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Internal Bank-Specific Determinants of Non-Performing Loans in Zambian Commercial Banks: A Time-Series Analysis, 2018–2024

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Abstract:

Non-performing loans (NPLs) pose a serious threat to the soundness of the banking sector in developing countries where credit markets are shallow and borrowers are informationally opaque. This study investigates the determinants of NPLs in Zambian commercial banks at the internal bank-specific level: profitability, lending practices, efficiency, and capitalisation-proxied by the return on assets (ROA), the loan-to-deposit ratio (LDR), the efficiency ratio and the capital adequacy ratio (CAR) respectively. Using a panel of secondary data derived from annual banking sector-wide reports of the Bank of Zambia over the period 2018-2024, an Ordinary Least Squares (OLS) regression is fitted after rigorous pre- and post-estimation diagnostic testing. The regression explains 85.8 per cent of the variation in the net NPL ratio and is fully compliant with classical linear regression assumptions. The evidence suggests a significant, strong negative relation between the ROA and NPLs; also negatively and significantly related to default are the LDR and efficiency ratio. The CAR is instead significantly positively related to NPLs, thus validating the risk-shifting hypothesis where well-capitalised banks take greater credit risk. Neither the net foreign-exchange exposure nor liquidity variable is significant. The findings corroborate the significance of internal management quality in restraining credit risk and underscore that strengthening profitability, lending, and efficiency should underpin credit risk management strategy within Zambia's banking sector.

Keywords: Non-Performing Loans; Credit Risk; Return on Assets; Capital Adequacy; Loan-to-Deposit Ratio; Zambia; Commercial Banks

1. Introduction

One of the most useful indicators of banking-sector health is the ratio of non-performing loans (NPLs). Traditionally, a loan is defined as non-performing if it remains in default, with regard to payment of principal or interest, for ninety days or more (Bank of Zambia, 2022; Basel Committee on Banking Supervision, 2017). In a banking sector dominated by NPLs, banks may have to set up provisions for potential losses on these loans which are costly and drain capital. These provisioning requirements could thus reduce bank capital levels and their ability to extend further credit to profitable sectors of the economy. Given that the Zambian financial system is bank-dominated, and given that commercial banks are responsible for the vast majority of lending and deposit-taking in the economy, a strong credit portfolio is closely associated with a healthy economy (Bank of Zambia, 2023).

Determinants of NPLs are generally separated into external factors, relating to the macro-economy, and internal bank-specific factors. While macro-economic factors like recessions, rising prices and exchange rate depreciation all clearly raise loan default risk, evidence of the substantial role of the quality of management in conditioning how macro-economic shocks affect bank asset quality is rapidly accumulating (Chikalipa, n.d.; Tunay and Tunay, 2025). Two banks, even facing an identical macro-

economic environment, can experience different NPL ratios based on how stringently their loan-making process is operated, the prudence and conservatism of their loan decisions, the efficiency of their operating functions, and their capitalisation level. This paper has focused squarely on internal bank-specific determinants of NPLs in Zambia's commercial banks, especially on the impacts of profitability, lending policies, operating efficiency, and bank capitalization levels-as represented by ROA, LDR, efficiency ratio and CAR, respectively. Bank-specific characteristics are not only the most policy relevant determinants, as they are subject to control by the banks' management and supervisors, but also as there is limited existing research investigating simultaneous macro and bank-specific factors of the Zambian banking sector in a sector-wide empirical framework.

The contribution of this paper is threefold. First, use of sector-wide secondary data rather than small number of banks as in other Zambian survey-based literature. Second, rigorous application of econometrics diagnostics that improves the quality of our regression estimates. Third, determination of the relative importance of four internal bank-specific indicators, providing actionable information about credit risk management and supervisory considerations. Remaining sections have been organized as follows: Section 2 reviews relevant literature and hypotheses. Section 3 discusses the data used and the estimation approach. Empirical results are presented and discussed in Section 4 and Section 5, respectively, followed by conclusions and policy implications in Section 5.

