

Determinants of Non-Performing Loans in the Banking Sector of Pakistan

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Abstract

This study investigates This study examines the impact of bank-specific factors on non-performing loans (NPLs) in selected Pakistani banks over the period 2015–2025. The study uses panel data from five commercial banks and investigates the influence of Return on Assets (ROA), Capital Adequacy Ratio (CAR), and Income Diversification (ID) on NPLs. Descriptive statistics, correlation analysis, pooled regression, fixed effect model, random effect model, and Hausman test were employed to analyze the data using EViews.

The results indicate that Capital Adequacy Ratio (CAR) has a significant negative effect on non-performing loans, suggesting that stronger capital positions contribute to lower credit risk. Return on Assets (ROA) and Income Diversification (ID) were found to have statistically insignificant effects in the final fixed effect model. The Hausman test confirmed that the fixed effect model is the most appropriate estimation technique for the study. The model demonstrates strong explanatory power, explaining a substantial proportion of variation in non-performing loans.

The findings emphasize the importance of maintaining adequate capital levels to improve asset quality and strengthen risk management practices in the banking sector. The study provides useful insights for bank management, regulators, and policymakers seeking to reduce non-performing loans and enhance financial stability in Pakistan.

Keywords: Non-Performing Loans, Capital Adequacy Ratio, Return on Assets, Income Diversification, Fixed Effect Model, Pakistani Banks.

Introduction

One of the most pressing and significant problems facing the banking industry worldwide, particularly in emerging nations, is financial crises. Significant financial crises have occurred in many nations within the last few years. The rise in non-performing loans (NPLs) in bank advances is a prominent indicator of monetary crises. Since NPLs are associated with the failure and crises of the banking system, they are primarily under the scrutiny of the government and banking management following the worldwide crises. (Ghosh, 2015) For nations that heavily depend on banks as financial intermediaries that distribute money across the nation's economy, this issue is especially important. Since these nations' capital markets are still developing, banks are seen as the main source of funding in banking-centered economies and are essential to the system's viability. (Moradi *et al.*, 2016). NPLs are advances that have not been paid. According to the International Monetary Fund (IMF), loans that fail to generate interest and principal for at least ninety days will be classified as non-performing loans (NPLs). Alton and Hazen (2001) declared that loans become non-performing loans (NPLs) if the

principle and interest are not paid by the maturity date and are not expected to be paid in the future. Weak credit procedures, incompetent credit specialists, high markup spreads, poor credit principles, and a lack of borrower monitoring policies are the primary causes of high non-performing loans (NPLs). NPLs are a key indicator of credit risk that impacts the nation's banking sector. [Handley \(2010\)](#) stresses that NPLs can be used as an indicator of banking crises as it affects the economic growth of the nation by decreasing credit development ([Ivanovic, 2016](#)). A healthy monetary system is demonstrated by a low level of non-performing loans (NPLs), whereas a bad financial situation is indicated by high NPLs. In the long run, the rising number of non-performing loans (NPLs) will first impact commercial banks before having an impact on the nation's financial situation. ([Souza and Feij'ó, 2011](#)). The increasing drift of NPLs will affect the banking efficiency resulting in banking crises ([Vouldis and Louzis, 2018](#)). The non-performing loans (NPLs) will hinder interest income, limit investment opportunities, and cause liquidity difficulties in the financial system, which leads to bankruptcy issues and a sluggish economy. Therefore, in order to reduce the amount of NPLs for financial stability and economic goals, it is vital to understand the factors that cause NPLs. ([Stijepovi'c, 2014](#)).

Literature review

Researchers have identified various elements that affect the NPLs, including income diversification, profitability, capitalization and operating efficiency. However, the relationship between NPLs and these factors is not clear. Some researchers concluded that these factors have positive relationships, while others reject their results.

Return on Assets (ROA)

Godlewski (2008) investigated the association between NPLs and return on assets (ROA), and he stated that the lower the rate of ROA, the higher would be NPLs and vice versa. [Boudriga et al. \(2010a\)](#) verified by their research that ROA and NPLs are negatively correlated. They came to the conclusion that as the ROA declines, the bank begins investing in high-risk initiatives, which raises the amount of non-performing loans. [Makri et al. \(2014\)](#) showed that there is a negative affiliation between ROA and NPLs.

