Impact of Credit Risk Management on Bank's Performance: Empirical Study on Commercial Banks of Pakistan

Syed Wajahat Ali[1], Abdul Rauf Kashif[2*], Muhammad Hammad[3], Sajjad Ahmad[4], Ahmad Raza[5]

Abstract
This practical study examines the relationship of "Credit Risk Management, over performance of commercial banks in Pakistan. Utilizing credit risk management-CRM indicators such as Non-Performing Loan (NPL), Advance to Deposit Ratio (ADR), and Capital Adequacy Ratio (CAR), our study spans 15 years of financial data from 21 out of 33 commercial banks. Employing panel data analyses, including Descriptive statistics, Unit Root Test, Panel Least Square Model and Hausman test. The study reveals noteworthy insights, Firstly, an increase in NPL negatively impacts bank profitability, advising systematic customer information collection and widespread analysis for lending decisions. Secondly, a negative relationship between CAR and bank performance emphasizes complicated balance between regulatory compliance and operational efficiency. Notably, ADR did not significantly impact performance, suggesting the need for further exploration. These findings contribute to bridging existing research gaps and offer practical insights for lending department and regulatory authorities in shaping the financial landscape of Pakistan's banking industry.
Keywords: Return on Assets, Non-Performing Loans, Capital Adequacy Ratio, Advances to Deposit Ratio, Pakistan

1. Introduction

Financial soundness means that the system of financial institutions, markets and infrastructure work together smoothly to help people save and invest money in a reliable way (Arzova & Sahin, 2023). It is important for a healthy economy. Central bank and regulators in the world have the job of making sure financial system is stable. This means they need to identify any problems or weaknesses in the system and take action to prevent them from affecting the rest of the economy and to keep people's trust in the system.

Banks are really important businesses all around the world. They help the economy of a country to grow and become robust. The banking sector is like lifeblood for the economic system of a country. Banks give money to both the government and private businesses (Harb, El Khoury, Mansour, & Daou, 2023). When we talk about how well a bank is doing, we look at two things: how much money the bank is making, and how stable the bank is. If a bank is making more and more money over time, it means that its performance is getting better. And if a bank is able to pay back all its debts with no trouble, it means that it is in a good position (Hamza & Khan, 2014). The financial sector in Pakistan encompasses banks, Development Finance Institutions (DFIs), Microfinance Banks (MFBs), Non-banking Finance Companies (NBFC), insurance firms, Mudarbas etc. Banks play a predominant part in the sector, having the largest share of banking sector assets as a percentage of GDP. Regulatory oversight is divided between the State Bank of Pakistan (SBP), which regulates banks, DFIs, exchange companies, and MFBs, and the Securities and Exchange Commission of Pakistan (SECP), which oversees NBFCs, insurance companies, and Modaraba companies.

Financial segment of Pakistan consist of total 51 Bodies including 32 banks, 09 DFIs and 11-Microfinance banks-MFB (SBP, 2023). Total deposit size of scheduled banks was Rs.22.467 trillion while advance size was Rs.11.912 trillion as on December 2022 which translated into ADR of 53%.

The banking industry is similar to the economy's mainstay, as was referred earlier. In light of this basic affirmation, we may argue that the stability of Pakistan's banking system and its functioning are essential to the country's economic stability. The performance of the banking system is affected by several factors. In this study, the effects of credit risk management-CRM on a bank's performance will be assessed. Indicators for credit risk management will include Capital Adequacy Ratio (CAR), Advance to Deposit Ratio (ADR) and Non-Performing Loans (NPL). It is identified (Budiarto, 2021) that NPLs have negative important effect on financial results of the banks. Since NPL has direct negative correlation with bank's performance, it is also suggested/identified by Mr. Boiardo that other internal and external factors that can affect NPLs may be included in efforts to reduce NPL. External and internal factors that may affect NPL can be used as new backgrounds in effort to reduce NPLs leading to improvement in bank's performance.

While reviewing the existing literature, it is observed that there is an ample amount of research available pertaining to relationship between NPL and profitability of commercial banks, up to my limited knowledge there is a scarcity of research papers specifically examining the influence of CRM over productivity of commercial banks in

---

[1] MS Scholar, Southern Business School, ISP Multan
2 Assistant Professor, Southern Business School, ISP Multan abdulraufkashif@isp.edu.pk
3 Lecturer, Southern Business School, ISP Multan
4 Scholar, Southern Business School, ISP Multan
5 MS Scholar, Iqra University Islamabad

Pakistan. Additionally, there remains a scarcity of up-to-date research and articles addressing this particular topic within the Pakistan's banking industry.

