



CREDIT RISK MANAGEMENT on financial performance

Impact of Credit Risk Management on Financial Performance: Panel Evidence from State-Owned and Private Commercial Banks in Bangladesh

Prahallad Chandra Das ACMA

Assistant Professor
Department of Accounting and Information Systems
Jatiya Kabi Kazi Nazrul Islam University
Trishal, Mymensingh- 2220
Mobile No.: 01718773480
prahalladdas@yahoo.com

Prof. Dr. Md. Ali Noor

Department of Accounting & Information Systems
Jagannath University, Dhaka.
Mobile No.: 01815006877
alinoordu@yahoo.com

Abstract

This study reveals that the impact of Credit Risk Management on the Financial Performance of the Commercial Banks in Bangladesh over the period of seventeen years (2000 to 2016) using data from ten commercial banks. Secondary data were collected from the bank's annual reports and analyzed using t-test for mean comparison, correlation and multiple regression analysis. Return on Assets (ROA) was used as the financial performance indicator while Non-Performing Loan (NPL), Capital Adequacy Ratio (CAR) and Advance Deposit Ratio were used as credit risk management indicators. The empirical results found that both NPL and ADR have negative and relatively significant effect on ROA, while NPL has higher significant effect on ROA compare to ADR. The study also found that Capital Adequacy Ratio has positive effect on ROA but it is not statistically significant. The study found from T-test that Return on Assets, Advance-Deposit Ratio and Capital Adequacy Ratio of private commercial banks were significantly higher than that of state-owned commercial banks. Inversely, it was also found that Non-performing loan of private commercial banks is significantly lower than that of state-owned commercial banks. The study concluded that credit risk stagnant remains a major concern for the commercial banks in Bangladesh, since credit risk is an important forecaster of bank financial performance. The researcher suggests that all banks should adopt a credit risk management guidelines and compliance in accordingly to enhance sustainable profitability and growth of the bank.

Key Words : Credit Risk, Credit Risk Management, Financial Performance, Non-Performing Loans, Capital Adequacy Ratio, and Advance-Deposit Ratio.

1.0 Introduction

Banks play a fundamental role in the economic development. To perform this role an effective banking system is needed and without it, it is difficult for the economy to mobilize the real resources which is necessary for economic growth and stability (McDonough 2000, 1). For economic development two basic issues of financing are important; first, how best external funds are provided to the business sectors and second, how efficiently financiers are monitoring the behavior and performance of these corporate borrowers under an effective system credit risk management. If credit risk management is poor then Non-Performing Loans (NPL) occurs most. It is clear that a poor banking system cannot help for the economic development in a country. In this situation, effective credit risk management is highly needed to overcome the mentioned problems. Risk management can be regarded as an active, strategic, and integrated process that encompasses both the measurement and mitigation of risk, with the ultimate goal of maximizing the value of a bank, while minimizing the risk of bankruptcy (Schoreck, 2002). Now-a-days, large exposures, whether to a single borrower or group of borrowers, are becoming a default concern (Chowdhury et al., 2014). It is well known that high volume of non-performing loans (NPL) has been the most critical concern of the banking sector of Bangladesh (Habib et al., 2016). Like the banking sectors of developed and developing economies, banking sector of Bangladesh is increasingly facing the difficulties of financial crimes. In spite of some notable improvement in the loan default status over the years, some banks have still been struggling with high volume of non-performing loans (Habib et al., 2016). Bank regulators shape the risk management approach and process of the banks in a significant way through establishing corporate governance standards, placing capital adequacy requirements through basel requirements and setting a number of prudential norms and limits on business lines (Siddique et al., 2015). Moreover, like 2016 three topical issues like excess liquidity, single borrower concentration and non-performing loan were causes of serious concern all along 2017. Bankers, policy makers, business houses and media have expressed opinion on above issues. Therefore, the objective of this study is to find out the impact of credit risk management on financial performance of commercial banks in Bangladesh.

