 period. The NPL for the period was around 9% (0.09), while GDP growth was 6%, interest rate growth and lending rate were around 3% with the exchange rate stood at TZS 2,223.075 per USD. The standard deviation suggests that all the macroeconomic variables are relatively stable with the highest variability among the scale variables being observed for annual customer deposits (of around TZS 15 million) while those measured in percentage the highest variability is reflected in NPL at 0.09. The skewness indicators suggest some abnormality in the data for NPL, net income, and customer deposits and exchange rate, which are slightly out of the acceptable ranges for skewness (−2 and +2). The remaining macroeconomic indicators are not that far from acceptable normality in the data.

Table 7

Descriptive Statistics

Name of variable	Mean	Std. Deviation	Minimum	Maximum	Skewness
NPL in million TZS	80,919.634	98,831.130	1,016.000	462,115.000	1.565
Total asset value in million TZS	2,226,638.480	3,092,686.089	59,210.000	16,590,560.000	2.187
Customer deposits in million TZS	1,604,722.337	2,173,264.314	0.100	10,833,044.000	1.965
Net income in million TZS	30,786.248	35,456.339	344.272	210,776.559	2.681
NPL (%)	0.084387	0.09064	0.013	0.544	2.573
GDP growth rate (%)	0.060	0.016	0.029	0.101	0.604
Inflation rate (%)	0.028	0.008	0.015	0.048	0.543
Exchange rate (TZS/$)	2,223.075	233.202	1,615.698	2,718.500	−1.093
Lending interest rate (%)	0.165	0.007	0.154	0.182	0.556

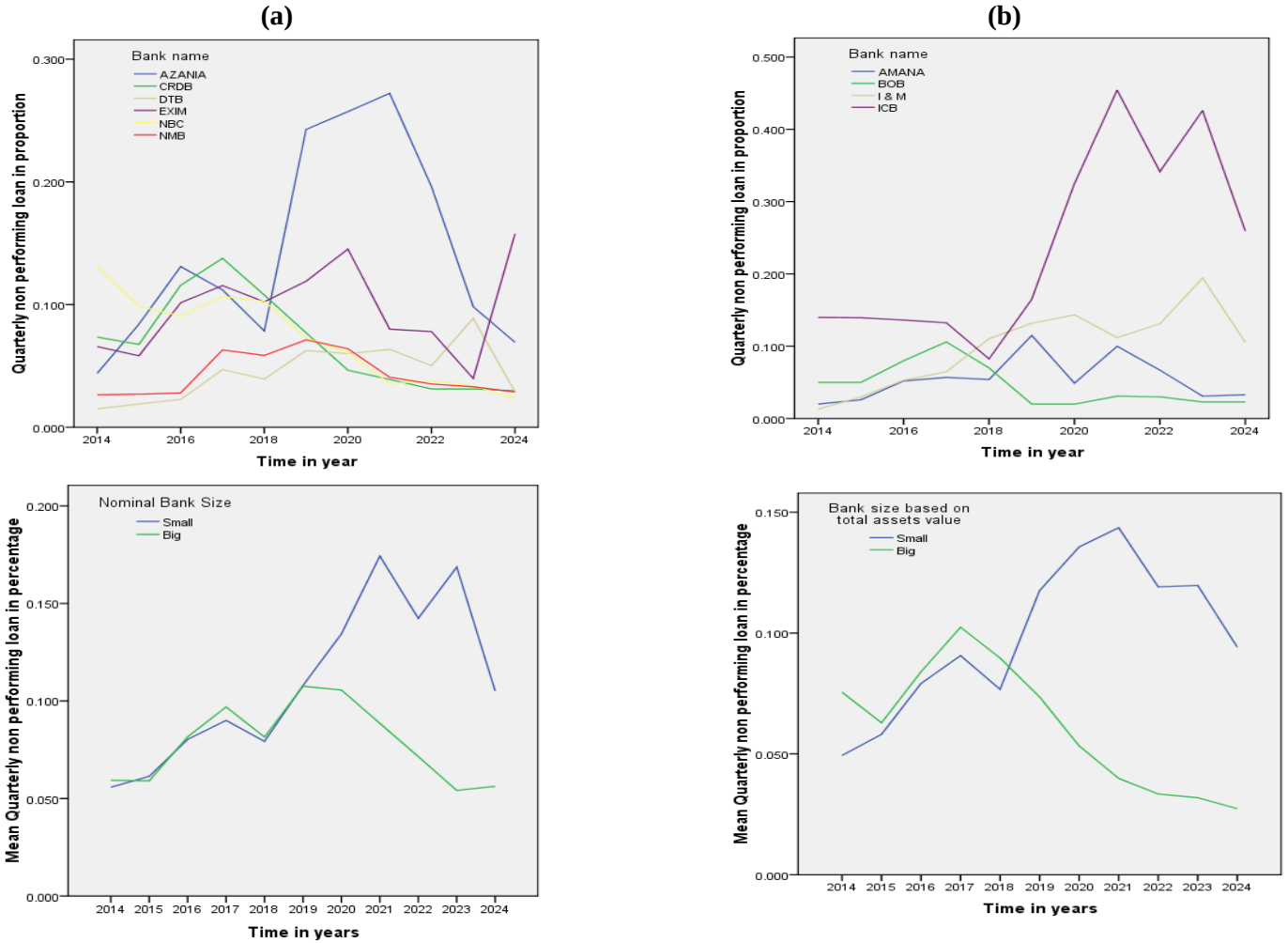
Source. Authors' construction, 2025.

