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The Influence of Credit Risk Management Indicators on Profitability Attributes: Empirical evidence from the State-Owned Commercial Banks in Bangladesh

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ABSTRACT

Purpose: The purpose of this study is to examine the impact of credit risk management indicators on the performance of Bangladesh's state-owned commercial banks. Six state-owned commercial banks' perspectives and board information are used in the examination.

Methodology: In order to conduct the examination, Stata 14.2 programming was used. It is used to determine how rational it is to distribute an arbitrary variable that is fundamental to the informative index. Then, the Leven Lin Chu unit root test and Hadri LM unit root test were used to determine if the variables used were stationary.

Findings: I looked at correlation coefficients and variance-inflating factors to see if there were any difficulties with multicollinearity among free factors. The focus also employs illuminating factual examination to outline the impact of credit risk and board factors on productivity, as well as relationship lattice to assess the degree of connections between the autonomous factors and the benefit of state-owned commercial banks. Using a fixed impact and pooled OLS relapses, I can see that credit hazard significantly affects benefits. According to the law, banks are obligated to enhance their credit hazard. It is important to keep an eye on non-performing advances, functional gambles, and financing cost hazard in addition to the subjective resource portfolio that was considered to have a significant impact on productivity.

Practical Implications: The findings of this analysis have some managerial implications. This study gives managers actual evidence on the impact of credit risk management indicators on bank performance, allowing them to discover ways to improve bank performance. Policymakers, regulators, and bank management should pay more attention to credit risk management indicators. Regulators should guarantee banks implement credit risk management rules to build a robust banking industry and achieve sustainable development goals.

Originality: This paper is, as far as we know, the first detailed empirical analysis using the most recent data to look at how credit risk management indicators affect the performance of Bangladesh's state-owned commercial banks.

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Research Limitations: This research has several limitations since the study's conclusions cannot be extended to other countries or industries due to the study's limited sample size and exclusive emphasis on state-owned commercial banks listed on the DSE for which data was readily available. In addition, this study may not be representative of the entire financial industry because it covers only state-owned commercial banks that are listed. Consequently, the findings may not apply to other industries functioning in distinct business ecosystems.

1. Introduction

As financial intermediaries, banks deal with individuals' funds. Therefore, banks are susceptible to a variety of risks, including credit risk, liquidity risk, operational risk, and market risk, which have a negative impact on profitability. Poor risk management jeopardizes the sustained expansion of a country's financial institutions. In the banking industry, credit risk is most prevalent. Inappropriate management of these risks is a significant concern for banks and may potentially result in insolvency. Alone, credit risk accounts for more than fifty percent of the total risk aspects in banks and financial institutions worldwide. State banks are overseen and constrained by the central bank, which acts in the interest of the public authorities. Banks really assume a significant part in the economy. It has a significant effect on the improvement of business and exchange. It functions as the maker of the abundance of a country as assets in a country, which are fundamental for the financial advancement of a country. The fundamental job of state-owned commercial banks is to give prudent administration to people in general and associations lay out monetary and social obligations, and maintainable development of the economy. Commercial banks are monetary establishments with the essential capacity to do monetary intermediation. These exercises anyway accompany gambles with which should be viewed as properly in the credit giving and venture making cycle to limit misfortune in case of the dangers falling. Many banks have numerous strategies that demonstrate the gamble taking limit incredibly sway on the size of credit that give and put resources into. Consequently will affect the degree of productivity against hazard. Have no outright imagination on the potential that a dangerous debt or resource will implode and higher solidify. These realities feature the intricacies in the financial business and spurred me to investigate the real impact of credit hazard the board on benefit of banks.

I have assessed and examined several types of research papers connected to my issue, which is the influence of credit risk on the profitability of a state-owned commercial bank; a case study of Bangladesh. In each of the articles, the specific variables of the impact of risk management on profitability have been identified. In reality, they did not investigate the impact of the overall credit risk measurement on the profitability of various variables. I've attempted to determine the total profitability performance based on credit risk indicators and demonstrate the relationship between dependent and independent factors. I have worked with three dependent factors for measuring profitability and seven independent variables for previously unseen credit risk indicators. My study report uses the most recent available data. No researcher composes such a study article on the basis of current facts.

2. Literature Review

The researcher must review research articles essential to the research in order to complete the investigation. Profitability is the primary role of banks, and this study examines the relationship between credit risk and profitability. The researcher has reviewed a number of studies concerning credit risk and profitability. In order to minimize loss in the event that these risks materialize, the loan granting and investment decision-making processes must take these risks into account.