This research aims to address the research gap by focusing on the specific context of Pakistan and utilizing the latest available data from annual reports of Pakistani banks. By examining the impact of CRM on profitability of commercial banks in Pakistan, this reading will contribute to filling the existing research gap and provide valuable insights into the banking industry within the country.

2. Literature Review

The literature review includes citation to previous studies that are relevant to this study to understand the factors that might influence financial performance. We also discuss the variables used in the main research.

2.1. Overview of the banking Sector of Pakistan

There are total 51 institutions operating in Pakistan. These institutions can be classified into 08 Public sector bank, 20-Private Sector banks, 04 Foreign Banking Operations, 09- Development Financial Institutions-DFIs, and 11 Microfinance Banks. The banking industry has an important role in the country's financial system, Public Sector commercial banks and Local Private Banks accounts for approximately 95% of the total financial assets of banking system of Pakistan.

2.2. Non-Performing Loans

This study (Psaila, Spiteri, & Grima, 2019) looks at the connection between commercial banks' profitability in the Euro-Mediterranean and their NPLs. The findings imply that NPLs have a negative and significant effect on listed commercial banks' profitability in the Euro-Mediterranean area, meaning that banks with large NPLs often have lower profitability.

Kingu, Macha, and Gwahula (2018) examined the impact of NPL on Tanzanian commercial banks' profitability. The researchers discovered that a bank is often taking greater risks with its loans when there are more non-performing loans (NPLs). This may result in increased expenses for the bank and perhaps hinder its ability to turn a profit. Put differently, a bank is less likely to generate money the more non-performing loans (NPLs) it has.

Budiarto (2021) identified that NPLs have negative significant effect on financial performance of banks. Since NPL has direct negative correlation with bank's performance, it is also suggested/identified by Mr. Boiardo that other internal and external factors that can effect NPLs may be included in efforts to reduce NPL. External and internal factors that may affect NPL can be used as new antecedents in effort to reduce NPLs leading to improvement in bank's performance.

Ozurumba (2016) discovered that a few key variables significantly impact banks' performance. We refer to these elements as explanatory variables. They discovered that the bank's performance deteriorates when the ratio of bad loans to money set aside for bad loans rises. NPL significantly affects how well a bank performs. These findings suggest that poor loans are a major issue for banks and may potentially pose a danger to their continued existence as companies (Harb et al., 2023).

2.3. Capital Adequacy Ratio- CAR

With bank ownership acting as a moderating factor, this study (Hussain & Rasheed, 2022) assesses the link between capital sufficiency, liquidity management, CRM, and financial performance. Using a secondary data technique, this study gathered panel data over ten years, from 2012 to 2021, from financial statements of fifteen commercial banks in Pakistan. The findings suggest that CAR, has a positive effect on banks' financial performance.

This study (Dao & Nguyen, 2020) aims to identify factors impacting banks' performance and capital adequacy ratio, exploring the correlation between these variables. Banks face the challenge of balancing safe lending practices with optimal capital utilization to maximize earnings. Strategies such as reducing risky assets and increasing equity capital can help achieve this balance. The study suggests that banks should manage and utilize capital efficiently to enhance market performance, cautioning against overly conservative practices that may limit earnings despite higher asset quality. Adjusting risk-weighted assets and boosting equity capital are recommended measures to maintain an appropriate capital level.

2.4. Advances to Deposit Ratio-ADR

The study (FCMA) findings showed a notable and favorable impact of the ADR on bank's performance. The research concluded that maintaining an optimal ADR positively contributes to enhancing a bank's return on assets, thereby benefiting its overall financial well-being. Conversely, an excessively high ADR could heighten credit risks, negatively impacting the firm's financial health. Conversely, a lower ADR might generate excess funds, potentially increasing the firm's opportunity costs.

Yeasin (2022) examines how CRM effects the financial performance of commercial banks. It uses ROA to measure bank performance and considers NPL, CAR, and Loan to Deposit Ratio-LDR as indicators of credit risk. The findings indicate that NPL and CAR have a negative and statistically significant impact on the financial performance of commercial banks, while LDR has a positive and noteworthy impact. Thus, credit risk has detrimental effect over financial performance of commercial banks (Arzova & Sahin, 2023).