Trends of NPL across Banks

Figure 2 provides details of NPL trends by comparing large and small banks as classified in the Tanzania Ernst &Young (EY) report (Tanzania, EY, 2022). In Figure 2(a), the bank size is based on the TAV for two years as summarized in Table 2. In this case, the cut-off point between large and small was arbitrarily chosen for the six highly ranked banks. To the contrary, in the Tanzania, EY (2022) classification (Figure 2(a)), banks were arranged based on their market value of total assets and those making a cumulative share of 75% from the largest were classified as large banks (or relatively large compared to other). Thus, all other banks used in this paper that failed to meet those two criteria (i.e. absolutely or relatively large) were considered small banks. For the six large banks in Figure 2(a), NPL trend exhibits a downward trend except for one bank, EXIM, while for the relatively smaller bank, AMANA bank exhibited a serious upward trend until 2021, but the remaining banks are relatively stable. It should be noted that AZANIA bank is a relatively new comer as a large bank following a 2019 merger with Bank M. The key message here is that NPL seem to vary by bank size with large banks experiencing huge NPL that deviate much from small banks in recent years.

Figure 2

NPL Trend Across Banks: (A) The Six Large Bank and (B) The Four Smaller Banks (Tanzania, EY, 2022)

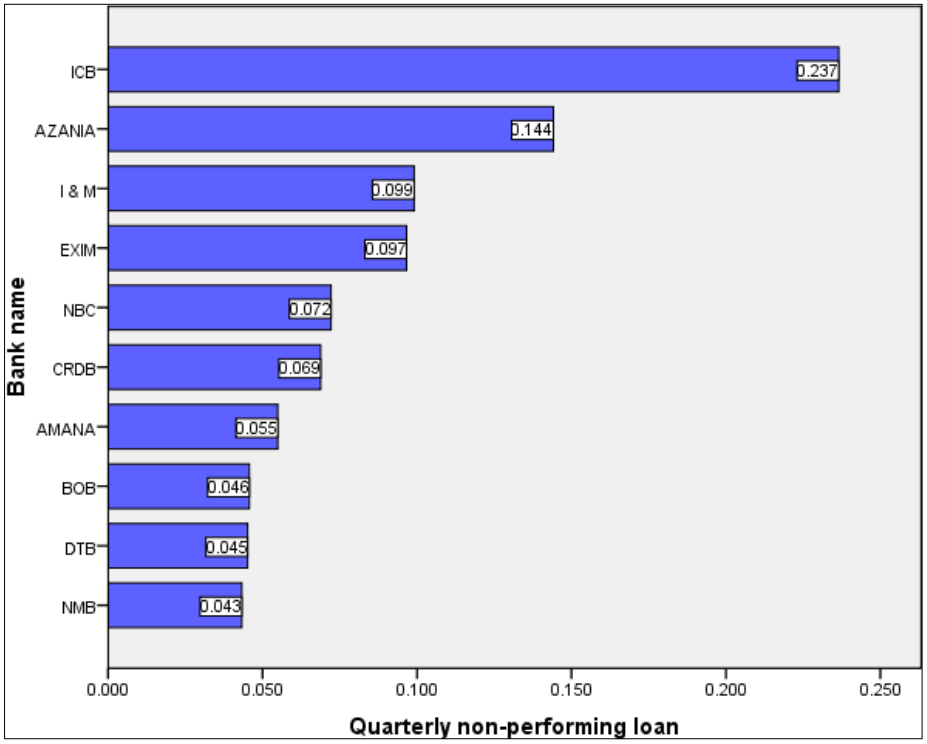


Source. Authors' construction, 2025.

A striking feature of the observations as presented in Figure 3 where the variability in NPLs across banks ranges between 4.3% and 23.7%, which suggests differing levels of resilience to macroeconomic shocks. This variation is also coupled with higher standard deviations for higher NPL banks. For example, ICB bank has both the highest NPL and the highest standard deviation on those data. The remaining banks have relatively stable NPL although for some banks it is still very large compared to the highest threshold requirement of 5%. The data in Figure 3 suggest that on average, only NMB, DTB and BOB managed to maintain the NPL within the requirement while the remaining had most of their NPLs higher than the maximum threshold.