2. Literature Review

2.1 Theoretical Framework

This paper's framework is grounded in three complementary theories on credit risk: information asymmetry, moral hazard, and agency theory. Together these theories describe why internal bank behavior and not solely external conditions are what determine loan performance.

Information asymmetry theory, initiated by Akerlof (1970) and extended to credit markets by Stiglitz and Weiss (1981), posits that when two parties to a transaction have asymmetric information, market outcomes are inefficient. In credit markets, borrowers are more informed about their repayment abilities than are lenders, leading to both adverse selection-lending to disproportionately riskier borrowers, and moral hazard-where loans to the already less risky are misused once disbursed. Weak information and monitoring capabilities lead to increased NPLs (Stiglitz and Weiss, 1981).

Moral hazard theory expands on these ideas by focusing on agents who are insulated from the results of their actions. Borrowers may choose to default if enforcement is costly and tardy and punishments meager; banks may become reckless in their lending if regulators guarantee bailouts (Mishkin, 2018; Tunay and Tunay, 2025). Both risk the overall quality of the asset.

Agency theory originally developed by Jensen and Meckling (1976) highlights how conflicts of interest between a principal and agent-for instance between the bank owners and bank managers-cause sub-optimal behavior. Managers who are motivated by achieving current targets for volume or profits may lower standards in order to do so (Saunders and Cornett, 2019) especially if their performance is poorly monitored. Thus, the theories collectively suggest that variables such as profit, caution in lending, operational efficiency, and capital adequacy -the very ones that this study examines-are channels through which behavior impacts NPLs.

2.2 Empirical Evidence of Internal Determinants

Overall, a growing empirical literature finds that bank-level variables do indeed significantly influence loan performance. Tunay and Tunay (2025), in their systematic review of over 150 studies, conclude that poor lending is often at the root of defaults, as is risk-taking due to both conflicts of interest, and poor management or weak financials. Chikalipa (n.d.), finds that, for Malawi's banking sector, bank size does not determine loan performance and prudent lending, care with borrower assessment and monitoring are critical variables instead.

Within Zambia, survey evidence dominates in assessing internal factors impacting loan performance. Mumba (2019) found that lax lending processes related to poor staff expertise, lack of training, workload pressures, and targets, along with failure to

enforce loan policies results in increased NPLs, while Chibawe (2025) likewise attributes higher NPLs to the weakness of internal controls linked to poor lending process, slow disbursement, and borrower monitoring. While these studies offer important qualitative detail, they cannot address system-wide effects due to their narrow scope, making this system-wide analysis timely.

Regarding profit, most of the literature shows a negative correlation with NPLs because of bank's higher capacity to finance monitoring and their greater motivation to protect loan quality (Salas, 2024). However, the evidence on capital adequacy is more ambiguous. Prudence demands that banks with strong capital adequacy are more cautious in their lending as they bear the cost of default, but some strands of moral hazard theory argue for a positive relationship, because stronger capital adequacy offers an incentive to increase risk (Tunay and Tunay, 2025). The relationship is thus an empirical issue tested directly below.

2.3 Hypotheses

Based on the theoretical and empirical literature, we test the following hypotheses on the internal determinants of NPLs of Zambian commercial banks:

- H1a: Return on Assets (ROA) has a significant negative association with the net NPL ratio (NPLR).
- H1b: The loan-to-deposit ratio (LDR) is significantly associated with the net NPL ratio (NPLR).
- H1c: The efficiency ratio (EFF) has a significant negative association with the net NPL ratio (NPLR).
- H1d: The capital adequacy ratio (CAR) has a significant association with the net NPL ratio (NPLR).

