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Original Research

Unraveling the Driver of Non-Performing Loans: Insights from Ethiopian commercial Banks

Temesgen Furi Kotin [1,*]

[1]Assistant Professor at Department of Economics, College of Business & Economics, Wollega University, Nekemte, Ethiopia

Abstract

This study investigates the key Unraveling the Driver of Non-Performing Loans: Insights from Ethiopian Banks. Utilizing panel data from 10 commercial banks spanning 2013 to 2023, sourced from the National Bank of Ethiopia and banks' annual reports, the study employs random effects panel least squares regression. Bank-specific determinants include Return on Assets, Return on Equity; Capital Adequacy Ratio, Loan Growth Rate, and Loan-to-Deposit Ratio, Macroeconomic factors examined are GDP Growth Rate, Inflation Rate, Exchange Rate, and Unemployment Rate. The analysis reveals that Return on Assets, Return on Equity, and Unemployment Rate significantly and positively influence Non-Performing Loans, suggesting that lower profitability and economic distress are associated with increased non-performing loans. Conversely, Capital Adequacy Ratio, Loan Growth Rate, GDP Growth Rate, and Exchange Rate demonstrate a significant negative impact on NPLs, implying that stronger capital buffers, faster loan expansion, economic growth, and a depreciating exchange rate contribute to lower NPLs. Increase in Capital adequacy could increase NPLs since poorly capitalized banks lend recklessly to recover lost returns. These findings underscore the importance for Ethiopian commercial banks to meticulously consider both bank-specific and macroeconomic factors in their credit risk management frameworks to mitigate NPL accumulation and enhance financial stability.

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*Corresponding Author:

Temesgen Furi

E-mail: *temefur@gmail.com*

INTRODUCTION

Inefficient banks are more susceptible to elevated NPLs, often due to approving uncertain credits to protect profitability and comply with prudential regulations (Boudriga et al., 2022). Inadequate management and insufficient oversight of operational expenditures and customer credit quality can lead to significant capital losses (Haneefshahbaz et al., 2021).

Return on Assets (ROA) and Return on Equity (ROE) are considered key indicators of bank profitability in this study. ROA reflects a bank's efficiency in utilizing its assets to generate net income. Empirical findings on the relationship between ROA and NPLs are mixed: Fawad (2018) identified a positive

correlation, while Abdulkader et al. (2022) found a negative correlation, suggesting that declining profitability can lead to riskier banking operations and higher NPLs.

ROE, representing the return on shareholders' equity, also shows disparate findings in its correlation with NPLs. For instance, Bashiro (2018) observed a negative correlation between ROE and NPLs. ROE reflects shareholder return might signal strong bank performance, which reduces credit risk and NPLs in contrast high ROE could be driven by aggressive lending strategies, potentially increasing NPLs.

The existing body of research consistently indicates a robust correlation between non-performing loans (NPLs) and macroeconomic variables. Studies, including that by Salas-Vincente (2023), underscore the critical importance of incorporating these variables due to their profound influence on fluctuations in credit risk. Real Lending Rate: The real lending rate directly impacts the total debt burden for borrowers. Increasing real lending rates are generally correlated with a heightened ratio of non-performing loans (NPLs) (Foziya, 2020; Quagliariello, 2021; Castro, 2021). Furthermore, asymmetric information can lead to "credit rationing" and adverse selection dilemmas, as theorized by Stiglitz (1981), where certain borrowers are denied loans despite their willingness to accept higher interest rates.

Empirical evidence regarding the relationship between the exchange rate and NPLs is mixed. Nill (2021) established a negative relationship between NPLs and the real effective exchange rate. Conversely, other studies have found no significant correlation between fluctuations in foreign exchange rates and the NPL ratio. Each paragraph now directly addresses the variable and its theoretical or empirical relationship with NPLs. Additionally, structured questionnaires and the records of these banks were utilized in the research as shown on Table 1 on appendix.

Conceptual Frame work of the Study

Empirical research shows that a combination of macroeconomic and bank-specific factors can determine non-performing loans (NPLs) in banks. Previous studies on NPLs mainly focused on countries other than Ethiopia, leaving the Ethiopian banking sector understudied. The factors contributing to NPLs in Ethiopian commercial banks have been evaluated by various researchers in different studies. Not enough attention has been given to the macrocosmic and bank-specific variables of NPLs in the Ethiopian banking sector, except for a study by Mesay in 2017.

Many studies have combined factors influencing NPLs in government-owned and commercial banks, but this study focuses solely on commercial banks in Ethiopia. The goal of this study is to examine the determinants of NPLs in Ethiopian commercial banking using an econometric model that considers bank factors, borrowers, and macroeconomic factors.