Figure 3

Averages NPL per Bank and Associated Variability

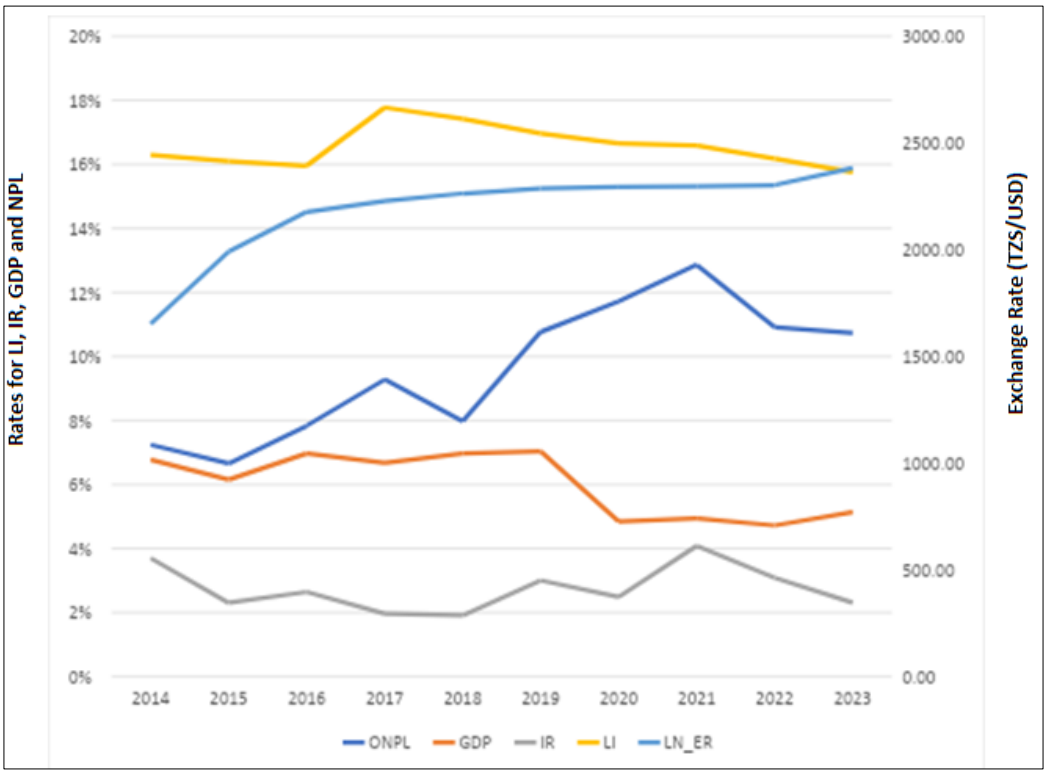


Source. Authors' construction, 2025.

Figure 4 complements the descriptive statistics by illustrating the trends in GDP growth, inflation, LIs, and foreign exchange rates over the study period. The fluctuations in GDP growth and exchange rates reflect the dynamic and often volatile economic conditions in Tanzania during the study period. The remaining two macroeconomic variables namely inflation and lending rate did not show substantial variability in response to NPL. Regarding trends, only the exchange rate suggests some upward trend while lending rates are on the decline. When compared to the overall NPL, it is obvious that NPL is increasing alongside only the exchange rate suggesting a positive correlation while it is negatively correlated with the remaining macroeconomic indicator. As such NPL is expected to be higher as the economy worsens and as both overall IR and lending rate falls. The significance of these observations requires further analysis.

Figure 4

Trends in Macroeconomic Variables and NPL



Source. Authors' construction, 2025.

Regression Analysis Results

To confirm the existence of long-run relationships among the variables, the Pedroni cointegration test results are presented in Table 8. Based on the cointegration that includes four within-dimension and three between-dimension group statistics, the results demonstrate the existence of a cointegration relation between the investigated variables for all statistic except panel v, which is negative but not statistically significant. Table 8 provide insights into the presence of a cointegration relationship among the variables NPLs, GDP, LI, IR, and the Foreign Exchange Rate (LN_ER) in the context of a Panel ARDL model. The test included both within-dimension (panel statistics) and between-dimension (group statistics) assessments for the null hypothesis of no cointegration. Within-dimension tests yield mixed results, the panel v-statistic, with nonsignificant *p* values, reject the null hypothesis, suggesting no cointegration. However, the panel rho-statistic, with significant *p* values, fail to rejects the null hypothesis at the 5% significance level, indicating some evidence of cointegration. Both the panel PP-statistic and panel ADF-statistic exhibit significant *p* values, strongly rejecting the null hypothesis and indicating a robust cointegration relationship among the variables in the panel as a whole.