Sufian, F., & Habibullah, M. S. (2009) analyzed the impact of credit hazard on the financial benefit This study embraced causality research configuration involving board information of 16 business banks in Bangladesh. The review utilized Descriptive measurement and various relapse investigation assessment strategies. Moreover, Ordinary Least-Squares relapse method was additionally utilized, and afterward Fixed Effects and Random Effects presumptions were thought of. The investigation discovered that event of non-performing advances is adversely connected with the degree of productivity in business banks in Bangladesh. The outcomes increment further the data deviation hypothesis which terrible administration theory. The discoveries of the review have both hypothetical and administrative ramifications for specialists and strategy producers. Ali, M. (2012) surveyed the viability of credit hazard the executives on banks execution and inspected the connection between premium pay and terrible obligation of the Union Bank. The review presumed that credit hazard influences the exhibition of Union Bank and to keep up with exorbitant premium pay, consideration should be given to credit hazard the board particularly in regards to the loaning strategies of the bank. It suggested that bank ought to ideate that advances given out to clients ought not be insufficiently audited now and again to survey the level of its gamble and such advance ought to be supported by insurance security. Banik, B. P., & Das, P. C. (2013) decided Comparison of monetary execution of state claimed business banks. For making productivity, two ward factors ROA and ROE were thought of while two factors of credit gambles hadnet charge off and nonperforming advance. Different factual investigations were directed on bank information from 2005 to 2012 to cover the time period. It was observed that credit hazard markers had a positive relationship with productivity of the banks. The outcomes additionally uncover that the bank size, influence, and development were likewise emphatically interlinked with one another, and the banks accomplished productivity after the monetary emergency and figured out how to handle the credit hazard throughout the long term. Noman, A. H. M., Pervin, S., Chowdhury, M. M., & Banna, H. (2015) utilized board direct relapse to evaluate the effect of credit hazard on monetary execution for the recorded banks over the period 2004 to 2014. The discoveries uncovered that while the non-performing credits proportion and awful obligation factors have critical adverse consequences on monetary execution of banks, the effect of the got and unstable advance proportion was irrelevant. Rahman, M. M., Hamid, M. K., & Khan, M. A. M. (2015) inspected determinants of bank benefit: Empirical proof from Bangladesh of 2003 to 2014 and observed that the credit hazard estimated by non-performing advances, advance misfortune arrangements and

capital sufficiency. To use board information assessment to evaluate the effect of credit hazard on the profitability. The results showed that the credit measures, non-performing advances and capital sufficiency, have critical negative impact on benefit, while the effect of advance misfortune provisioning was positive and huge. Yesmine, S., & Bhuiyah, M. S. Y. (2015) investigated the determinants of banks' monetary presentation: A similar report among nationalized and neighborhood private business banks of Bangladesh. The concentrate additionally saw that hazard the executives techniques altogether worked on significantly the efficient. Jahan, N., & Rahman, B. (2017) investigated Effectiveness of credit hazard the executives and its effect on monetary execution of banks in Bangladesh: An exact examination. Board information model was utilized to decide the relationship that exists between return on resources and the credit hazard markers like advance misfortune arrangement, advances and advances, capital ampleness. Discoveries depicted that sound credit hazard the board and capital sufficiency impacted decidedly the presentation of banks with the exception of advances and advances which mirrored an adverse consequence on execution. SARKER, N., & NAHAR, S. (2017) inspected the effect of possession structure on bank credit hazard. For the reason optional information gathered from 8 example business banks for a long term period were gathered from yearly reports of separate banks. The information were investigated utilizing an elucidating statics and board information relapse model and the outcome showed that credit hazard measures: non-performing advance, advance misfortune arrangements and capital ampleness altogether affect the benefit of business banks in Bangladesh. Anik, T. H., Das, N. K., & Alam, M. J. (2019) investigated non-performing advances and its effect on profitability the results demonstrated a huge adverse consequence of credit hazard on monetary execution, estimated as ROA and ROE, while the capital gamble and oversaw reserves factors showed a critical positive impact on monetary execution. Islam, K. M., Alam, M. B., & Hossain, M. M. (2019) investigated Impact of Credit Risk Management on Bank Performance: Empirical Evidence from Bangladesh. The outcomes demonstrate that the incorporation of advance misfortune arrangements as an info expands the proficiency scores, yet cockeyed sheet things don't have a critical effect. The distinctions between the effectiveness scores acquired through the benefit situated and the intermediation approaches are in everyday little. Banks that have extended their activities abroad give off an impression of being more specialized proficient than those working just at a public level. Higher capitalization, advance action, and market power increment the productivity of banks. The quantity of branches altogether affects proficiency, however the quantity of ATMs doesn't. The outcomes are blended in as for factors demonstrating whether the banks are working abroad through auxiliaries or branches.