In order to estimate the macroeconomic and bank-specific determinants of non-performing loans (NPLs) of commercial banks in Ethiopia, the goal of this study is to examine the determinants of NPLs in Ethiopian Commercial Banking using an econometric model. Based on theoretical and empirical perspectives, the conceptual framework that explains the relationship between non-performing loans (NPLs) and bank factors, borrowers, and macroeconomic factors was developed as (Figure 1) on appendix.

MATERIAL AND METHODS

In this study, annual data for the period of 2013 to 2023 were employed. To make interpretation of the results easier the researchers converted all variables in to the natural logarithms after change the data for current account deficit and budget deficit in to positive. Utilizing panel data from 18 commercial banks spanning 2013 to 2023, sourced from the National Bank of Ethiopia and banks' annual reports. Outliers were retained due to their policy relevance and limited impact on estimation, as verified by robustness checks.

As a result, the model was applied to investigate the factors that contributed to NPLs for Commercial Banks in Ethiopia between 2013 and 2023. These factors are as follows:

$$Y_{it} = \beta_0 + \beta X_{it} + \varepsilon_{it} \quad \ldots\ldots 3.1$$

Where: - Y_{it} is the dependent variable for firm „*i*" in year, *t,* β_0 is the constant term, β_i's the coefficient of the independent variables of the study, X_{it} is the independent variable for firm „*i*" in year **'t'** and ε_{it} the normal error term. Thus, this study is based on the conceptual model adopted from Fawad and Taqadus (2018).

Accordingly, the estimated models for this study was presented as follow;

$$NPL_{it} = \beta_0 + \beta_1 CA_{it} + \beta_{2ROA_{it}} + \beta_{3ROE_{it}} + \beta_{3LD_{it}} + \beta_{4OE_{it}} + \beta_{4RR_{it}} + \beta_{5ER_{it}} + +\beta 6\ RLRit + \beta_{7EXE_{it}} + \beta_{8INF_{it}} + \beta_{9GDP_{it}} + \varepsilon i \ldots\ldots\ldots\ldots \mathbf{3.2}$$

Dependent Variable: is Non-Performing Loan measured or indicated by the amount of Non-Performing Loans to gross loans. The ratio of nonperforming loans to total loans was used to calculate non-performing loans (NPLs) as Table 2 on appendix.

RESULTS AND DISCUSSION

Descriptive Statistics Analysis

Table 3, offers a comprehensive overview of the descriptive statistics intended to explain broad characterizations of the data encompassing both dependent and independent variables. Each variable was examined through a total of 100 observations, derived from 10 banks and 10 years, with adjustments made for a few outlier values. To clarify the overarching trends within the data-set throughout the studied period, the mean, standard deviation, minimum, and maximum values of each variable were employed.

The analysis of the determinants of non-performing loans (NPLs) of Ethiopian commercial banks elucidates several interrelated economic indicators. The mean value of NPL in Ethiopian commercial bank is 14.4 percent with maximum of 22 and minimum 2 percent indicate highest default rate. The average loan growth rate among the firms is 22.1%, accompanied by a modest variability indicated by a standard deviation of 0.062, suggesting a relatively stable lending environment. Simultaneously, the mean inflation rate is recorded at 15.736, characterized by a positive skewness of 1.346 and a kurtosis of 4.123, which implies that elevated inflation rates are more prevalent and that the distribution exhibits heavier tails.

The average loan growth rate is 22.1%., which reveals loans given out by the banks are increasing at 22.1 rates while the inflation rate, is increasing at 15.736. This high inflation rate suggests decrease the ability of borrowers to repay their loans.

Table 1

Descriptive Statistics Analysis

	NPL	ROA	ROE	UER	LG	INR	GDP	EXR	CA
Mean	14.397	0.101	24.442	2.873	0.221	15.736	7.098	9.705	15.06
Median	16.130	0.095	24.100	2.675	0.227	10.836	7.070	6.12	16.88
Maximum	22.340	0.182	30.200	4.000	0.312	51.756	9.998	22.3	17.7
Minimum	2.120	0.085	4.500	1.347	0.116	4.901	4.255	1.347	3.61
Std. Dev.	5.721	0.019	4.637	0.682	0.062	11.937	2.814	7.467	4.327
Skewness	-0.603	1.630	-2.144	0.478	-0.253	1.346	0.0005	0.409	-2.076
Kurtosis	2.072	5.335	10.923	2.415	1.829	4.123	1.001	1.486	5.480
Jarq-B	9.643	67.024	338.26	5.232	6.781	35.480	16.648	2.331	97.53
Prob.	0.008	0.000	0.000	0.073	0.033	0.000	0.0002	0.002	0.000
Sum	1439.77	10.19	2444.2	287.34	22.17	1573.6	709.8	970.5	1506
SSS	3240.8	0.039	2129	46.0	0.38	14108	784.06	5521	1853
Obs		100	100	100	100	100	100	100	100

Test of Fixed and Random effect model (Hausman Test)

Which model is better right now? (Fixed or Random Effect Model); Hausman test answer for this as table 4 below.