Table 8

Pedroni Cointegration Test Results

	Within panel dimension		Between group dimension	
	Statistic	Prob.	Statistic	Prob.
v-Statistic	−2.629			
rho-Statistic	4.121	**	5.392	
PP-Statistic	4.291	***	5.554	**
ADF-Statistic	3.907	***	4.921	***

Source. Authors' construction, 2025.

Between-dimension (Between group) tests present a nuanced view. While the group ADF-statistic and somehow the group PP-statistic strongly rejects the null hypothesis, indicating that some individual cross sections exhibit cointegration, the group rho-statistic partially support integration within panels and not between groups. This implies that cointegration may not be uniform across all banks, suggesting variability in the cointegration relationship among banks. Nevertheless, the Pedroni cointegration test results provided some evidence of a cointegrating relationship among variables.

Part A of Table 9 presents the long-run coefficients derived from the panel ARDL model. Among the macroeconomic variables, neither GDP growth nor inflation emerged as significant determinant of mortgage performance, both seem to be negatively correlated with NPL. The higher GDP growth and inflation may reduce NPL but we do not find strong evidence to support this argument. To the contrary, LIs demonstrated a significantly positive relationship with NPLs, indicating that higher borrowing costs exacerbate the risk of mortgage defaults. One-unit increase in lending rate increases NPL by around 12.3 times in the long run suggesting the hassle that borrowers face to repay loans as a result of interest rate increase. These results highlight the importance of fostering a stable macroeconomic environment to enhance mortgage market resilience. Exchange rate is also positive on NPL and statistically significant. One-unit increase in exchange rate has around 3.22 times higher NPL. One bank-specific indicator suggested for a long-run effect, that is, customer deposits where if customer deposit increase by a unit, NPL responds by around 6 percent lower value. It is evident that the long-run effect of macroeconomic variables on NPL among banks in Tanzania is channeled via higher lending rate and exchange rate both of which worsens NPL in the long run.

Table 9

Regression Model Results

Variables	ARDL		95% Confidence interval	
	B	Sig		
A: ECT: Long-run effects				
Natural log of GDP growth (lngdpg)	−6.10		−16.98	4.79
	(5.55)			
Head count inflation (inflation)	−3.76		−19.71	12.19
	(8.14)			
Natural log of exchange rate in TZS/USD (lner)	3.22	***	1.46	4.97
	(0.89)			
Lending interest rate (lendinginterest)	12.30	***	−10.54	35.13
	(11.65)			
Natural log of customer deposits (lndep)	−0.63	***	−2.55	1.29
	(0.98)			
B: Short-run effect				
ECT	−0.16	***	−0.25	−0.06
	(0.05)			
Lagged difference of natural log of NPL (lnnpl LD).	0.02		−0.05	0.09
	(0.04)			
Lagged second difference of natural log of NPL (lnnpl L2D)	0.06	*	−0.01	0.13
	(0.04)			
Lagged first difference of natural log of GDP growth (lngdpg D).	0.03		−1.83	1.90
	(0.95)			
Lagged difference of natural log of GDP growth lngdpg LD.	1.03		−1.03	3.09
	(1.05)			
Differenced IR (inflation D1).	0.05		−3.38	3.48
	(1.75)			
Differenced natural log of exchange rate in TZS/USD (lner D1).	0.97	***	0.41	1.53
	(0.29)			
Lagged differenced natural log of exchange rate in TZS/USD lner LD.	−1.49	**	−2.71	−0.28
	(0.62)			
Differenced natural log of LI (lendinginterest D1).	2.88		−4.04	9.80
	(3.53)			
Differenced natural log of total asset value of a bank lntav D1.	0.09		−1.60	1.78
	(0.86)			
Differenced Natural log of customer deposits (lndep D1).	−0.23		−1.18	0.71
	(0.48)			

(continued)

Variables	ARDL		95% Confidence interval	
	B	Sig		
Differenced natural log of net income of a bank (lnsni D1).	0.03		−0.16	0.21
	(0.10)			
Lagged differenced natural log of net income of a bank (lnsni LD).	0.10		−0.04	0.24
	(0.07)			
Constant (_cons)	−4.26	***	−6.80	−1.73
	(1.29)		−0.25	−0.06
Number of observations	410			
Number of groups	10			
Observations per group: minimum	41			
Observations per group: maximum	41			
Number of observations	410			
Log Likelihood	143.3639			

Notes.
Standard Error are provided in parentheses; * = Significant at 10%, ** Significant at 5% and *** = significant at 1%
Source: Authors' construction, 2025.