3. Data and Methodology

3.1 Data and Variables

Secondary data has been used for the study from 2018-2024. The period was selected as it captures a number of key events that impacted on the performance and stability of Zambia's banking sector such as the COVID-19 pandemic, increased exchange rate volatility, inflationary pressures, changes in monetary policy stance and the subsequent phase of economic recovery. These events constitute a good setting to assess the role of internal bank-specific factors on non-performing loans in different economic conditions. The endogenous variable in this study is the net NPL ratio (NPLR), which is calculated as net NPL as a ratio to total gross loans. The primary internal determinants analyzed are profit (ROA), lending (LDR), operational efficiency (EFF) and capital (CAR). In addition to these four main internal determinants, net foreign exchange position over capital (NFP) and ratio of liquid assets to total assets (LIQ) are also included to control for these effects. The descriptions of variables used are shown in Table 1.

Table 1. Definition and Measurement of Internal Variables

Variable	Symbol	Measurement	Expected sign
Net NPL ratio	NPLR	Net non-performing loans / gross loans (dependent variable)	—
Return on assets	ROA	Net income / total assets	−
Loan-to-deposit ratio	LDR	Total loans / total deposits	±
Efficiency ratio	EFF	Operating expenses / operating income	+
Capital adequacy ratio	CAR	Regulatory capital / risk-weighted assets	±
Net forex position	NFP	Net foreign-exchange position / capital	±
Liquidity ratio	LIQ	Liquid assets / total assets	±

Source: Authors' compilation.

3.2 Model Specification

A linear regression model is fitted using OLS. Parameter estimates are generated by minimizing the sum of the squares of the residuals. If the assumptions of the classical linear regression model are satisfied, OLS estimates are unbiased, consistent and efficient (Gujarati, 2004). The internal factors model is set up as:

NPLR = + ROA + LDR + EFF + CAR + NFP + LIQ + U

where NPLR denotes the net non-performing loan ratio, is the intercept and are the estimated parameters. U Is the stochastic error term. The coefficients of the four primary internal variables, profitability, lending practices, operational efficiency, and capitalisation are estimated using coefficients to while and measure the effect of foreign-exchange exposure and liquidity.

3.3 Estimation and Diagnostic Procedures

All estimation is performed using EViews. Prior to and following estimation of the model series, a range of diagnostic tests are applied to the individual variables in order to verify the reliability and validity of the regression results. These include the Augmented Dickey-Fuller unit-root test, in order to establish the order of integration of each variable (both level and first-differenced), and pairwise correlation, to check for multicollinearity. If any two independent variables have an absolute correlation greater than 0.8, the two variables were considered highly collinear. The residuals were tested post-estimation for autocorrelation using the Breusch-Godfrey Lagrange Multiplier test, for heteroscedasticity using the Breusch-Pagan-Godfrey test, and for normality using the Jarque-Bera test. The Ramsey Regression Equation Specification Error test (RESET) was used to verify the functional form, and stability of coefficients was examined using CUSUM statistics.

4. Results and Discussion

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the dependent and the internal explanatory variables. Average net NPL ratio is 4.35% over the study period, ranging from 0.40% to 10.70% with a standard deviation of 3.42%, denoting significant variance in bank credit risk throughout. ROA average of 3.79% is quite moderate and quite stable, showing moderately profitable operations, while the average LDR of 43.20% depicts quite conservative lending. Average liquidity, at 44.47%, appears ample. The efficiency ratio is on average 61.22% but reveals wide variation, from 43.03% to 103.9%. The maximum value implies negative profits during some period due to high operating expenses in proportion to profits during this time. Capitalisation is sound, with average CAR of 22.98%, comfortably above regulatory minimums.

Table 2. Descriptive Statistics of Internal Variables

Statistic	NPLR	ROA	LDR	EFF	CAR	LIQ
Mean	4.35	3.79	43.20	61.22	22.98	44.47
Median	3.75	3.20	42.10	60.55	22.65	44.80
Maximum	10.70	5.70	53.50	103.90	27.50	50.80
Minimum	−0.40	2.10	33.90	44.90	19.20	36.10
Std. dev.	3.42	1.11	5.56	10.80	2.19	3.16
Skewness	0.44	0.36	0.20	0.98	0.32	−0.47
Kurtosis	1.80	1.59	1.74	4.85	2.21	3.12
Observations	70	70	70	70	70	70

Source: EViews output, based on Bank of Zambia data.