2.0 Literature Review

There have been argument and dilemma on the impact of credit risk management and bank's financial performance. Some scholars e.g., (Nawaz et al. 2012; Naceur and Kandil 2009; Kintinji 2010; Fredrick 2012; Kolapo, Ayeni; Yasuda, Okuda, & Konishi 2004, Ahemed & Malik 2015; Lalon 2015; Charles, Okaro & Kenneth 2013; Mokaya & Jagongo 2014; Singh 2014; Ojo 2012; Kargi 2011 and Bhattarai 2015) amongst others have carried out extensive studies on this issue and produced diverse results; whereas some found that credit risk management impact positively on banks financial performance, some found negative relationship and others suggest that other factors aside from credit risk management effects on bank's performance. Specifically, Kargi (2011) found in a study of Nigeria banks from 2004 to 2008 that there is a significant relationship between banks performance and credit risk management. Kolapo, Ayeni and Ojo (2012) using panel data regression for the period 2000 to 2010 found that the effect of credit risk on bank's performance measured by the Return on Asset (ROA) of banks are cross sectional invariant.

According to Nawaz et al. (2012) conducted this empirical study in **Nigeria** and it was published in the Interdisciplinary Journal of Contemporary Research in Business, **Nigeria**. In this study, the researchers examined that the impact of credit risk on the profitability of Nigerian banking system and identifies the relationships between the non-performing loans and banks profitability and evaluate the effect of loan and advance on banks profitability on Nigerian banks. They were argued that the bank with high credit risk has high liquidation risk that puts the depositors in peril. In this connection, they used financial ratios to find out the impact thereon. The study is both historical and descriptive in nature and they were used non-probability method to conclude. They were used ratio of Profit after tax to Total asset (ROA) as dependent variable; and ratio of Non-performing loan to Loan & Advances and ratio of total loan & Advances to total deposit as Independent variables. They founded in the regression result that is the significant negative relationship between credit risk indicators (Ratio of Non-performing loan to loan & Advances, Ratio of Loan & Advances to total deposit) and profitability. That means increase in non-performing loans

decreases profitability (ROA), on the other hand, increase in the level of loan & advances to total deposit significantly decrease profitability of the banks. They suggested that banks should practice sensible credit risk management to safeguard their assets and protect the investors' interests. They also suggested that management of the banks should setting up a watchful credit policy to manage credit risk that will ensures proper utilization of depositor's fund and maximize profit of the bank. Finally, they recommended that the escalation of the securities market will have a positive impact on the overall development of the banking sector by increasing competitiveness in the financial sector.

Fredrick (2012) wrote this article in **Kenya** and it was published in the *DBA Africa Management Review*. The researcher examined the impact of credit risk management on financial performance. He was used in his study a causal research design and multiple regression analysis to analyze secondary data. He used variables as dependent variable i.e., the financial performance of the banks whereas the independent variables were the CAMEL components of Capital adequacy, Asset quality, Management efficiency, Earnings and Liquidity. In his study he found that there was a strong impact of the CAMEL components on the financial performance of commercial banks. The study also established that capital adequacy, asset quality, management efficiency and liquidity had weak relationship with financial performance (ROE) whereas earnings had a strong relationship with financial performance. The study suggests that CAMEL model can be used as a proxy for credit risk management. In this study he fails to recognize the impact of effective internal control and explanatory variables of financial performance of bank.

Yasuda, Okuda, & Konishi (2004) conducted this empirical study in **Japan** and it was published in the *Review of Quantitative Finance and Accounting, Japan*. In this study, researchers examined that relationship between bank risk and earnings management. They founded that bank risk is negatively associated with discretionary accruals, indicating that investors misinterpreted high reported earnings as favorable information about bank financial health. They also marked that the negative relationship was very powerful prior to the major bank failures in late 1997 and 1998, but it diminished subsequent to the failures. They concluded that investors started to

anticipate potential manipulation of financial reports by bank managers more rationally after the major bank failures.

Ahemed & Malik (2015) conducted this empirical study in **Pakistan** and it was published in the *International Journal of Economics and Financial Issues*. In this study, the researchers focused that the impact of credit risk management (CRM) practices on loan performance (LP) in microfinance banking sector of Pakistan. In this study, the researchers were gathered data from various managerial levels like: Top level, Middle level, and Lower level. He used different variables such as: a) Dependent Variable: Loan Performance (LP), actually which represent CRM; and b) four Independent Variables: Credit Terms (CTP), Client Appraisal (LCA), Collection Policy (CP), and Credit Risk Control (CRC). He also used descriptive and inferential statistical techniques to analyzed data. The study results founded that the credit terms and client appraisal have positive and significant impact on the LP at 1% significant level, while the CP and CRC have positive but insignificant impact on LP. The researcher hoped that this study results will be helpful to management for proper managing the credit risk and enhancing loan performance by focused on explanatory variables that are credit terms and client appraisal.