Part B of Table 9 provides the results of the short-run effect of macroeconomic factors as well as the robustness of those effect. Although lagged values of NPL are not significant predictor of current NPL, it is notable that as the second lag of NPL increases the higher will be the realized current quarter NPL suggesting for a delayed signaling of up to two quarters. All other bank-specific controls turned out to be not statistically significant in the short run. The short-run effect from macroeconomic variables onto NPL is mainly attributed by exchange rate with the first lag of exchange rate being associated with higher NPL ($B = 0.97$, SE = 0.29). This indicates that the immediate response of NPL on a unit increase in exchange rate is 0.97, which is closer to being proportional. In the second lag of exchange rate, it turns out to be negative and significant anchoring on the long-run effect of exchange rate on NPL. Therefore, although higher exchange rate increases NPL in the immediate future, the long-run effect is to lower NPL potentially lending in Tanzania is channeled into long-term investment for which immediate repayment is not forthcoming.

The short-run dynamics of the relationship between macroeconomic variables and NPLs were further explored for each bank based on the ARDL output, with results detailed in Table 10. The results provide insights into individual bank's NPL behavior (with the exception of two banks namely NBC and DTB that had no any significant variable) in terms of their respective responses to macroeconomic factors. For CRDB, the error correction term was not significant but negative, indicating some adjustment to equilibrium of around 5% in each quarter. Lagged GDP growth, LIs and CRDB-specific net income showed significant short-term effects, with higher lagged GDP growth increasing NPLs and rising interest increasing NPLs while net income reduces NPL. NMB exhibited significant adjustment speed of 36% back to equilibrium each quarter. NMB-specific indicators namely TAV and customer deposits emerged as influential on its NPL, reflecting their sensitivity to internal operational factors. Comparing the two largest banks in Tanzania, it is evident that their respective NPL respond to different factors, while CRDB has an NPL structure that is both internally and externally influenced, NMB's NPL is more determined by its size with a negative effect and customer deposits with a positive effect.

Table 10

Short-Run Dynamics

Variables	CRDB		NMB		EXIM		AZANIA		I & M		AMANA		ICB		BOB	
	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig
Error Correction Terms	−0.05		−0.36	***	−0.03		−0.11	**	−0.18	***	−0.47	***	−0.10		−0.20	***
	(0.06)		(0.09)		(0.06)		(0.05)		(0.05)		(0.13)		(0.06)		(0.05)	
lnnpl LD.	−0.13		−0.07		−0.17		0.13		0.10		0.15		0.05		0.01	
	(0.15)		(0.17)		(0.15)		(0.11)		(0.13)		(0.14)		(0.16)		(0.12)	
lnnpl L2D	0.02		0.17		0.21	*	−0.05		0.13		0.18		0.09		−0.12	
	(0.20)		(0.17)		(0.12)		(0.10)		(0.13)		(0.14)		(0.19)		(0.11)	
lngdpg D1.	5.06	***	−1.48		1.65		−2.56		0.82		2.19		−4.52		2.21	
	(1.89)		(2.13)		(1.35)		(2.16)		(1.66)		(3.08)		(2.84)		(2.79)	
lngdpg LD.	2.23		0.98		1.69		2.16		5.67	***	4.60	*	−2.02		−6.05	**
	(1.70)		(1.92)		(1.39)		(2.15)		(1.50)		(2.71)		(2.87)		(2.68)	
inflation D1.	2.59		−3.67		4.32		−9.15	*	−0.55		−5.87		−1.47		9.35	
	(3.71)		(3.26)		(3.00)		(5.35)		(3.41)		(7.09)		(6.32)		(6.22)	
lner D1.	1.18		0.69		1.41	*	1.10		2.50	***	0.41		0.75		0.45	
	(0.93)		(0.80)		(0.79)		(1.17)		(0.82)		(1.68)		(2.95)		(1.61)	
lner LD.	0.12		−1.37		−1.30		0.00		−6.16	***	−2.92		0.24		−2.33	
	(1.32)		(1.29)		(0.97)		0.00		(1.27)		(2.25)		(3.10)		(2.08)	
lendinginterest D1.	14.60	**	−1.18		6.86		0.00		0.86		−0.22		14.13		19.11	*
	(6.13)		(5.70)		(5.03)		0.00		(6.61)		(10.43)		(10.98)		(10.00)	
lntav D1.	0.31		−3.33	**	−0.12		0.00		0.31		2.94	*	−0.82	**	−4.81	***
	(1.21)		(1.67)		(0.44)		0.00		(0.37)		(1.64)		(0.36)		(1.59)	
lndep D1.	−0.77		2.12		0.58		0.00		−0.13		−3.45	**	0.05		0.39	
	(0.79)		(1.30)		(0.41)		0.00		(0.36)		(1.73)		(0.11)		(1.31)	
lndep LD.	0.04		1.35	**	0.11		0.00		−0.29	**	−1.05	*	0.13		−0.90	

(continued)