Bagh, Razzaq, Azad, Liaqat, and Khan (2017) examined how Pakistani banks' cash flow management practices impact their bottom line. According to the study, several liquidity management techniques (such ADR, CDR, and

DAR) improved ROA (return on assets) but decreased ROE (return on equity). On the other side, ROE was positively impacted by CR, ADR, CDR, and DAR. The study comes to the conclusion that firms should be mindful of their liquidity management procedures as it is a significant factor in determining profitability of banks. The International Journal of Academic Research in Economics & Management Sciences published this study.

2.5. Conceptual Framework

A conceptual framework is a visual representation of the variables under study in research. It serves as a crucial research tool designed to assist researchers in deepening their understanding of the situation.

2.6. Conceptual Framework
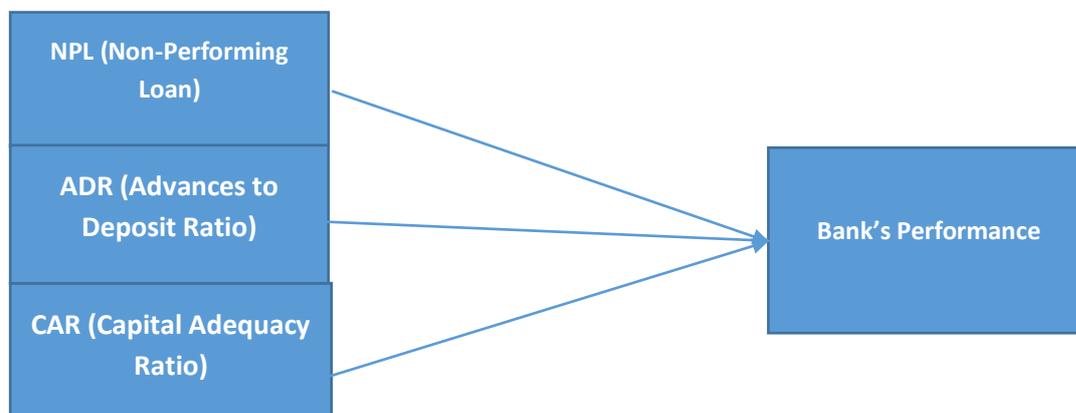
Based on the above referred literature review and conceptual framework, the following hypotheses are formulated

2.7. Hypothesis Development

H1: Non-performing Loans have significant impact on bank's performance.

H2: CAR has significant relationship on Bank's performance.

H3: ADR has significant impact on Bank's performance.

3. Research Methodology

3.1. Data and Sample

This is explanatory research with deductive research strategy meaning that it emphasizes the relationship between research variables (causality) by testing the hypothesis.

This study used secondary data of 15 years from financial statements for 2008-2022 which come from 21 commercial banks out of 33 Pakistan. Sample determination criteria includes banks listed in Pakistan Stock Exchange-PSX 100 index based on availability of data for selected period of banks, Externally Rated Banks. Selected banks volume covered around 85-90% of total advances/deposit of commercial banks in Pakistan. Data collected for 15 years and total number of observations in this study are (15*21) 315.

3.2. Measurement of Variables

3.2.1. Dependent Variables

DV for the research is Bank's performance to be measure vides calculating ROA, ROE and Return per employee.

ROA = Net Profit / Total Assets

ROE = Net Profit / Total Equity

Return per Employee= Net Profit / No of Employees

ROA/ROE is an pointer of performance measure how banks are profit able relative to their assets/equity, meaning how much management is effective in utilizing the company assets & equity to produce profits. Likewise, return per employee will evaluate how efficiently management is utilizing its employee in the best interest of the bank.

3.2.2. Independent Variables

In this study, NPL, CAR & ADR are independent variables to be included to check their effect of performance. The details are given below:

3.2.3. (NPL) Ratio

NPL= NPL / Total Gross Advances

The higher NPL ratio shows poor advances and, so, the higher risk that more advances loss will be charged against income.

3.2.4. Capital adequacy ratio (CAR)

CAR is a financial ratio that measures a bank's ability to meet its obligations and absorb losses. It is calculated by dividing a bank's capital by its risk-weighted assets.

CAR = Capital / Risk Weighted Assets

Capital refers to the funds that a bank holds to cover potential losses, while risk-weighted assets are assets that are assigned a risk factor based on their potential to cause losses to the bank

3.2.5. The advances to deposit ratio (ADR)

ADR is a financial metric that measures % of loans or advances that are funded by its customer deposits. It is calculated by dividing the total loans or advances extended by a bank by the total deposits held by the same bank.
ADR= Total Advances / Total Deposits:
The ADR is used as an gauge of a bank's liquidity and capability to lend, with a higher ADR indicating that a bank is more reliant on loans to fund its operations, while a lower ADR indicates that a bank has more customer deposits to rely on.