[Godlewski \(2008\)](#) stated that there is a direct relationship between NPLs and ROA; the lower the ROA, the higher will be NPLs and vice versa. [Ahmad and Bashir \(2013\)](#) affirm that ROA and NPLs have direct association. [Hue \(2015\)](#) concluded from her study that the growth rate of loans increased the NPLs for Vietnamese banks from 2009 to 2012. [Kumar and Kishore \(2019\)](#) studied various banking and microeconomic factors as elements of NPLs in the banking system of the UAE and revealed that ROA has an insignificant association with NPLs. Based on earlier argument, we suppose that

H1. Return on assets has a positive association with NPLs

Bank capital

The effect of bank capital on NPLs is in the opposite direction. On one side, the incentive and encouraging managers of low capitalized banks tend to get involved in high-risk investments and give loans that are issued without proper credit rating and monitoring ([Keeton, 1999](#)). As a result of these activities, the rise in loan default occurs showing the negative relationship between bank capital and NPLs. On the other side, banks with a high level of capital tend to give loans easily as they know that due to these loans banks are not going to be bankrupt and

fail; therefore, banks are highly engaged with these kinds of risky credit activities suggesting a positive association between capital and NPLs ([Rajan, 1994](#)).

Capital adequacy ratio (CAR)

verified by their research that ROA and NPLs are negatively correlated. They came to the conclusion that as the ROA declines, the bank begins investing in high-risk initiatives, which raises the amount of non-performing loans. (Boudriga et al. [2009](#); Osei-Assibey and Asenso [2015](#)).

Certainly, the study of Barth et al. ([2004](#)) needs to be mentioned. Employing a database on bank regulation and supervision for 107 countries for the year 1999, the authors suggest that stricter CAR might encourage banks to enter into riskier lending activities to increase profitability. [Makri et al. \(2014\)](#) also stated that there is a negative association between CAR and NPLs. [Constant and Ngomsi \(2012\)](#) stated that NPLs and CAR are having a positive association with each other. [Amuakwa and Boakye \(2015\)](#) studied the various banking factors that effected the NPLs in Ghana and revealed that microeconomic factors have a negative impact on NPLs while bank capital has a positive impact on NPLs. [Kumar and Kishore \(2019\)](#) stated that concerning banking factors, the NPLs and CAR are having a negative association in the banking sector.

[Koju et al. \(2018\)](#) conducted a study on the banking sector of Nepal and concluded that CAR has a negative relationship with NPLs. Keeping in view the diverse views and disagreements among researcher, we suppose that

H3. Bank capital has a positive association with NPLs.

Income Diversification

The banks make money from two different sources: loan activities and noninterest activities like trading and derivative transactions. Banks that earn more than just interest are more cautious and make fewer high-risk investments in an effort to reduce their risk. As a result, these banks' loan performance is superior, demonstrating the negative correlation between NPLs and income diversification.(Ghosh, 2015). [Hu \(2002\)](#), [Louzis et al. \(2012\)](#) examined a number of banking and microeconomic variables, including leverage ratio, ROA, CAR, and noninterest income, as predictors of non-performing loans (NPLs) in several Greek banks and found that ROA had a negative effect on NPLs while noninterest income had a positive effect. In light of the research' previously reported findings,

H4. Income diversification has a positive association with NPLs.

Methodology

The study uses panel data collected from five Pakistani commercial banks over the period 2015–2025. NPL ratio is the dependent variable, while ROA, CAR, and Income Diversification are independent variables. The study applies pooled regression, random-effect, and fixed-effect models. The Hausman test is used to select the most suitable estimator. Data were obtained from annual reports and financial statements of the selected banks.

Descriptive statistics

	NPL	CAR	ID	ROA
Mean	0.055400	0.161891	0.372727	0.017318
Median	0.058000	0.160000	0.380000	0.016500
Maximum	0.100000	0.210000	0.460000	0.035000
Minimum	0.014000	0.120000	0.250000	0.005000
Std. Dev.	0.020391	0.024732	0.047705	0.006626
Skewness	-0.308111	0.199110	-0.466105	0.633193
Kurtosis	2.684253	2.000093	2.833293	3.226594
Jarque-Bera	1.098683	2.654653	2.055185	3.792886
Probability	0.577330	0.265185	0.357868	0.150102
Sum	3.047000	8.904000	20.50000	0.952500
Sum Sq. Dev.	0.022453	0.033031	0.122891	0.002371
Observations	55	55	55	55

The standard deviation values are relatively low, indicating limited fluctuations in the variables over the study period. Furthermore, the Jarque-Bera probabilities for all variables are greater than 0.05, confirming that the data is normally distributed.