Variables	CRDB		NMB		EXIM		AZANIA		I & M		AMANA		ICB		BOB	
	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig
	(0.58)		(0.56)		(0.09)		0.00		(0.14)		(0.63)		(0.12)		(0.99)	
lndep L2D.	0.68		0.69		−0.17	*	0.00		−0.18		−0.88		−0.15		−0.94	
	(0.55)		(0.57)		(0.09)		0.00		(0.12)		(0.64)		(0.29)		(0.91)	
lnsni D1.	0.05		−0.01		−0.22	***	0.00		0.10		0.66	***	0.17		−0.54	
	(0.08)		(0.08)		(0.06)		0.00		(0.11)		(0.24)		(0.26)		(0.37)	
lnsni LD.	−0.15	**	0.06		−0.04		0.00		−0.14		0.30		0.40	*	−0.15	
	(0.07)		(0.08)		(0.06)		0.00		(0.12)		(0.25)		(0.25)		(0.35)	
_cons	−1.45		−9.65	***	−0.71		0.00		−4.66	**	−12.75	***	−2.58		−5.53	***
	(1.69)		(3.13)		(1.67)		0.00		(1.90)		(4.46)		(1.76)		(1.69)	

Notes. Standard error is provided in parentheses; * = significant at 10%, ** significant at 5%, and *** = significant at 1%.

"L" stands for lagged values and "D" stands for differenced values.

Source. Authors' construction, 2025.

The EXIM bank analysis revealed a small and insignificant adjustment speeds of around 3 percent while highlighting significant short-term effect of lagged values of NPL lagged values of exchange rate (all having positive effect), lagged values of customer deposits and lagged values of net income (all having a negative effect). It is evident here that this bank's NPL worsen as a result of its business with the general public despite its NPL reduction due from customer deposits and net income. AZANIA bank exhibited significant adjustment speeds of around 11, with IR volatility being the only significant driver of NPLs in the short term, emphasizing the impact of price fluctuations on borrower repayment capacity.

Conversely, I & M bank's short-run analysis highlighted the critical impact of lags of GDP and foreign exchange rate on NPLs, demonstrating significant currency risk exposure. The model indicated a moderate adjustment speed of around 18%, suggesting stability in reestablishing equilibrium after economic shocks. Internally, the bank seems to significantly benefit from customer deposits in line with other banks. AMANA bank's NPL showed a strong positive relationship with GDP growth, with a fast adjustment speed of around 47%, underscoring its reliance on stable economic growth. AMANA's NPL is also strongly associated with its internal structures with significant positive total asset effect, which suggests that the bigger the bank size, the larger is the NPL, an indicator that the bank's expansion in assets emanate mainly from loans. Similarly, AMAN's NPL is negatively affected by the lags of customer deposits suggesting that as the lag of customer deposits expands, the bank transforms them into loans that are however taken by hard-to-collect customers thus leading to higher NPL in the next quarter. AMANA's NPL is connected to its income positively suggesting that its net income somehow responds to interest income on loans.

The results for ICB's NPL indicated insignificant short-term sensitivity to macroeconomic variables, accompanied by moderate adjustment speed of around 10% compared to other banks. ICB's NPL is mainly reduced by changes in its size over time, the effect of TAV that is negative as well as the positive net income effect. The negative effect of TAV can be attributed to a larger dependence on other asset types rather than loan. Finally, BOB's NPL showed rapid adjustment to equilibrium of around 20%, with lagged values of GDP growth contributing to lower NPL. The effect of lending rate is likewise positive suggesting BOB's NPL increases with higher lending rate that is similar to other banks. Similar to ICB, the effect of bank size is negative suggesting that as the bank expands its asset base, the lower is its NPL. Generally, looking across banks, it seems small banks are negatively affected by bank size, while large banks tend to experience higher NPL in response to increases TAV.

These findings reveal diverse macroeconomic sensitivities across banks, emphasizing the varying effects of exchange rates, inflation, and GDP changes on loan performance. It is evident that the immediate effect of previous quarter NPL on current quarter is nonexistent until some two quarters have elapsed is when such lags' affect among relatively bigger banks become clear. The effect of GDP growth is bank specific regardless of whether it is large or small, it can be negative or positive depending on other factors. Inflation seems to affect only one bank out of the ten evaluated although it is predominantly negative on NPL. The immediate effect of exchange rate is to higher NPL however after some time, that is, 2 lags it reverses to reducing NPL suggesting for a negative long-term effect. As expected, higher lending rates are detrimental to NPL and this observation pertains to all significant effect of lending rates and NPL. These observations underscore the need for tailored risk-management strategies for each bank.

DISCUSSION OF RESULTS

The findings of this study highlight the complex and multifaceted relationship between macroeconomic factors and NPLs of mortgage-offering banks in Tanzania, providing insights that align with and, in some cases, diverge from existing literature. Significant long-run effects of LIs, and exchange rate were identified, underscoring the critical role of these variables in shaping mortgage market dynamics. In the long run, GDP growth was found to have a stabilizing effect on NPLs across all banks though its significance varied. This aligns with studies by Louzis et al. (2012) and Kansheba and Jacob (2020), which emphasize the importance of sustained economic growth in reducing default risks. These findings highlight significant variations in how macroeconomic factors influence NPLs across Tanzanian banks, reflecting the diversity in their operational structures, market exposures, and strategic orientations.