HN: The Random Effect Model is appropriate and HA: The Fixed Effect Model is appropriate. Since P-value =1, meaning that we accept HN, meaning that the Random Effect Model is appropriate model.

Table 4

Housman test

Test Summary	St Chi-Sq	d.f.	Prob.
Cross-section random	).000000	8	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ROA	-44.965782	-41.267126	141.463277	0.7558
ROE	-0.316519	-0.305002	0.000383	0.5564
UER	4.644304	4.682643	0.001054	0.2377
LG	18.594325	18.638713	0.346849	0.9399
INR	0.016244	0.066027	0.000720	0.0635
GDP	8.577335	0.051087	39.474481	0.1748
EXR	0.074603	0.074008	0.001509	0.9878
CA	0.789546	0.771624	0.000696	0.4971

The difference between fixed and random effect model indicate similar result.

Fixed effect or LSDV Model

This model allow of Heteronomy or individually for all companies by allowing to have it is own intercept value. To choose the better model POLS and Fixed Effect Model, researchers have to state the hypothesis as:

HN: POLS is the best model if we cannot reject HN or if we accept HN.

HA: Fixed effect Model is the best model, if we accept HA or if we reject HN.

Table 5

Fixed Outcome

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-64.503	45.399	-1.420	0.1592
ROA	-44.965	16.803	-2.675	0.0090
ROE	-0.316	0.053	-5.938	0.0000
UER	4.644	0.404	11.467	0.0000
LG	18.594	4.009	4.637	0.0000
INR	0.016	0.034	0.467	0.6411
GDP	8.577	6.283	1.365	0.1760
EXR	0.074	0.050	1.471	0.1450
CA	0.789	0.070	11.208	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.877062	Mean dependent var	14.39770
Adjusted R-squared	0.851575	S.D. dependent var	5.721557
S.E. of regression	2.204286	Akaike info criterion	4.580233
Sum squared resid	398.4277	Schwarz criterion	5.049164
Log likelihood	-211.0117	Hannan-Quinn criter.	4.770018
F-statistic	34.41195	Durbin-Watson stat	2.420074
Prob(F-statistic)	0.000000		

Random Effect Model

A statistical model known as a random effects model is employed in the analysis of panel data, which is information gathered over time from the same people or institutions. When unobserved heterogeneity exists between the individuals or entities in the data, random effects models are employed. An additional random effect term to the regression model accounts for this unobserved variability. In this model, the intercept mean value is the same for all companies.

Table 6

Random effect model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-41.26713	11.87002	-3.476584	0.0008
ROE	-0.305002	0.049577	-6.152132	0.0000
UER	4.682643	0.403677	11.59998	0.0000
LG	18.63871	3.966084	4.699526	0.0000
INR	0.066027	0.022031	2.996965	0.0035
GDP	0.051087	0.094721	0.539348	0.5910
EXR	0.074008	0.032567	2.272510	0.0254
CA	0.771624	0.065314	11.81415	0.0000
C	-5.269788	2.394559	-2.200735	0.0303

Effects Specification			
		S.D.	Rho
Cross-section random		0.000000	0.0000
Idiosyncratic random		2.204286	1.0000

Weighted Statistics			
R-squared	0.867551	Mean dependent var	14.39770
Adjusted R-squared	0.855907	S.D. dependent var	5.721557
S.E. of regression	2.171878	Sum squared resid	429.2519
F-statistic	74.50712	Durbin-Watson stat	2.162482
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.867551	Mean dependent var	14.39770
Sum squared resid	429.2519	Durbin-Watson stat	2.162482

Result of Random effect regression model indicates, a one-percent increase in ROA leads to a significant 41.26-percent reduction in NPLs, and this highlights the importance of profitability in maintaining strong asset quality.

If reduction ROE increase by one-percent, NPL increase by 0.30 percent other things remain constant at mean which suggests that well-managed banks with strong equity positions tend to have lower default rates.