Lalon (2015) wrote this descriptive research article in **Bangladesh** and it was published in the *International Journal of Economics, Finance and Management Sciences*. In this article, researcher remarked about the theoretical framework, importance, process, advantage and challenges of CRM. He also pronounces that the CRM practice and performance. Finally he tries to find out if there is any relationship between CRM performance and banks profitability. The researcher used secondary date and analyzed the data by using Ms Excel and SPSS software. In this study, the researcher founded that Credit risk management encompasses identification, measurement, matching mitigations, monitoring and control of the credit risk spotlights. The research result founded that there is a positive relationship between CRM practices and Banks profitability (ROA). This indicated that effective and efficient Credit Risk Management can contribute on banks profitability. He mentioned in his study the main challenges of CRM practices are additional cost for training and employee motivation. He hoped that a very skilful and technically enhanced

Credit Risk Management department can contribute to better practices of Credit Risk Management and that ensures smooth recovery of classified loan and maximize profitability of bank.

Charles, Okaro & Kenneth (2013) conducted this empirical study in **Nigeria** and it was published in the Journal of Emerging Issues in Economics, Finance and Banking. In this study, they examined the impact of credit risk management on capital adequacy and banks financial performance in Nigeria. For this purpose six banks were selected by using positive sampling technique. Data were obtained from the published financial statements from 2004 to 2009. Panel data model was used to estimate the relationship that exists among Loan Loss Provisions (LLP), Loans and Advances (LA), Non-performing Loans (NPL), Capital Adequacy (CA), and Return on Assets (ROA). The empirical results showed that sound credit risk management and capital adequacy related positively on banks' financial performance with the exception of loans and advances which was found to have a negative impact on banks' profitability in the period under studied. Based on the findings, they recommended that Nigerian banks establish appropriate credit risk management strategies by conducting rigorous credit appraisal before loan disbursement and drawdown. They were also recommended that adequate attention to be paid for TIRE-one capital of Nigerian banks.

Mokaya & Jagongo (2014), conducted this empirical study in the **Kenya**. In their study they sought to establish the association between corporate loan portfolio diversification and credit risk management among commercial banks in Kenya. They were used descriptive research design and also used descriptive and inferential statistics to analyze the data. In this study they used Credit Risk Management as the Dependent variable; and geographical diversification, industry diversification, and size of the borrowing company are Independent variables. They found that corporate loan portfolio diversification had a strong association with credit risk management among commercial banks in Kenya. More specifically, it was concluded that Geographical diversification had no significant relationship with credit risk management among commercial banks in Kenya. Secondly, it was concluded that there existed a significant relationship between industry diversification and credit risk management among

commercial banks in Kenya and that there existed a significant relationship between size of the borrowing company and credit risk management among commercial banks in Kenya. They concluded that asset base and pretax profits of the borrowing companies affected to a small extent credit risk management among commercial banks under study. In addition, the study concluded that the variety or category of the industry and amount of loan borrowed affected moderately the credit risk management among commercial banks. In their study they suggested that: i) commercial banks should not look at the geographical location of the borrowing company in an endeavor to enhance credit risk management. ii) They should consider the industry of operation of the borrowing company before extending credit. This is because some industries are prone to various economic shocks. iii) They should always consider size of the borrowing companies before extending credit based on level of their pre-tax profits or their asset base.

Singh (2014) did this empirical study in **India** and it was published in the International Journal of Management and Business Research, India. In this study, researcher opted that the impact levels of credit risk management towards the profitability of Indian commercial banks. The study was quantitative in nature and intended to comparative study between state- owned bank and private banks. In this study, he was used ROA (Return on Assets) as dependent variable; NPAs (Non-Performing Assets) and CAR (Capital Adequacy Ratio) as Independent variables. Here, the researcher collected data from FBI since 2003 to 2013. The ultimate objective of the study is to found out the impact of credit risk management on performance. The empirical result showed that there was a significant relationship between bank performance (in terms of return on asset) and credit risk management (in terms of nonperforming asset). The study reveals that there was a direct but inverse relationship between return on asset (ROA) and the ratio of non-performing asset (NPA). He concluded that better credit risk management results in better bank performance. Finally, he recommended that the public sector banks to effectively use technology to counter the challenges posed by the private sector banks and should provide training for the employee to enhance their capacity and reviewing the adequacy of credit training across.