Although GDP did not exhibit significant long-run effect on NPL, short-run dynamics suggest for a positive effect especially among larger banks. In this regards, economic expansion enhances borrowers' income stability, enabling them to meet mortgage obligations more consistently as supported in the previous studies (Koju et al., 2020; Kumar et al., 2023; Christodoulou-Volos, 2025; Bergmann, 2020; Mokas & Nijskens, 2019). However, in this study, this positive relationship varied in the short run, where certain banks exhibited heightened sensitivity to GDP fluctuations, indicating the need for institution-specific strategies to cushion against macroeconomic shocks. These results highlight the need for tailored risk-management strategies that account for the unique characteristics of individual banks and their exposure to specific macroeconomic risks. Overall, the insights derived from this study emphasize the importance of maintaining macroeconomic stability to enhance the performance and resilience of Tanzania's mortgage market.

The effect of LIs on mortgage defaults, particularly in the short run was not conclusive contrary to previous studies that suggest a positive effect (Zheng & Zhang, 2021; Christodoulou-Volos, 2025; Kumar et al., 2023; Mokas & Nijskens, 2019). Higher interest rates significantly increase repayment burdens, leading to higher default probabilities only for two banks, and for the rest it was not statistically significant. The significant positive relationship between NPL and lending rate is observed only in the long run indicating that higher borrowing costs impose substantial financial burdens on mortgage holders, increasing the likelihood of future rather than immediate defaults. Banks with greater sensitivity to interest rate changes, particularly those that are heavily reliant on variable-rate mortgage products may not realize immediate default, rather face heightened risks under volatile interest rate conditions. These findings not only corroborate earlier studies emphasizing the adverse effects of rising interest rates on mortgage performance but also highlight heterogeneity among banks. Institutions with significant exposure to variable-rate mortgages could be more vulnerable thus adopting fixed-rate products or implementing caps on variable rates to mitigate risks may be proposed.

Foreign exchange rates also play a pivotal role in influencing the performance of select mortgage-offering banks in Tanzania specifically I & M and EXIM. This could be the case for banks with substantial foreign-denominated loans (see I & M and EXIM in Table 10) or customers with income streams tied to exchange rate movements. Depreciation of the Tanzanian shilling can, in theory, adversely affect borrowers with foreign-currency obligations as they need more of local currencies to buy foreign currency for their loan repayment obligations. Christodoulou-Volos, (2025) observed a positive association between appreciation of the local currency and NPL similar to long-run effect observed in Table 9 although in this study, most of the effect was captured in personal characteristics of the borrower. This underscores the interconnectedness of the mortgage market with international financial dynamics and the risks posed by external shocks. Banks with greater foreign exchange

exposures must enhance their risk-management frameworks, including currency hedging and diversification strategies.

Inflation, while a notable macroeconomic factor (Kumar et al., 2023), shows a less consistent impact on mortgage defaults. The findings suggest that its influence on NPL could be contingent on the broader economic and institutional contexts, such as wage adjustments and cost-of-living factors alongside (Koju et al., 2020), although these other variables were not part of this study. The finding of this study regarding inflation, however, diverges from the study by Güneş and Apaydın (2021), who found significant inflationary impacts on NPL, suggesting that the role of inflation may depend on other macroeconomic environments, such as wage dynamics and inflation pass-through mechanisms. In Tanzania, inflationary pressures may be partially offset by government interventions (Bank of Tanzania, 2023) or borrower adaptations, reducing its direct influence on mortgage performance thus resulting into insignificant effect similar to observations by Goyal et al. (2023) who evaluated both developed and developing countries and found a significant and positive inflation effect on NPL in low-income countries. Since Tanzania is transiting out of that income brackets toward lower middle income, the inflation effect could be insignificant.

The varying adjustment speeds observed across banks highlight significant differences in their resilience to macroeconomic shocks. According to Yoldas and Senyuz (2018), differences in adjustment toward long-run equilibrium require large shocks to risk *premia* such as balance sheet adjustment by banks as well as policy interventions that aim to reduce liquidity and credit risk *premia*. It seems, in these findings, that the studied banks respond differently to the central bank's intervention policy given their diverse sizes and the nature of interventions that may be selective in favor of against certain banks. For purposes of mortgage in Tanzania, Banks through the Tanzania Mortgage Refinancing Company (TMRC), a credit facility that ensures Bank's liquidity, can request refinance based on their ability to issues such loans.