3.3. Econometric Models for data analysis

Descriptive statistics are utilized to calculate DVs and IV during selected period, providing a snapshot of the current state and enabling the extraction of relevant information. The linear regression model in statistics describes the relationship between a DV and one or more IVs.
The equation of a linear regression is revealed by equation 1
$Y = a + bx + €$ ………………………….eq. 1
Where:
X = Independent variable   Y= Dependent variable.   € = Regression error term
This reading fixed this model by foreseeing the variables used in existing studies (eq. 2).
$ROA = \alpha + \beta1 \ NPL + \beta2 \ CAR + \beta3 \ ADR + €$
Where,
α = Intercept ROA= Evaluate financial performance of the bank
NPL=Non performing Loans
CAR= Capital Adequacy Ratio,
ADR=Advances to Deposit Ratio
€ = Regression error term

4. Data Analysis

Secondary data from financial statements spanning the period 2008-2022 (15 years) were utilized, sourced from 21 out of 33 commercial banks in Pakistan. The total number of observations in this study amounts to 315. Panel data analyses including Descriptive statistics, Unit Root Test, Panel Least Square Model & Hausman test employed by using e-views V_{13} and results are explaining below

4.1. Descriptive statistics

Descriptive statistics is crucial both in quantitative and qualitative research, as they help researchers and analysts to understand and communicate key aspects of the data they are working with. Descriptive Statistics are applied on secondary data. The results are given in below table No. 01.

Table 1: Descriptive Statistics

	ADR	CAR	NPL	ROA
Mean	0.599005	0.153988	0.106014	0.006364
Median	0.575550	0.149900	0.083700	0.008400
Maximum	1.075600	0.802000	0.657800	0.042000
Minimum	0.229600	-0.800400	0.001400	-0.089300
Std. Dev.	0.143434	0.110517	0.096480	0.014510
Skewness	0.554393	-2.511581	2.970214	-2.959259
Kurtosis	3.095932	34.76647	14.24417	16.70455
Jarque-Bera	16.20517	13532.63	2115.837	2915.536
Probability	0.000303	0.000000	0.000000	0.000000
Sum	188.0877	48.35230	33.28830	1.998200
Sum Sq. Dev.	6.439453	3.822979	2.913517	0.065902
Observations	315	315	315	315

The Advances to Deposit Ratio (ADR) measures a bank's lending activity relative to its deposits, with a higher ADR indicating a more aggressive lending approach. The average bank's ADR is 59.90%, meaning banks lend out approximately 0.5990 units of currency for every unit held in deposits. The standard deviation of 14.34% indicates the average variation in ADR values around the mean, highlighting the dispersion in lending activities among banks. A skewness score of 0.554393 suggests a moderate tendency for banks to have higher ADRs than average, potentially due to differences in lending processes, risk preferences, or market conditions. The Jarque-Bera test, with a value of 16.20 and a p-value of 0.000303, indicates that the ADR data significantly deviates from a normal distribution, leading to the rejection of the null hypothesis of normalcy in favor of the alternative hypothesis.
The Capital Adequacy Ratio (CAR) is a crucial financial indicator used to evaluate a bank's stability and ability to withstand losses, measuring the ratio of capital to risk-weighted assets. The average CAR among banks is 15.3988%, with a standard deviation of 0.110517, indicating an average deviation of this magnitude from the mean CAR. The negative skewness of -2.511581 reveals that the distribution of CAR values is heavily skewed to

the left, suggesting that many banks in the dataset have significantly lower CARs than the average, which could imply higher risk exposure or reduced financial stability. The Jarque-Bera test statistic of 13,532.63 and a p-value of 0.0000 strongly indicate that the CAR data distribution deviates significantly from normality.

The Non-Performing Loans (NPL) ratio, indicating credit risk, is calculated by dividing non-performing loans by the total amount of loans and advances, with a higher NPL ratio signifying poorer credit quality and increased likelihood of loan losses impacting income. An average NPL ratio of 10.6% in the sample reflects that this proportion of the loan portfolio is classified as non-performing, highlighting the importance of this metric in assessing credit risk, potential financial impacts, and the overall health of a bank's loan portfolio. The standard deviation of 0.096480 indicates considerable variability around the mean NPL ratio. A positive skewness of 2.970214 in the interest rate distribution suggests that the data is heavily skewed towards higher rates, with a few outliers significantly above the majority. The Jarque-Bera test statistic of 2,115.837 with a p-value of 0.00000 strongly rejects the assumption of a normal distribution for the NPL data.