Bhattarai (2015) carried out this empirical study in **Nepal** and it was published in the NRB Economic Review, Nepal. In this study, the researcher analyzed the impact of credit risk indicators on performance of Nepalese commercial banks. He had been adopted descriptive and causal comparative research design in this study and used pooled data from secondary sources. He used descriptive and inferential statistics to analyzed pooled data by SPSS program. In this study, he were used ROA (Return on Assets) as dependent variable; and Capital Adequacy Ratio (CAR), Non-performing loan ratio, Cost per loan assets, Cash reserve ratio and Bank size as independent variables. The empirical results, and expected results were presented in the following table:

Independent variables	Expected result	Empirical results	Level of significance statistically
Capital adequacy ratio	Positively related	Positively related	Not statistically sig.
Non-performing loan ratio	Inversely related	Inversely related	Statistically sig. at 1% level
Cost per loan assets	Inversely related	Positively related	Statistically sig. at 1% level
Cash reserve ratio	Inversely related	Positively related	Not statistically sig.
Bank size	Positively related	Positively related	Statistically sig. at 5% level

He also founded from inferential statistics that 'non-performing loan ratio' has negative effect on bank performance whereas 'cost per loan assets' has positive effect on bank performance. Moreover, he founded that credit risk indicators, bank size had positive effect on bank performance. Capital adequacy ratio and cash reserve were not considered as the influencing variables on bank performance. He concluded that there was significant relationship between bank performance and credit risk indicators. He suggested that banks should strictly follow the prevailing NRB Directive as well as Basel II Accord while managing credit risk. Compliance with the Basel II Accord means a sound approach to tackling credit risk and this ultimately improves bank performance. He also recommended that bank's credit granting activities conform to the established strategy that written procedures should be developed and implemented, and that loan approval and review responsibilities are clearly and properly assigned. Senior management must also ensure that a periodic independent internal assessment of the bank credit-granting and management functions.

3.0 Problem Statement

Banks are generally exposed to several types of risks, i.e., credit risk, reputation risk, operational risk, liquidity risk, legal risk and market risk (BOC, 2012). Nowadays commercial banks in Bangladesh are severely affected by the credit risk. Commercial banks thus develop their own strategies to either eradicate or diminish this credit risk. In the management of credit risk, commercial banks are anxious about their financial performance. Conversely in spite of the struggles made to discourse the pitiable credit risk management, commercial banks still have complications resulting from the credit risk management progressions undertaken and changes in customer base leading to decreasing financial performance. Therefore, credit risk management as a discipline is being highly alarmed nowadays. Moreover, the presence of huge non-performing loans and poor credit risk management in the financial institutions in Bangladesh and limited research on credit risk management motivates the researcher to select the topic. The present research is thereby, aimed to measure the overall impact of credit risk management on financial performance; to find out the impact of credit risk management on financial performance.

4.0 Objectives of the Study

- To evaluate the financial performance of commercial banks;
- To measure the level of credit risk of commercial banks in terms of NPL, CAR and ADR;
- To investigate the impact of credit risk on the performance of commercial banks

5.0 Research Questions

- Is there any influence of credit risk management on return on assets?
- To what extent does credit risk management influences return on assets?

6.0 Research Hypotheses

H₁I : There is a significant relationship between NPL and ROA of commercial banks.

H₂I: There is a significant relationship between CAR and ROA of commercial banks.

H₃I: There is a significant relationship between ADR and ROA of commercial banks.

7.0 Methodology of the study

7.1 Population, sample and date set

The population of interest for the study was all scheduled commercial banks in Bangladesh, according to Bangladesh Bank (2017) there were fifty seven (57) scheduled commercial banks operating in the banking industry. The researcher selected four (4) state-owned commercial banks and six (6) private-commercial banks as a sample of this study covering seventeen (17) years period. Secondary data, it was collected from the published financial statements in annual reports of the selected banks from 2000 to 2016.

7.2 Method of Data Analysis

The data collected from the annual reports of the banks was analysed using t-test for mean comparison, correlation and multiple regression analysis and output was obtained using SPSS 20.