4.2 Correlation Analysis

Table 3 displays the pairwise correlation matrix, a descriptive analysis of bivariate relationships and as an indicator for multicollinearity. The ratio of net NPL over assets is highly negative related to ROA (0.84). This is in line with the idea that a profitable bank must have a relatively low level of defaults. NPLR is positively related with both efficiency ratio (0.39) and LDR (0.31) and negatively related with CAR (0.34). As all pairwise correlation coefficients between the regressors is under 0.8 in absolute values, a strong multicollinearity seems to be highly improbable. bc.

Table 3. Correlation Matrix of Internal Variables

	NPLR	ROA	LDR	EFF	CAR	LIQ
NPLR	1.00					
ROA	−0.84	1.00				
LDR	0.31	−0.68	1.00			
EFF	0.39	−0.64	0.60	1.00		
CAR	−0.34	0.46	−0.24	−0.18	1.00	
LIQ	0.63	−0.51	−0.08	0.18	−0.27	1.00

Source: EViews output.

4.3 Diagnostic Tests

The results of the diagnostic tests reveal that the estimated model satisfies the main assumptions of the Classical Linear Regression Model (CLRM). The Augmented Dickey-Fuller (ADF) unit root tests showed that all variables were non-stationary in levels but became stationary after first differencing, meaning they are integrated of order one, I(1). The Breusch-Pagan-Godfrey test did not reject the null hypothesis of homoscedasticity ($p = 0.70$), indicating that the residuals have a constant variance. Similarly, the Breusch–Godfrey Lagrange Multiplier test gave no evidence of serial correlation in the residuals ($p = 0.50$). Furthermore, the Jarque–Bera statistic indicated that the residuals are approximately normally distributed ($p = 0.11$). In addition, the Ramsey RESET test suggested that the model is well specified and does not suffer from serious functional form misspecification ($p = 0.61$). The Durbin–Watson statistic of 2.06 suggests absence of first order autocorrelation. Taken together, these diagnostic results suggest that the estimated coefficients are reliable, efficient and appropriate for statistical inference.

4.4 Regression Results

Table 4 displays the OLS estimated equations of the internal-factor model. The model is found to have high explanatory power; the adjusted R-squared value of 0.858 shows that more than 85.8% variation of net NPL ratio is attributable to these internal factors; F-statistics 63.28 with p-value 0.000 further shows that the regression is overall significant.

Table 4. OLS Regression Results: Internal Determinants of NPL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NFP	-0.087623	0.143907	-0.608888	0.5448
LDR	-0.317191	0.058031	-5.465921	0.0000
LA	-0.061721	0.084763	-0.728164	0.4692
E_RATIO	-0.047644	0.020867	-2.283215	0.0058
CAR	0.194451	0.085111	2.284671	0.0057
ROA	-4.188028	0.354823	-11.80315	0.0000
C	35.43711	7.209675	4.915217	0.0000

R-squared	0.857679	Mean dependent var	4.352857
Adjusted R-squared	0.844125	S.D. dependent var	3.421574
S.E. of regression	1.350874	Akaike info criterion	3.534020
Sum squared resid	114.9662	Schwarz criterion	3.758869
Log likelihood	-116.6907	Hannan-Quinn criter.	3.623333
F-statistic	63.27686	Durbin-Watson stat	2.057460
Prob(F-statistic)	0.000000		

Source: EViews output.

Profitability has proved to be the most powerful internally driven driver of credit risk. In terms of significance and magnitude, the coefficient on ROA is negative and highly significant (= 4.188, $p < 0.01$) implying that for every one percentage point increase in profitability, the net NPL ratio declines by about 4.19 percentage points, holding other variables constant.

Hypothesis H1a is therefore validated. Lending policies, as reflected by LDR, were also negatively and significantly related to NPLs (= 0.317, $p < 0.01$), and supports H1b, implying that a more prudent use of deposits to expand credit over the observed sample period is associated with better asset quality.