A one percent- increase in loan growth results in a substantial rise in NPLs by 18.63 percent other things remain constant at mean. This underscores the risks associated with aggressive lending practices, particularly when credit assessments are inadequate. Model shows ROE negatively related to NPLs, emphasize that high ROE here reflects stable, efficient lending, not recklessness. Inflation's positive impact on NPLs implies: one percent increase in inflation, increase NPL by 0.05-percent signals potential financial distress during inflationary periods. High inflation erodes the purchasing power of borrowers, making debt servicing more difficult. Central banks should adopt inflation-targeting policies and stabilize price levels to prevent adverse effects on loan repayment capacity**.**

A one-percent increase in unemployment rate leads to a rise of NPLs by 4.68 percent while , one percent increase in exchange rate and interest rate increase NPLs by 0.074 and 0.066 percent , indicating vulnerability to currency fluctuations and borrowers default. This demonstrates the direct impact of labor market conditions on loan repayment capabilities and Borrowers with foreign-denominated debt may face heightened default risks due to currency depreciation. Policymakers should prioritize employment growth initiatives to ensure financial stability.

The positive relationship between capital adequacy and NPLs (0.77-percent increase per one-percent rise in CA) is counterintuitive, possibly reflecting inefficiencies in capital utilization or weak banking sector oversight. Strengthening regulatory frameworks related to capital reserves, implementing stringent risk-based capital requirements, and ensuring banks hold sufficient high-quality liquid assets are crucial policy measures.

Expanding job opportunities, supporting workforce development programs, and promoting sectors with high employment potential can reduce borrower default rates.

In general, to ensure the robustness of results, the study conducted diagnostic tests on the regression model and found no evidence of normality violations, multicollinearity, or autocorrelation issues.

CONCLUSION

The findings indicate that: Profitability indicators (ROA and ROE) are significantly negatively correlated with NPLs, implying that banks with higher profitability exhibit better loan portfolio management. Loan growth (LG) and unemployment rate (UER) are positively correlated with NPLs, highlighting risks associated with aggressive lending and adverse economic conditions.

Inflation rate (INFR), exchange rate (EXR), and interest rate (IR) contribute to higher NPLs, showing that macroeconomic volatility influences loan default rates. Capital adequacy (CA) exhibits a positive correlation with NPLs, suggesting complexities in financial stability management.

GDP growth does not show a statistically significant effect on NPL levels, indicating that broader economic expansion may not directly enhance loan performance in Ethiopia. The regression model explains approximately 86.03% of the variation in NPLs (R-squared), while the adjusted R-squared stands at 84.97%, confirming the strong explanatory power of the independent variables.

Policy-Oriented Recommendations

To mitigate NPL levels and enhance financial stability in Ethiopia's banking sector, the following strategies are recommended:

Banks should implement rigorous credit evaluation processes and prioritize strong risk management practices; ensuring borrowers' creditworthiness is thoroughly assessed before loan approvals. Enhancing stress-testing measures can improve forecasting for potential

default risks, particularly during economic downturns.

Given the positive correlation between aggressive loan expansion and NPL growth, banks must exercise caution in rapid lending while enforcing stricter lending guidelines. This includes adjusting underwriting standards and ensuring adequate capital buffers to withstand potential shocks.

Financial institutions should invest in data-driven predictive analytics to track macroeconomic indicators such as unemployment rates, inflation trends, and exchange rate fluctuations. By proactively adjusting lending policies based on forecasts, banks can minimize default risks in times of economic instability.

Policymakers should enhance transparency and accountability in lending practices by enforcing stringent loan classification and provisioning guidelines. This includes requiring more rigorous reporting standards and ensuring compliance with international financial regulations to maintain banking sector resilience.

Banks should expand their loan offerings across multiple sectors, reducing dependence on vulnerable industries that may be more susceptible to economic fluctuations. Portfolio diversification will help mitigate systemic risks associated with sector-specific downturns.

Adopting data analytics, artificial intelligence, and machine learning tools can enhance credit evaluation accuracy and early detection of potential defaults. Given the finding that macroeconomic volatility drives NPL accumulation, policymakers could explore digital finance tools such as AI-based early warning systems to monitor credit risk in real time.

Given the complexity of NPL determinants, future research could: Incorporate additional factors such as money supply, operational efficiency, corruption, and corporate governance, which may influence loan performance.

CRediT authorship contribution statement

Temesgen Furi: Temesgen Furi Kotin lead writer of the research has exerted all his efforts in the conceptualization, data gathering, data preparation, formal analysis, data validation, data presentation, and writing review and original draft as well the revisions. He provided valuable insights in the conceptualization, theoretical foundation, and data presentation of the study.

Declaration of competing interest

All data generated or analyzed during this study will be provided based on request

Data availability

Data will be made available on request

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