Islam, M. N., Akter, A., Alam, M. J., & Shahriar, A. H. M. (2020) Analyzing how credit risk influences the performance of commercial banks in Bangladesh. Credit risk is a major concern for commercial banks in Bangladesh, which has hampered economic growth. The study examines how credit risk indicators affect commercial banks in Bangladesh. This study used quantile regression analysis to investigate 22 sample commercial banks from 2008

to 2017. Loan Loss Provision to NPL ratio and Cost per Loan ratio have a beneficial impact on Return on Assets (ROA), but Capital Adequacy and Leverage ratios hurt bank performance. Non-Performing Loan ratio, Loan Loss Provision to Total Asset, Total Loan to Total Asset, and Log of Total Asset and Deposit had little impact on profitability. Credit risk hurts profitability, according to the report. The report suggests bank management be more strategic in assessing credit risk to reduce exposure and enhance profitability.

The above mentioned experimental evidence demonstrate the impact of credit risk on the overall performance of commercial banks in Bangladesh. I have completed the research using only six state-owned commercial banks and assessed their risk management indicators and profitability qualities, notwithstanding the absence of such conclusions in the context of Bangladesh using recent data.

3. Research objectives

As the global environment becomes more competitive, financial institutions have attempted to determine experimentally if these expenditures are justified based on the results reported by the financial institutions. Thus, my purpose is to

- Analyze and determine through empirical data if risk management has any effect on the profitability of banks
- To reveal that credit risk has any significant effect on the performance of banks.

3.1 Significance of the Research

As banks must lend money to make income, a policy that severely restricts lending will have a negative impact on their bottom line. Thus, the combination of reduced lending as a result of the adopted credit risk techniques and the cost of implementing these policies results in decreased earnings for the banks, since resources have been expended without generating money. This study aims to determine whether or not the resources banks devote to the development of credit risk management initiatives, processes, models, and techniques are justified.

4. Methodology

4.1 Sample Design

The vital point of this examination is to decide the connections between bank benefit and acknowledge gambles related for banks. The mathematical information for examinations is gained from six state-claimed business banks for the time of years beginning from 2006 to 2020. The banks are Sonali Bank Ltd, Rupali Bank Ltd, Agrani Bank Ltd, Janata Bank Ltd, Basic Bank Ltd and Bangladesh Development Bank Ltd.

4.2 Sources of Data

This report depends on optional wellspring of data. For hypothetical improvement of this paper, information have been gathered from the different sources like various distributions, different reading material, Official site of Bangladesh Bank, Economic audit of Bangladesh Bank, Bangladesh Bureau of measurements, important articles, yearly report of each bank and so on

4.3 Data assortment

The review depends on optional information which are taken from the Bank scope data set, Sonali Bank Ltd, Rupali Bank Ltd, Agrani Bank Ltd, Janata Bank Ltd, Basic Bank Ltd and Bangladesh Development Bank Ltd of Bangladesh for the time of 2006 to 2020 utilizing an example of six state claimed business banks.

4.4 summary of the research variables

	Variables	Methods
Dependent variables	Return on assets [ROA]	$\frac{\text{Net income}}{\text{Total assets}}$
	Return on equity [ROE]	$\frac{\text{Net income}}{\text{Totalequity}}$
	Net interest margin [NIM]	$\frac{\text{Net income}}{\text{Total earningassets}}$
Independent variables	Capital adequacy ratio [CAR]	$\frac{\text{Total capital}}{\text{Risk weighted assets}}$
	Operational risk ratio [OPE.RISK]	$\frac{\text{Operating expenses}}{\text{Total revenue}}$
	Liquidity ratio [LIQ.R]	$\frac{\text{Current assets}}{\text{Current liability}}$
	Interest rate risk [INT.RISK]	The percentage change in net interest margins.
	Non-performing loan ratio [NPLR]	$\frac{\text{Non} - \text{performing loans}}{\text{Total loans}}$
	Gdp growth rate [GDPG.R]	The country's economic growth rate.
	Inflation rate [INFL]	Calculated using the consumer price index.