Correlation Matrix

Correlation				
	NPL	ROA	CAR	ID
NPL	1.000000	-0.734870	-0.477560	0.147157
ROA	-0.734870	1.000000	0.811314	0.273150
CAR	-0.477560	0.811314	1.000000	0.418387
ID	0.147157	0.273150	0.418387	1.000000

The correlation matrix indicates that ROA has a strong negative relationship with NPL ($r = -0.7349$), suggesting that more profitable banks tend to have lower non-performing loans. CAR also exhibits a negative relationship with NPL ($r = -0.4776$), implying that stronger capital positions help reduce loan defaults.

Regression Analysis

Dependent Variable: NPL
 Method: Panel Least Squares
 Date: 05/07/26 Time: 16:15
 Sample: 2015 2025
 Periods included: 11
 Cross-sections included: 5
 Total panel (balanced) observations: 55

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.031290	0.015436	2.027017	0.0479
ROA	-2.922893	0.421936	-6.927344	0.0000
CAR	0.122807	0.119720	1.025786	0.3098
ID	0.147153	0.037720	3.901153	0.0003
R-squared	0.677471	Mean dependent var		0.055400
Adjusted R-squared	0.658499	S.D. dependent var		0.020391
S.E. of regression	0.011916	Akaike info criterion		-5.951887
Sum squared resid	0.007242	Schwarz criterion		-5.805899
Log likelihood	167.6769	Hannan-Quinn criter.		-5.895432
F-statistic	35.70850	Durbin-Watson stat		0.278774
Prob(F-statistic)	0.000000			

The regression analysis reveals that ROA has a coefficient of **-2.9229** with a probability value of **0.0000**, indicating a statistically significant negative impact on NPL. This suggests that an increase in profitability leads to a reduction in non-performing loans.

CAR has a coefficient of **0.1228** with a probability value of **0.3098**, indicating an insignificant effect on NPL. Therefore, CAR does not significantly influence non-performing loans in the pooled regression model.

Income Diversification (ID) has a coefficient of **0.1472** and a probability value of **0.0003**, indicating a positive and statistically significant relationship with NPL.

The R-squared value of **0.6775** indicates that approximately **67.75%** of the variation in NPL is explained by the independent variables included in the model.

Random-effect model.

Dependent Variable: NPL
 Method: Panel EGLS (Cross-section random effects)
 Date: 04/23/26 Time: 18:53
 Sample: 2015 2025
 Periods included: 11
 Cross-sections included: 5
 Total panel (balanced) observations: 55
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.121480	0.016455	7.382392	0.0000
ROA	0.257316	0.531983	0.483692	0.6307
CAR	-0.762917	0.194647	-3.919491	0.0003
ID	0.142122	0.073184	1.941993	0.0577

Effects Specification		S.D.	Rho
Cross-section random		0.010018	0.6747
Idiosyncratic random		0.006955	0.3253

Weighted Statistics			
R-squared	0.525596	Mean dependent var	0.011351
Adjusted R-squared	0.497690	S.D. dependent var	0.010808
S.E. of regression	0.007660	Sum squared resid	0.002992
F-statistic	18.83445	Durbin-Watson stat	0.424383
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.252788	Mean dependent var	0.055400
Sum squared resid	0.016777	Durbin-Watson stat	0.075693

The random effect model shows that ROA has a positive coefficient of 0.2573, but its probability value (0.6307) indicates statistical insignificance.

CAR has a coefficient of **-0.7629** with a probability value of **0.0003**, demonstrating a significant negative impact on NPL. This finding implies that banks with higher capital adequacy tend to experience lower levels of non-performing loans.

Income Diversification (ID) has a positive coefficient of **0.1421** with a probability value of **0.0577**, indicating significance at the 10% level.

The R-squared value of **0.5256** suggests that approximately **52.56%** of the variation in NPL is explained by the independent variables.

Fixed-effect Model.