Another explanation could be linked to integration of the banking system as investigated by Koutsomanoli-Filippaki and Mamatzakis (2010) in a study of European banks. Their insights highlight that bank integrations have had some positive impact on the speed of adjustment toward long-run equilibrium among banks. Since Bank's in Tanzania have differing speed of adjustment, these provide some indication that they are not integrated. Similarly, those banks that displayed high speed toward their long-run equilibrium suggested for a competitive environment that could be highly questionable in Tanzania given the notable bank concentration (Sanga, 2022). The heterogeneity of these results emphasizes the necessity for tailored risk-management strategies that account for individual bank characteristics and exposures. Banks with higher sensitivity to interest rates and foreign exchange fluctuations may benefit from implementing hedging strategies and diversifying their mortgage portfolios. Policymakers, on the other hand, are advised to prioritize macroeconomic stabilization, particularly through measures that ensure stable interest and exchange rates, as these have the most profound effects on mortgage market performance.

CONCLUSION

The observations in this study also confirm the importance of macroeconomic stability in supporting a robust mortgage market performance. Specifically, GDP growth was shown to have a stabilizing but insignificant influence on NPLs, suggesting though inconclusively that sustained economic expansion reduces the likelihood of mortgage defaults by increasing borrowers' income and repayment capacity

(Goyal et al., 2023). Conversely, volatility in interest rates and exchange rates emerged as key risk factors, emphasizing the need for financial institutions to develop adaptive strategies to mitigate their effects on borrowers. Given that rising interest rates heighten repayment burdens and exchange rate depreciation poses additional risks to borrowers with foreign-currency mortgages, policy interventions to stabilize these variables are paramount.

This study also highlights the necessity of bank-specific risk-management strategies. The varying adjustment speeds observed across different banks point to differences in their ability to respond to macroeconomic shocks. Banks with more agile risk-management frameworks may be better equipped to absorb external shocks, underscoring the need for enhanced internal controls, diversified loan portfolios, and flexible lending practices (Sanga, 2022). The findings suggest that financial institutions should not adopt a one-size-fits-all approach but instead tailor their strategies based on their unique operational contexts and market exposures.

Furthermore, the limited impact of inflation on mortgage defaults in the Tanzanian context as observed in Tables 9 and 10 (no significant long-run effect of inflation on NPL in Table 9 while short-run dynamics in Table 10 show significant effect of inflation for CRDB bank only), calls for a nuanced understanding of inflationary dynamics and their indirect effects on borrowers. While inflation may not have shown a direct correlation with NPLs, other factors such as income growth (Sanga, 2022), government interventions, and the overall economic environment may play compensatory roles in moderating its influence on mortgage performance. Generally macroeconomic performance is associated with NPL whether directly or indirectly. For example, government policies that foster economic growth will ultimately reduce NPL, while contractionary policies are likely to exacerbate it (Goyal et al., 2023). Financial institutions must therefore consider the broader economic context, including fiscal and monetary policies, when assessing risks related to inflation.

Overall, the findings reinforce the need for tailored risk-management strategies at both the institutional and policy levels. Policymakers should prioritize macroeconomic stabilization, focusing on interest rate and exchange rate stability to safeguard the mortgage market. Observations in Table 9 suggest that all banks tend to have significantly lower NPLs in response to higher exchange rate with the exception of the two major banks whose NPL escalates in response to higher exchange rate. This observation ties the major banks to foreign exchange risk on their loan portfolio. Simultaneously, these major banks may adopt proactive measures, such as diversifying their portfolios, enhancing credit assessment processes, and promoting financial literacy among their respective borrowers. These interventions will help mitigate risks, improve resilience, and foster a stable mortgage market capable of supporting sustainable economic growth.

In light of these findings, several policy recommendations are evident. First, policymakers must prioritize the stabilization of macroeconomic variables such as interest rates and exchange rates, as these have a direct impact on mortgage market stability. Stabilization measures, including monetary policies aimed at controlling inflation and managing exchange rate fluctuations, are essential for reducing default risks. In addition, financial institutions should strengthen their credit risk assessment models, incorporate stress-testing procedures, and promote financial literacy programs to help borrowers better manage their obligations.

Although the government has increased financial literacy initiatives in collaboration with financial institutions, higher learning institutional as well as the private sector (Mmari, 2023), there is still a gap of financial literacy education in line with mortgage products. There is a need to specifically invest in

financial literacy programs to educate potential and existing mortgage borrowers on managing their finances, understanding the implications of interest rates, and preparing for economic fluctuations. Providing advisory services to borrowers can help them make informed decisions regarding their mortgage commitments and manage their debt more effectively.

Lastly, the findings highlight the need for continued research on the dynamics of mortgage markets, particularly in emerging economies like Tanzania. Expanding the scope of research to include more diverse financial institutions and considering alternative performance indicators will provide a more comprehensive understanding of the complex interplay between macroeconomic factors and mortgage default rates. By enhancing the resilience of the mortgage market, Tanzania can foster more sustainable economic growth, improve financial inclusion, and ensure greater stability in its financial system.

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