4.5 Model specification

The relapse model considered three productivity estimates ROA, ROE and NIM which rely on 7 free credit hazard pointers including capital ampleness proportion, financing cost hazard, activity hazard proportion, advance to store proportion, non-performing advances, GDP development rate, and expansion rate. The beneath shows autonomous factors as credit hazard markers which are gone into both relapse conditions (I), (ii) and (iii)

- ROA = α + β1 (CAR) + β2 (IRR) + B3 (OPER) + β4 (LDR) + β5 (NPLR) + β6 (GDPGR) +B7(INFL)+ε.....(I)
- ROE = α + β1 (CAR) + β2 (IRR) + β3 (OPER) + β4 (LDR) + β5 (NPLR) + β6 (GDPGR) + β7 (INFL) +ε….....(ii)
- NIM = α + β1(CAR) + β2(IRR) + B3(OPER) + β4(LDR) + β5(NPLR) +β6(GDPGR)+β7(INFL)+ε……(iii)

Where

ROA= Return on assets, Measure of financial performance and is the ratio of net income to total assets.

ROE= Return on equity, Measure of financial performance and is the ratio of net income to total equity.

NIM= Net Interest margin, Measure of financial performance and is the ratio of net income to total earning assets.

CAR=Capital Adequacy Ratio, Total Capital/Risk Weighted Assets. Measure the ratio of bank's capital to its risk.

OPER= Operational risk, OPERISK, peroxide by the cost to income ratio which is operating expenses as a proportion of gross earnings.

LDR= Liquidity risk, measured through the loan to deposit ratio.

IRR= Interest rate risk, INTRISK is the percentage change in net interest margins; GDPGR=GDPGR, which is indicative of the country's economic growth.

INFL= Inflation rate, INFL, calculated using the consumer price index.

4.5.1 Research Hypothesis

i. Null hypothesis: There is no significant relationship between capital adequacy ratio and profitability.

   Alternative hypothesis: There is a significant relationship between capital adequacy ratio and profitability

ii. Null hypothesis: There is no significant relationship between nonperforming loan and profitability

   Alternative hypothesis: There is a significant relationship between nonperforming loan and profitability

iii. Null hypothesis: There is no significant relationship between operational risk and profitability

   Alternative hypothesis: There is a significant relationship between operational risk and profitability

iv. Null hypothesis: There is no significant relationship between interest rate risk and profitability

   Alternative hypothesis: There is a significant relationship between interest rate risk and profitability

v. Null hypothesis: There is no significant relationship between liquidity risk and profitability

   Alternative hypothesis: There is a significant relationship between liquidity risk and profitability

vi. Null hypothesis: There is no significant relationship between GDPGR and profitability

   Alternative hypothesis: There is a significant relationship between GDPGR and profitability

vii. Null hypothesis: There is no significant relationship between inflation and profitability

   Alternative hypothesis: There is a significant relationship between inflation and profitability

5. Analysis and Findings

5.1 Normality- test

Normality test assists with deciding how possible it is for an arbitrary variable basic the informational index to be regularly conveyed. There are a few tests, for example, skewness kurtosis test, Jarque Bera test, Shapiro Wilk test and Chen-Shapiro test. In this review, I utilized skewness kurtosis test to check whether the informational index is typically circulated or not.

H_0= the information follow ordinary circulation.

H_1= the information doesn't follow ordinary circulation.

Table 5.1: Skewness/Kurtosis tests for Normality

Variables	Pr(Skewness)	Pr(Kurtosis)	Prob>chi2
ROA	0.2152	0.5524	0.0515
ROE	0.1432	0.6301	0.0517
NIM	0.7611	0.2939	0.5424
CAR	0.2203	0.1743	0.1779
OPER	0.6285	0.2554	0.0503
IRR	0.1768	0.8070	0.3796
LDR	0.1902	0.1441	0.1372
NPLR	0.8671	0.0357	0.1046
GDPGR	0.0492	0.1257	0.0521
INFL	0.1489	0.8129	0.3327
my Residuals	0.6687	0.9986	0.9125

Interpretation: Skewness is a proportion of the unevenness of the likelihood conveyance of an irregular variable regarding its mean. It addresses the sum and the course of slant though, Kurtosis addresses the stature and sharpness of focal pinnacle relative that of a standard ringer bend. The figure above shows the outcomes got in the wake of performing skewness and kurtosis test for ordinariness in stata. The likelihood worth of skewness is more noteworthy than 0.05 which demonstrates that skewness is asymptotically dispersed. The likelihood worth of kurtosis shows that Kurtosis is additionally asymptotically dispersed. At long last the Prob>chi2 is higher than 0.05 in the above table. Therefore, the invalid speculation can't be rejected. Moreover as indicated by skewness test for ordinariness, residuals indicate ordinary circulation. A histogram plot likewise demonstrates ordinariness of residuals that is connected in the informative supplement. A ringer molded bend is drawn that shows the typical dissemination of the series that is likewise joined in the informative supplement.