The Return on Assets (ROA) is a financial ratio that measures a bank's efficiency in generating profits from its assets, calculated by dividing net income by average total assets (ROA = Net Income / Total Assets). An average ROA of 0.6364% indicates that banks in the dataset generate this return for every unit of assets held. A standard deviation of 0.014510 highlights the variability in ROA, with some banks performing significantly better or worse than the mean. The distribution of ROA values is heavily skewed to the left, as indicated by a negative skewness of -2.959259, suggesting that most banks have lower ROA values, with a few exceptions exhibiting extremely high ROA values.

4.2. Panel Unit Root Test:

To ascertain whether a time series dataset is stationary or non-stationary, econometricians and time series analysts employ statistical analyses known as unit root tests. When a series is said to be stationer, it means that its statistical characteristics, such its variance and mean, are steady throughout time. Conversely, a non-stationary series displays patterns, which makes it challenging to generate accurate forecasts or meaningful conclusions.

4.2.1. Kao Residual Co-integration test-KRC:

KRC is a statistical test used to examine the existence of co-integration among non-stationary time series variables in a system. Co-integration advocates a long term relationship among variables despite the fact that each variable might be non-stationary individually.

	t-Statistic	Prob.
ADF	-3.383513	0.0004
Residual variance	0.005587	
HAC variance	0.004829	

Sample: 2008-2022, Null Hypothesis: No cointegration: Trend assumption: No deterministic trend

In terms of standard errors, t-statistic assesses how strongly the variables are related. Stronger evidence against the null hypothesis is often indicated by a greater absolute value of the t-statistic. In this instance, the result of -3.383513 indicates a stronger argument against the lack of co-integration by pointing to a rather substantial divergence from the null hypothesis.

Strong evidence against the null hypothesis is indicated by a low p-value. The likelihood that co-integration is present is strengthened by the probability of 0.0004, which indicates strong evidence against the null hypothesis that there is no co-integration. It suggests that the factors taken into account in the Kao Residual Co-Integration Test most likely have a consistent, long-term connection.

The variety of the residuals that are derived from the model is represented by residual variance. Lower residual variance can bolster the evidence of a consistent, long-term link between the variables in the context of co-integration testing. The use of HAC variance estimation and the comparatively low residual variance (0.005587) increase the robustness of the findings.

4.2.2. Dicky Fuller Test

Table 2-B-Dickey Fuller Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.473480	0.057978	-8.166505	0.0000
D(RESID(-1))	0.125308	0.065334	1.917951	0.0562
R-squared	0.193951	Mean dependenst var		-0.010145
Adjusted R-squared	0.190955	S.D. dependent var		0.081942
S.E. of regression	0.073704	Akaike info criterion		-2.370169
Sum squared resid	1.461280	Schwarz criterion		-2.343585
Log likelihood	323.1579	Hannan-Quinn criter.		-2.359495
Durbin-Watson stat	1.882952			

Dependent Variable: D(RESID)

The Augmented Dickey-Fuller (ADF) test results suggest that the regression model's explanatory factors explain approximately 19.40% of the variability in the differenced time series variable, with an R-squared value of 0.193951. After adjusting for the number of predictors, the adjusted R-squared value of 0.190955 indicates that around 19.10% of the variability is accounted for. The standard error of regression of 0.073704 indicates a good fit of the model to the differenced time series data. However, the Durbin-Watson statistic result of 1.882952 suggests some degree of autocorrelation in the model's residuals, indicating that there may be correlation between the residuals and their lagged values, which could affect the validity of the test findings.

4.3. Panel Least Square Test

A statistical technique used in econometrics to evaluate panel data is panel least squares (POLS). Panel data is information gathered on several entities (people, businesses, and nations) observed across a number of time periods. In panel data analysis, POLS is an extension of ordinary least squares (OLS) regression that takes individual- and time-specific effects into consideration.

A link between a DV and one or more IVs relationships is recognized as a linear regression model in statistics. Linear regression is presented by equation 1

$$Y = a + bx + \epsilon \dots\dots\dots eq\ 1$$

Where

X = Independent Variable   Y= Dependent Variable. ϵ = Regression error term

To create the relationship between DV and IVs general linear regression is used. Our study secure this model by envisaging variables used in previous studies (Equation 2).

$$ROA = \alpha + \beta 1\ NPL + \beta 2\ CAR + \beta 3\ ADR + \epsilon \dots\dots eq2$$

Where,

α = Intercept
ROA= It measures financial performance
NPL=Non performing Loans
CAR= Capital Adequacy Ratio
ϵ = Regression error term

Panel Least Square Model is applied to regress Eq#2. The results are given in table no 3.