Efficiency ratio carried a negative and statistically significant coefficient (= 0.048, $p < 0.01$) and H1c is therefore confirmed in terms of significance. However, given the structure of the cost-to-income ratio, a negative sign needs careful interpretation, but essentially says that the movement of measured efficiency and NPLs were in the opposite direction over the period of study; a result which is easily attributed to the conjunction of sector wide efficiency gains and cleanup of the loan book towards the end of the study period. CAR had a positive and statistically significant coefficient (= 0.194, $p < 0.01$), H1d therefore holds, a positive relation which supports the risk-shifting hypothesis where highly capitalized banks engaged in higher-risk activities. On the other hand, net FX position ($p = 0.545$) and liquidity ($p = 0.469$) are insignificant.

4.5 Discussion

As empirical evidence, the data confirmed that internal, bank-specific determinants are very significant drivers of credit risk in Zambian commercial banks. Collectively, they explain close to 86 percent of the variability in net NPLs ratio. Dominance of profitability as a significant predictor is notable. The strong negative correlation between profitability and NPLs aligns well with the argument that more profitable banks are likely to be better endowed and have the correct incentives to pursue stringent credit analysis and efficient loan monitoring procedures and prevent future loan defaults (Salas, 2024; Tunay and Tunay, 2025). These findings are in line with broader observations from the related causality test in the main paper where profitability seems to be causing a decline in loan quality, not the reverse.

The statistically significant negative LDR is reinforcing of the impact of sound lending practices. Less vigorous lending relative to the base deposits is associated with higher asset quality, which corresponds with the Zambian survey findings of Chibawe (2025) and Mumba (2019) who point to poor loan appraisal and ineffective enforcement of policies as key contributors to loan defaults. Although the coefficient on operational efficiency is significant and negative, caution is warranted because of how it is calculated. Nevertheless, it emphasizes that the overall internal process quality is positively related to loan quality, which reiterates the point about capabilities rather than bank size found in Chikalipa (n.d.).

Arguably the most interesting observation for policy comes from the positive and significant coefficient on the CAR. While prudential convention would expect higher capitalization to stabilize banks, these results support the risk-shifting hypothesis where well-capitalized banks might engage in riskier lending activities due to higher comfort in the safety and robustness of their capital buffers against possible losses (Tunay and Tunay, 2025). This finding does not necessarily mean that higher capitalization should be discouraged but highlights the importance of supervisory assessment of risk-taking behavior, in conjunction with capital requirements, in an effort to circumvent what appears to be a contradiction of design in such circumstances. Neither liquidity, nor net foreign exchange position, seemed to impact the NPL ratio over the sampled period significantly.

5. Conclusion and Policy Recommendations

This paper investigated the internal bank specific determinants of non-performing loans in Zambian commercial banks focusing specifically on profitability, lending policies, operational efficiency and capitalization. OLS, based on sector wide, monthly data for 2018 to 2024 and supplemented with a full battery of diagnostics, revealed that profitability (ROA), lending policies (LDR) and operational efficiency had significant negative associations with NPLs, whereas capital ratio (CAR) had a significant positive relationship. In conclusion, internal bank specific factors as a whole explained a vast majority of the variations in credit risk indicating the prominence of sound bank management on loan quality in Zambia.

The policy recommendations from this study for the commercial banks in Zambia are to endeavor to increase their profitability levels through well-controlled costs and efficient resource management and to improve loan appraisal processes as well as loan

portfolio monitoring systems while investing in staff that are well trained in the best practices in lending and loan monitoring, to avoid defaults and ensure quality of loan book; and importantly to avoid overconfidence which high capitalization can bring through well-established internal controls and adherence to prudential lending guidelines. The prudent application of capital requirements along with supervision for risk-taking and the development of credit information systems for the reduction of information asymmetries are the important policy lessons for the regulators and Policymakers.

Limitations to this study were identified, particularly given the analysis is based on aggregate data and limited to only four indicators, thus ruling out inter-bank comparison and also other important indicators like income diversification, bank size, corporate governance and employee turnover, thus, bank-level panel data is recommended for future study to properly capture these relationships.

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