5.2 Unit root test for data stationary

A unit root is a stochastic pattern in a series that occasionally called an irregular stroll with float. Assuming a series has a unit root, it shows a methodical example that is eccentric. Heretesting for stationarity is significant on the grounds that the entire consequences of the relapse would be manufactured. I look at unit root trial of board information. In my undertaking paper I utilized Levin-Lin-Chu unit root test and Hadri LM test.

Table 5.2 Results of unit-root test

Variable	P-value at level		P-value after first order difference		Decision
	Levin-Lin-Chu unit-root test	Hadri LM test	Levin-Lin-Chu unit-root test*	Hadri LM test	Levin-Lin-Chu unit-root test*
ΔROA	0.00	0.024	0.00	0.095	0.00
ΔROE	0.00	0.0065	0.00	0.617	0.00
ΔNIM	0.0045	0.0017	0.00	0.249	0.00
ΔCAR	0.0634	0.00	0.00	0.906	0.00
ΔOPER	0.0008	0.043	0.00	0.226	0.00
ΔIRR	0.00	0.0044	0.00	0.094	0.00
ΔLDR	0.00	0.065	0.00	0.821	0.00
ΔNPLR	0.0005	0.0067	0.00	0.456	0.00
ΔGDPG	0.9999	0.00	0.00	0.975	0.00
ΔINFL	0.00	0.00	0.00	0.529	0.00

- **Interpretation:** In Levin-Lin-Chu unit-root test, Null speculation is that all Panels contain unit roots and elective theory is that all Panels are fixed. In Hadri LM unit-root test, Null theory is that all boards are fixed and elective speculation is that a few boards contain unit roots. Table 4.2 addresses that invalid speculation is dismissed; elective theory is acknowledged in Levin-Lin-Chu unit-root test in light of the fact that the likelihood worth of the factors is more modest than 0.05 huge levels after first separation. So it is said that all boards are fixed in Levin-Lin-Chu unit-root test. In Hadri LM unit-root test shows that the likelihood worth of the multitude of factors after first separation is higher than 0.05 critical levels. So invalid speculation can't be dismissed.

5.3 Diagnostic tests of Multicollinearity

In this study, I use cross-sectional panel data of 6 banks with 7 variables over the period of 2006–2020. Thus multicollinearity might be a problem. To check for the multicollinearity among independent variables, I examined the Correlation Coefficients and Variance Inflating Factors.

Table 5.3: Results of Diagnostic tests of Multicollinearity

	CAR	OPER	IRR	LDR	NPLR	GDPGR	INFL
CAR	1.0000						
OPER	-0.0469	1.0000					
IRR	0.0325	0.0917	1.0000				
LDR	0.0932	-0.1557	0.1530	1.0000			
NPLR	-0.1124	0.1540	0.0103	-0.1380	1.0000		
GDPGR	0.0169	-0.1674	0.0543	0.1023	-0.1036	1.0000	
INFL	-0.0847	-0.0194	0.3455	-0.0470	0.1133	0.0279	1.0000

- **Interpretation:** As per Gujrati (2003), multicollinearity exists assuming the relationship coefficient of free factors is more prominent than 1.0. Results introduced in Table 4.3 show which there has no high connection between's the free factors. Expansion and loan fee hazard has most elevated relationship around 34.55% and it is meaning that multicollinearity is anything but a genuine worry in the assessment.

5.4 VIF Test for Multicollinearity

I also conduct VIF test to examine whether multicollinearity exists among the independent variables. Gujrati. D, (2009) suggested that VIF < 10.0 is acceptable.

Table 5.4: Results of VIF Test

Variable	VIF	1/VIF(TV)
INFL	1.27	0.789509
GDPGR	1.05	0.955950
CAR	1.03	0.972319
IRR	1.14	0.876573
OPER	1.24	0.805063
NPLR	1.08	0.928783
LDR	1.22	0.821814
Mean VIF	1.8	

5.7 Model specification test for ROA, ROE and NIM

Board information model portrays the singular conduct both across time and people. There are three kinds of models: the decent impacts model, and the irregular impacts model, the pooled OLS model. The inquiry is which model is more fitting for analysts, fixed impact model (FEM), Breusch-Pagan LM test in a Random impact model. To disconnect, which model is proper for the examination, utilized F test and Breusch-Pagan Lagrange multiplier (LM).The speculation of F test is that

H0: Random impact model is proper

H1: Fixed impact model is proper.