Table 3. Path Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.024093	0.004959	4.858646	0.0000
ADR	-0.021575	0.004652	-4.638174	0.0000
NPL	-0.085287	0.007491	-11.38581	0.0000
CAR	-0.007569	0.006368	-1.188632	0.2355
R-squared	0.426334	Mean dependent var		0.006364
Adjusted R-squared	0.415123	S.D. dependent var		0.014510
S.E. of regression	0.011097	Akaike info criterion		-6.142218
Sum squared resid	0.037806	Schwarz criterion		-6.058633
Log likelihood	971.3282	Hannan-Quinn criter.		-6.108819
F-statistic	38.02581	Durbin-Watson stat		0.564910
Prob(F-statistic)	0.000000			

Dependent Variable: ROA, Method: Panel Least Squares, Sample: 2008 2022

Equation #2 is regressed in Table 3 above, where NPL IV and ROA is DV. The Advances to deposit ratio (ADR), and capital adequacy ratio (CAR) are the other independent factors. The R-square shows the percentage change in DV induced by each observed IV. In the previous table, the corrected R square is 0.415. According to this statistic, all observable factors contribute 41.5% of the change in the bank's performance, while unseen variables account for 58.5% of the change. Below is a list of the hypothesis's conclusions. When evaluating the overall significance of a group of independent variables in a regression model, the F statistic is employed. This statistic value indicates the ratio of the explained variance to the unexplained variance in the model and is used to determine if overall effect of IVs on the DVS is statistically substantial. A higher F-statistic of 38.025 and corresponding P value below 0.05 in Table 3 above suggest a greater correlation between IVs & DV.

4.4. Hypothesis Testing

All hypotheses are tested on 95 percent confidence interval and 5 percent probability of error.

H1: Non-performing Loans-NPL have significant impact on bank's performance.

In above table 3, the probability value for casual relationship between NPL & bank's performance is 0.0000 which is less than probability of error 0.05. This value confirms significant impact of NPL on bank's financial results The value of T statistics for this relationship is -4.63 and coefficient value is -0.085. These both values show negative significant impact on bank's financial performance. As per above results, it is established that ADR has negative significant impact on bank's performance. Therefore, Hypothesis 1 is accepted. These results are consistent with studies of Malenković (2023)

H2: CAR has significant impact over Bank's performance.

In above table 3, the probability value for casual relationship between CAR & bank's performance is 0.2355 which is higher than probability of error 0.05 indicating that the coefficient is not statistically significant in influencing the bank's performance. The value of T statistics for this relationship is -1.188 and coefficient value is -0.007. These both values show negative which shows negative relation between bank's performance and CAR. As the CAR increases, the bank's performance tends to decrease. Moreover, higher probability of error -value suggest influence of CAR on bank' financial performance is not significant. As per above results, it is found that CAR has negative insignificant significant impact over bank's financial performance. Therefore, Hypothesis 3 is rejected. Their results indicate that CAR has positive and statistically significant effect on financial performance of bank.". On the other hand, results are consistent with finding of Khalifaturofi'ah (2023)

H3: ADR has significant impact on Bank's performance:

Probability value for casual relationship between ADR & bank's performance is 0.0000 which is less than probability of error 0.05. This value confirms significant impact of ADR on banks financial performance. The value of T statistics for this relationship is -4.6 and coefficient value is -0.021. These both values show negative significant impact on bank's performance. From above, it is established that high ADR has negative significant impact on bank's performance. Therefore, Hypothesis 4 is accepted. These results are aligned to Hypothesis with study of (Khalifaturofi'ah (2023))

4.5. Hausman Test

Table # 4: Hausman Test

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		17.255479	6	0.0084
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
ADR	-0.006751	-0.010033	0.000002	0.0311
CAR	-0.025361	-0.022912	0.000001	0.0248
NPL	-0.086598	-0.088816	0.000011	0.4977

Correlated Random Effects - Hausman Test, Equation: Untitled, Test cross-section random effects

A p-value of 0.0084 associated with the Hausman test indicates strong evidence against the null hypothesis. At a typical significance level of 5% (0.05), since the p-value (0.0084) is less than probability of error 0.05, we would reject the null hypothesis.