Dependent Variable: NPL
 Method: Panel Least Squares
 Date: 04/23/26 Time: 18:51
 Sample: 2015 2025
 Periods included: 11
 Cross-sections included: 5
 Total panel (balanced) observations: 55

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.135306	0.019748	6.851550	0.0000
ROA	0.541176	0.641630	0.843438	0.4032
ID	-0.239526	0.080193	-2.986870	0.0044

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.872405	Mean dependent var	0.055400
Adjusted R-squared	0.856455	S.D. dependent var	0.020391
S.E. of regression	0.007726	Akaike info criterion	-6.770126
Sum squared resid	0.002865	Schwarz criterion	-6.514647
Log likelihood	193.1785	Hannan-Quinn criter.	-6.671330
F-statistic	54.69830	Durbin-Watson stat	0.468217
Prob(F-statistic)	0.000000		

The fixed effect model indicates that ROA has a coefficient of **1.0946** with a probability value of **0.0740**, suggesting that its effect is statistically insignificant at the 5% significance level. CAR has a coefficient of **-1.0514** and a probability value of **0.0010**, indicating a significant negative effect on NPL. This result implies that stronger capital adequacy contributes to reducing non-performing loans.

Income Diversification (ID) has a coefficient of **0.1683** with a probability value of **0.2260**, indicating an insignificant relationship with NPL.

The model has an R-squared value of **0.8987**, indicating that approximately **89.87%** of the variation in NPL is explained by the independent variables. This demonstrates strong explanatory power.

Hausman's Test

Cross-section random effects test equation:

Dependent Variable: NPL

Method: Panel Least Squares

Date: 04/23/26 Time: 18:56

Sample: 2015 2025

Periods included: 11

Cross-sections included: 5

Total panel (balanced) observations: 55

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.143918	0.017949	8.018077	0.0000
ROA	1.094625	0.598963	1.827535	0.0740
CAR	-1.051442	0.300782	-3.495699	0.0010
ID	0.168338	0.137207	1.226889	0.2260

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.898734	Mean dependent var	0.055400
Adjusted R-squared	0.883652	S.D. dependent var	0.020391
S.E. of regression	0.006955	Akaike info criterion	-6.964872
Sum squared resid	0.002274	Schwarz criterion	-6.672897
Log likelihood	199.5340	Hannan-Quinn criter.	-6.851963
F-statistic	59.58907	Durbin-Watson stat	0.669263
Prob(F-statistic)	0.000000		

The Hausman test was conducted to determine the most appropriate model between the fixed effect and random effect approaches. The test produced a Chi-square statistic of **13.8550** and a probability value of **0.0031**.

Since the probability value is less than **0.05**, the null hypothesis is rejected. Therefore, the fixed effect model is preferred over the random effect model and is considered the most appropriate model for this study

Discussions

Descriptive statistics indicate reasonable stability and normality across variables. Correlation analysis shows a strong negative association between ROA and NPLs and a moderate negative relationship between CAR and NPLs. In pooled regression, ROA significantly reduces NPLs while ID positively affects NPLs. However, the Hausman test supports the fixed-effect model as the preferred specification. Under the fixed-effect model, CAR remains statistically significant and negatively associated with NPLs, whereas ROA and ID become insignificant.

The model explains approximately 89.87% of variation in NPLs, indicating strong explanatory power. These findings imply that capital strength plays a more important role in controlling credit risk than profitability or diversification strategies.

Conclusion

The study concludes that Capital Adequacy Ratio is the most influential determinant of non-performing loans in the selected Pakistani banks. Banks with stronger capital positions experience lower credit risk and improved asset quality. Although profitability and income diversification show relationships with NPLs, their effects are not consistently significant in the final model. The results emphasize the importance of maintaining strong capital buffers and effective risk management practices.

Policy Implications

Regulators should continue enforcing capital adequacy requirements and strengthen prudential supervision. Bank management should improve credit monitoring, loan screening, and risk assessment frameworks. Strong capitalization can contribute significantly to reducing loan defaults and improving financial stability.

Limitations & Future Research Direction

The study is limited to five commercial banks and focuses only on bank-specific factors. Future studies should include larger samples, macroeconomic variables such as inflation and GDP growth, and advanced econometric techniques such as GMM. Comparative studies between Islamic and conventional banks may also provide valuable insights.

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