Then again the speculation of Random impact (B-P LM test) is that

H0: Fixed impact model is proper

H1: Random impact model is proper.

Table 5.7: Results of model specification test

	P-value		
Model	Fixed effect (F test)	Random effect (B-P LM test)	Selection
Model-1 (ROA)	0.0000	0.9998	Fixed effect
Model-2 (ROE)	0.6652	0.4736	Pooled OLS
Model-3 (NIM)	0.3280	0.0548	Pooled OLS

- **Interpretation:**

In the model-1, the invalid speculation of a F-test in a decent impact model which is dismissed and the invalid theory of Breusch-Pagan LM test in a Random impact model isn't dismissed, for this situation fixed impact model is more suitable for research.

In the model-2 and 3, the invalid speculation of a F-test in a decent impact model isn't dismissed and the invalid theory of Breusch-Pagan LM test in a Random impact model isn't additionally dismissed, for this situation Pooled OLS model is liked for research**.**

5.7 Fixed-effects regression model

A Fixed-effects regression is an estimation technique employed in a panel data setting that allows one to control for time-invariant unobserved individual characters that can be correlated with the observed independent variables.

Table 4.8: Results of Fixed-effects regression

ROA	Coefficient	Standard. Error	T- statistics	P-value
CAR	0.017956	0.034402	0.52	0.603
OPER	-0.036703	0.005935	-6.18	0.000
IRR	0.086089	0.043523	1.98	0.015
LDR	0.000017	0.000032	0.54	0.035
NPLR	-0.103189	0.032916	-3.13	0.002
GDPGR	0.038671	0.062000	0.62	0.535
INFL	0.131765	0.035801	3.68	0.02
Constant	0.0196131	0.008294	2.36	0.000

4.7.1 ROA =0.0196+ 0.017956 (CAR) - 0.036703 (OPER) + 0.086089 (IRR) +0.000017 (LDR) - 0. 103189 (NPLR) + 0.038671 (GDPGR) + 0.131765 (INFR)

- **Interpretation:** The likelihood figures of the free factors under a microscope to be specific CAR, OPER, IRR, LDR, NPL, GDPGR and INFL are, minuscule under 0.005 and consequently extraordinarily critical. The consequences of board information in depict that every one of the coefficients are exclusively measurably critical. The five incline coefficients have positive signs in particular capital ampleness proportion, financing cost hazard, advance to store proportion, GDP development rate, and expansion rate and just two slant coefficients with a negative sign to be specific activity hazard proportion, non-performing advance. Along these lines the outcomes depict that any remaining gamble the board factors aside from OPER, NPLR have a positive relationship with return on resource. The outcomes show that a unit change in the default rate, for instance, on the off chance that the working gamble, increment by 1%, return on resources (benefit) will diminish by 3.67% , Similarlry1 % increment in non-performing credits will infer 10.32% reduction consequently on resource as well as the other way around. Lastly, 1% increment in capital sufficiency, financing cost hazard, and credit to store, GDP development rate and expansion rate that will suggest 1.80%, 8.61%, .0017%, 3.87%, 13.18% increment consequently on resource as well as the other way around.

5.8 Pooled -OLS regression of ROE and NIM

Pooled OLS regression can be used to derive unbiased and consistent estimates of parameters even when time constant attributes are present, but random effects will be more efficient.

Table 5.9.1: Summary of the models

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
ROE	0.8958	0.8025	0.6050	0.4444
NIM	0.8426	0.7100	0.7073	0.4075

- **Interpretation:** Table 5.9.1 displays two regression models based on the percentage of variability of independent variables. The "R square" shows the link between dependent and independent variables, while "R" is the square root of R. The value of R square indicates the relationship between ROE and NIM and independent factors. In addition, the "adjusted R square" describes the statistical reduction of credit risk indicators. Simply, modified R square refers to the compatibility between independent and dependent variables in order to justify decisions based on a regression model. R square and its corrected value were 0.8958 and 0.8025, respectively, in the regression analysis of ROE. R squared implies that 89.58% of the variance in ROE is explained by the model's independent variables. The R square value of 0.8958 indicates an adequate level of connection between all variables. The R square and corrected R square values in the regression analysis of NIM are 0.8426 and 0.7100 respectively. R squared value indicates that 84.26% of NIM variance is explained by the model's independent variables. The value of R square is 0.7100, indicating a sufficient degree of correlation between all variables. The corrected R square value is 0.8426. Both models are statistically significant in terms of R, R square, and adjusted R square, although the standard error of ROE model's estimate is greater than that of NIM model. This demonstrates the relevance of random changes.