Therefore, based on the significance level conventionally used (5% or 0.05), you would lean towards rejecting the idea that the coefficients estimated in the fixed effects and random effects models are similar. Instead, we would conclude that there's evidence to favor one model over the other –favoring the fixed effects model in this scenario.

4.6. Fixed Effect Model

Table 5: Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.029237	0.006785	4.308849	0.0000
ADR	-0.006751	0.004827	-1.398492	0.1630
CAR	-0.025361	0.005658	-4.482021	0.0000
NPL	-0.086598	0.008540	-10.14041	0.0000
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.673500	Mean dependent var		0.006364
Adjusted R-squared	0.643922	S.D. dependent var		0.014510
S.E. of regression	0.008659	Akaike info criterion		-6.578446
Sum squared resid	0.021517	Schwarz criterion		-6.256046
Log likelihood	1059.816	Hannan-Quinn criter.		-6.449621
F-statistic	22.76999	Durbin-Watson stat		0.975052
Prob(F-statistic)	0.000000			

Dependent Variable: ROA, Method: Panel Least Squares

In the table 5 above, Eq#2 is regressed, with ROA serving as DV and NPL as the IV. The other independent variables are the CAR, ADR, Interest Rate, and Corporate Governance. Board size and CEO tenure serve as proxies for corporate governance.

The percentage change in DV caused by each observed IV is indicated by the R-square. The adjusted R square in the preceding table is 0.64. This data indicates that 64% of the variation in the bank's performance is attributable to the observable factors, with the remaining 36% coming from the unseen variables. The findings of the hypothesis are listed below.

The F-statistic is used to test the overall significance of a set of independent variables in a regression model. It examines whether the overall effect of the independent variables on the dependent variable is statistically significant, statistic value represents the ratio of the explained variance to the unexplained variance in the model.

In above table 5, a higher f-statistic of 22.77 and associated P value below 0.05 indicates a stronger relationship between the independent variables and the dependent variable.

4.7. Hypothesis Testing

All hypotheses are tested on 95 percent confidence interval and 5 percent probability of error.

H1: Non-performing Loans-NPL have significant impact on bank's performance.

In above table 5, the probability value for casual relationship between NPL & bank's performance is 0.0000 which is less than probability of error 0.05. This value confirms the significant impact of NPL over bank's financial performance

Moreover, the value of t-statistics for this relationship is -10.14 and coefficient value is -0.086. These both values show negative significant impact over bank's financial performance. As per above results, it is established that ADR has negative significant impact on bank's performance. Therefore, Hypothesis 1 is accepted.

H2: CAR has significant impact on Bank's performance.

In above table 5, the probability value for casual relationship between interest rate & bank's performance is 0.0000 which is lower than probability of error 0.05 indicating that CAR is statistically significant in influencing the bank's performance. The value of T statistics for this relationship is -4.482 and coefficient value is -0.025. These both values are negative which shows negative relation between bank's performance and CAR. As the CAR increases, the bank's performance tends to decrease. As a result, it is found that impact of CAR on bank' performance is significant negative impact Therefore, Hypothesis 3 is accepted. These results are alingned with the studies of Hussain & Rasheed, (2022) & Agbeja, Adelakun, & Olufemi, (2015). However, their results indicate that CAR has positive and significant effect over the performance of banks while our results are depicting negative relationship. However, our results are exactly consistent with the studies of Dao & Nguyen, 2020 that provide recommendations to the banks to improve performance by managing and make use of capital in an effective way.

H3: ADR has significant impact on Bank's performance:

Probability value for casual relationship between ADR & bank's performance is 0.1630 which is higher than probability of error 0.05. This value confirms the insignificant impact of ADR over bank's financial performance. The value of T statistics for this relationship is -1.398 and coefficient value is -0.0067. These both values show negative insignificant impact on bank's performance. From above, it is found that ADR has negative insignificant impact on bank's performance. Therefore, Hypothesis 4 is rejected. However, negative relationship wih bank's formance is consistent with the studies of Yeasin, 2022.

5. Conclusion

In conclusion, this research has revealed several critical findings that hold significant effects for the banking sector in Pakistan. Firstly, the study establishes a clear association between an increase in NPL and a decline in the financial performance of banks, emphasizing the imperative need for meticulous due diligence in customer information collection and loan decision-making processes.

The study also looked at how much money banks have compared to what they lend out (CAR). Having too much money compared to loans can also be bad for a bank's performance. Banks need to find the right balance between having enough money to follow the rules and making sure they run efficiently.

The research also through light on the adverse correlation between CAR and the performance of Pakistani banks, highlighting the delicate balance financial institutions must strike to comply with regulatory capital requirements while optimizing operational efficiency. However, the study finds that Advance to Deposit Ratio (ADR) does not play a statistically significant role in influencing a bank's performance, suggesting the need for further research to explore additional factors that may contribute to a more comprehensive understanding of this relationship.

5.1. Future Recommendations

Given the significant negative impact of NPL on financial performance of commercial banks within Pakistan, it is crucial for banks to strengthen their credit risk management practices. Lending department of banks should conduct thorough due diligence when collecting customer information, especially when making lending decisions. This involves implementing robust risk assessment mechanisms and ensuring a comprehensive understanding of the borrower's ability to repay. Regular training programs for bank personnel on effective risk management strategies could further enhance the overall credit risk management framework.

This study finds that Pakistani banks' performance is clearly impacted negatively by the CAR. As a result, the banks should review their capital allocation plans in order to achieve a balance between achieving regulatory capital needs and maximizing operational efficiency. Strengthening risk management frameworks is essential to protect against future performance downturns linked to increasing capital adequacy. Additionally, improved capital management procedures are required to lessen the negative consequences of excessive capital adequacy. Furthermore, collaborative efforts between banks and regulatory authorities are essential to refine regulatory frameworks, ensuring they promote both financial stability and operational excellence within the Pakistani banking sector.

References

Arzova, S. B., & Sahin, B. S. (2023). The effect of financial soundness variables on bank performance: a macro-level analysis in MSCI Emerging Market Index countries. *Kybernetes*.

Bagh, T., Razzaq, S., Azad, T., Liaqat, I., & Khan, M. A. (2017). The causative impact of liquidity management on profitability of banks in Pakistan: An empirical investigation. *International Journal of Academic Research in Economics and Management Sciences, 6*(3), 153-170.

Budiarto, A. (2021). *The Impact of Non-Performing Loans Towards Financial Performance of BPR in Central Java, the Role of Empathy Credit Risk.* Paper presented at the 4th International Conference on Sustainable Innovation 2020-Accounting and Management (ICoSIAMS 2020).

Dao, B. T. T., & Nguyen, K. A. (2020). Bank capital adequacy ratio and bank performance in Vietnam: A simultaneous equations framework. *The Journal of Asian Finance, Economics and Business, 7*(6), 39-46.

FCMA, P. C. D. Impact of Advance-Deposit Ratio (ADR) on Financial Performance: Panel Evidence from Commercial Banks in Bangladesh. (2020).

Hamza, S. M., & Khan, E. A. (2014). Effect of banking sector performance in Economic growth Case study of Pakistan. *Journal of Applied Environmental and Biological Sciences, 4*(7), 444-449.

Harb, E., El Khoury, R., Mansour, N., & Daou, R. (2023). Risk management and bank performance: evidence from the MENA region. *Journal of Financial Reporting and Accounting, 21*(5), 974-998.

Hussain, S., & Rasheed, A. (2022). Impact of capital adequacy, liquidity management and credit risk management on economic performance: Evidence from Pakistan. *Journal of Social Sciences and Management Studies, 1*(4), 44-56.

Khalifaturofi'ah, S. O. (2023). Cost efficiency, innovation and financial performance of banks in Indonesia. *Journal of Economic and Administrative Sciences, 39*(1), 100-116.

Kingu, P. S., Macha, S., & Gwahula, R. (2018). Impact of non-performing loans on bank's profitability: Empirical evidence from commercial banks in Tanzania. *International Journal of Scientific Research and Management, 6*(1), 71-79.

Malenković, N. (2023). Effects of the NPL on the banks' profitability during the COVID-19 pandemic: The case of the Republic of Serbia. *Anali Ekonomskog fakulteta u Subotici*(50), 115-130.

Ozurumba, B. A. (2016). Impact of non-performing loans on the performance of selected commercial banks in Nigeria. *Research journal of Finance and Accounting, 7*(16), 95-109.

Psaila, A., Spiteri, J., & Grima, S. (2019). The impact of non-performing loans on the profitability of listed Euro-Mediterranean commercial banks.

SBP, P. (Producer). (2023, 05 02). SBP Regulated Institutes. *https://www.sbp.org.pk/f_links/f-links.asp*. Retrieved from https://www.sbp.org.pk/f_links/f-links.asp

Yeasin, H. M. (2022). Impact of credit risk management on financial performance: A study of commercial banks in Bangladesh. *Interdisciplinary Journal of Applied and Basics Subjects, 2*(1), 14-22.