Table 5.9.2: Result of ANOVA Test

Model		Sum of Squares	Mean Square	F	Sig
ROE	Regression	0.002045632	0.000292233		
	Residual	0.003867818	0.000042041	6.95	0
	Total	0.00591345	0.000059732		
NIM	Regression	0.00152803	0.00021829		
	Residual	0.002340944	0.000025445	8.58	0
	Total	0.003868974	0.000039081		

Predictors: (Constant), CAR, OPER, IRR, NPLR, GDPGR, INFL.
Dependent Variable: ROE
Dependent Variable: NIM

- **Interpretation:** The ANOVA examination in Table 4.9.2 shows the measurable meaning of indicators (or autonomous elements) and their unconventionality over ROE and NIM. This importance is showed in Table 4.9.2 utilizing "F" and "Sig." values. The "Sig." esteem is otherwise called P-Value. In the investigation ROE and NIM models, the p-esteem 0.00 is underneath than 0.05 guidelines which show that the connection between indicator factors and ward factors. The F-esteem 6.95, 8.58 Table 4.9.2 signifies a fitting connection among reliant and autonomous variables in model ROE and NIM. Be that as it may, model 2 and 3 exhibits p-values which are under 0.05 norms. This implies that the relationship among reliant and free factors.

Table 4.9.3: Coefficients Analysis

	ROE			NIM		
Variables	Coefficient	PV	Std. Err.	Coefficient	PV	Std. Err.
CAR	.016696	0.726	.04745	.033926	0.360	.03691
OPER	-.02637	0.016	.01071	-.00261	0.045	.00833
IRR	.199299	0.005	.06865	.309832	0.000	.05341
LDR	-.00801	0.533	.01281	.011995	0.232	.00997
NPLR	-.0913	0.011	.05619	-.005216	0.006	.04404
GDPGR	-.55118	0.035	.25792	-.03225	0.873	.20066
INFR	.314044	0.000	.06857	.22257	0.000	.05334
Cons.	.002888	0.006	.00101	.001422	0.015	.00079

Table 5.9.3 provides detail of beta coefficients of model 2 and model 3 of regression. Based on Table 5.9.3 coefficients, the following regression models of ROE and NIM are formed.

5.9.1 ROE=0.002888+0.016696(CAR)-0.02637(OPER)+0.199299(IRR)-0.00801(LDR) - 0.0913 (NPLR) + 0.55118 (GDPGR) + 0.314044 (INFR)

5.9.2 NIM = 0.001422+ 0.033926 (CAR) - 0.00261 (OPER) +0.309832 (IRR) + 0.011995 (LDR) - 0.005216 (NPLR) - 0.03225 (GDPGR) + 0.22257(INFR)

Interpretation: Table 5.9.3 indicates that, under the above models, none of the coefficients are large. Three slope coefficients are positive and four are negative. The results show that CAR, IRR, and INFR have a favorable connection with execution. OPER, LDR, NPLR, and GDPGR also negatively affect execution. Sinkey and Greenwalt, Ahmed et al., Berros, Ueda, and Mauro had similar findings. ROE and NIM are affected by OPER, NPLR, and GDP growth rate. In the ROE model, the likely worth of capital sufficient percentage and liquidity risk is 72% and 53.3%, which is over 5%. It reveals that ROE and CA, LDR are unrelated. The coefficient results show that a 1 percent increase in the default rate reduces the return on value by 2.64 percent. Increases of 1% in liquidity risk, non-performing loans, and GDP growth rate result in 0.8%, 9.13%, and 55.12% value declines, respectively. A 1% increase in

capital adequacy, financing cost risk, and expansion rate increases value by 1.7%, 20%, or 31%, respectively. In the NIM model, the likely values of capital ampleness percentage, liquidity hazard proportion, and GDP growth rate are 36%, 23.2%, and 87%, which is over the 5% important threshold. It shows that CAR, LDR GDP growth rate, and NIM are unrelated. The coefficient results show that a 1% increase in functional risk will reduce non-performing loans' net interest margin by 0.26 to 0.52 percent. Lastly, a 1% increase in loan cost risk and growth rate will increase net revenue by 30.98%, 22.250%, and vice versa.

5.10 Correlation analysis

The correlation analysis is done to correlate ROE and ROA profitability indicators with credit risk factors that are considered independent in this research. Therefore, this section is divided into two subsections:

- Correlating return on assets with credit risk factors
- Correlating return on equity with credit risk factors
- Correlating net interest margin with credit risk factors

Table 5.10: Correlation matrix of return on assets with credit risk factors

	ROA	CAR	OPER	IRR	LDR	NPLR	GDPGR	INFL
ROA	1.000							
CAR	0.1075	1.000						
OPER	-0.586	0.0597	1.000					
IRR	0.0164	0.2584	-0.0315	1.000				
LDR	-0.3367	-0.211	-0.1658	-0.1318	1.000			
NPLR	-0.3818	-0.1842	0.1562	-0.0316	-0.2559	1.000		
GDPGR	0.459	-0.3322	-0.2276	-0.4905	0.4979	-0.2688	1.000	
INFL	0.4723	-0.4749	-0.2889	-0.4792	0.4646	-0.1536	0.7584	1.000

- **Interpretation**: While trying to decide the idea of the connection among reliant and autonomous factors and furthermore gauge whether or not multicollinearity exists as an impact of the relationship among the factors, Tab. 4.10 is ready for this job. The connection lattice from Tab. 4.10 gives a record in which the free factors specifically capital sufficiency proportion, financing cost hazard, activity hazard proportion, advance to store proportion, non-performing credits, GDP development rate, and expansion rate are connected with ROA. From Table, it is obvious that the connection coefficients between the illustrative factors are extremely low. The connection coefficient are by and large under 0.70 Wooldridge (2015) states that multi-collinearity exists assuming the relationship coefficient is higher than 0.70 as indicated by the outcomes introduced in the table. Subsequently, there is no multi-collinearity impact on return on assets.

6. Findings and Recommendation

6.1 Findings:

The outcomes from pooled relapse examination is that there is no effect of capital ampleness proportion on return on resources, return on value and net interest edge with some other credit hazard factors in the model in light of the fact that the likelihood worth of Capital sufficiency proportion in the ROA model is 72% is higher than 5% importance level that shows that there is no relationship among ROA and CAR, The likelihood worth of Capital sufficiency proportion in the model 2 is 72% is higher than 5% importance level that demonstrates that there is no relationship among ROE and CAR., The likelihood worth of Capital ampleness proportion 36% in the model 3 is higher than 5% importance level that demonstrates that invalid speculation is acknowledged, there is no relationship between NIM and CAR. There is adverse consequence of nonperforming advance on return on resources, return on value and net interest edge with some other credit hazard factors in the relapse model in light of the fact that the likelihood worth of NPLR in the model 1 is 1.2% which is under 5% importance level that shows that there is a relationship among ROA and NPLR, The likelihood benefit of nonperforming advance in the model 2 is 1.10% which is under 5% importance level that demonstrates that there is a connection among ROE and NIM., The likelihood worth of NPLR is 0.6% in the model 3 which is under 5% importance level that demonstrates that elective speculation is acknowledged, there is converse connection among NIM and NPLR. On the off chance that 1% expansion in non-performing advances will infer 8.28%, 9.13% and 0.52% decline in ROA, ROE and NIM.

6.2 Conclusion and Recommendation

With the aid of credit risk management components and a financial performance indicator or measure, the current study attempts to assess the impact of credit risk management on the performance of banks. Consequently, the prevalent empirical findings indicate that credit risk key factors such as capital adequacy ratio, interest rate risk, and operation risk ratio, loan-to-deposit ratio, non-performing loans, GDP growth rate, and inflation rate influence the profitability of commercial banks as measured by ROA, ROE, and NIM. The paper suggests, based on the aforementioned empirical findings, that credit risk management factor analyses are significant in determining the profitability of state-owned commercial banks, and hence banks should pay greater attention to them. These results demonstrated, for instance, that the performance of banks was negatively influenced by non-performing loans, operating risk, and liquidity risk, which may expose them to significant illiquidity and financial catastrophe. Accordingly, the study suggests that state-owned commercial banks develop effective techniques to address credit risk management challenges. This is a result of ineffective credit risk management strategies that have a negative influence on the profitability of banks by lowering the quality of their assets, resulting in higher loan losses and nonperforming loans. Moreover, empirically and theoretically, credit risk is not severe, as it has been emphasized

that greater risk equals larger return, due to banks' ability to expand their credit portfolios, despite the fact that banks must balance and reduce the credit risk associated with a degree of return. Therefore, banks should retain a certain amount of capital reserves to manage credit risk in the event of a financial crisis. In order to increase the profitability of banks, competent credit risk management committees must be created. The Bangladesh Central Bank should develop regulations and instruments for monitoring and analyzing the lending environment of commercial banks on the market. This paper's findings can be applied to policy recommendations by credit risk managers when making credit risk management choices in Bangladesh and around the globe.

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