7.3 Research Model

Multiple regression models with three independent variables were used. The measure for financial performance was ROA and for credit risk management are NPL, ADR and CAR respectively.

$$ROA = \beta_0 + \beta_1 NPL + \beta_2 CAR + \beta_3 ADR + \varepsilon$$

Here,

ROA = Return on Assets

β_0 = Constant

β_i = Coefficients

NPL = Non-Performing Loans

CAR = Capital Adequacy Ratio

ADR = Advance Deposit Ratio

ε = Error Term

It is the regression function which determines the relation of X (NPL, CAR and ADR) to Y (ROA), β_0 is the constant term and β_i is the coefficient of the function. β_i represent the independent contributions of each independent variable to the estimate of the dependent variable. It is the worth for the regression equation to forecast the variances in dependent variable from the independent variables.

7.4 Variables description

7.4.1 Non-Performing Loans :

A non-performing loan, or NPL, is a loan that is in default or close to being in default (**Wikipedia, 2018**). A loan is normally defined as non-performing when customer's payments are arrears (**Kauko, 2012, p.196**). A loan amount on which the borrower is not making interest payments or repaying any principal is called non-performing loan. At what point the loan is classified as non-performing by the bank, and when it becomes bad debt, depends on local regulations (**Financial Times, 2018**). Late payment is often characterized a non-performing loan (NPLs) rather than a defaulted loan if the borrower is still undertaking business (**Choudhry, 2011, p. 131**).

7.4.2 Capital Adequacy Ratio :

Capital adequacy ratio (CAR) is defined as the ratio of capital to the risk-weighted sum of a bank's assets (**Hyun & Rhee, 2011, p. 325**). It measures the amount of a bank's capital relative to the amount of its risk-weighted credit exposures (**Basel-III Guidelines, Bangladesh Bank, 2014**). **Capital adequacy ratio (CAR)** is a specialized ratio used by banks to determine the adequacy of their capital keeping in view their risk exposures. Banking regulators require a minimum capital adequacy ratio so as to provide the banks with a cushion to absorb losses before they become insolvent. This improves stability in financial markets and protects deposit-holders (**Obaidullah**). Capital-based regulation has become a major issue in the banking industry after the financial crisis in 2007 caused by subprime mortgage problems. Losses on mortgages and other mortgage-related securities significantly decrease the capital base of many banks (**Hyun & Rhee, 2011, p. 323**).

7.4.3 Advance Deposit Ratio :

The advance-deposit ratio is a useful tool to determine bank liquidity, and by extension, it

influences the profitability of the banks (Rengasamy, 2014). Advance to Deposit Ratio (ADR) is determined by putting Advance in numerator and Liabilities (excluding capital) in the denominator (ALM guideline, BB, 2017). The ratio should be fixed in such a manner so that there will be no unnecessary liquidity pressure on the bank at any point in time. Considering the regulatory liquidity requirements (CRR and SLR), the maximum value of the ratio shall be derived using the formula $[100\% - CRR - SLR]$ (ALM guideline, BB, 2017). Depending upon the capital base, liquidity condition, NPL status etc. and above all the maintenance of (LCR) Liquidity Coverage Ratio & Net Stable Funding Ratio (NSFR), the board may decide to add a maximum 4.5% and 2%** (for conventional banks and Shariah-based banks respectively) with the result of the above formula to fix a suitable AD ratio (ALM guideline, BB, 2017).

7.4.4 Return on Assets :

Return on Assets (ROA) is a ratio that measures banks profitability against its total net assets. The ratio is considered an indicator of how efficient a bank is using its assets to generate before contractual obligation must be paid. It is calculated as $ROA = EBIT / \text{Total Assets}$. Return on assets gives a sign of the capital strength of the banking industry (Appa, 1996). Return on assets (ROA) is an indicator of how profitable a company is relative to its total assets. ROA gives a manager, investor, or analyst an idea as to how efficient a company's management is at using its assets to generate earnings (Investopedia, 2018).

8.0 Analysis And Findings

8.1 T-test for mean comparison between SCBs and PCBs:

8.1.1 T-test for Return on Assets ROA

Hypothesis :

Ho : Mean of Return on Assets of state-owned commercial banks and private commercial banks are equal.

H1 : Mean of Return on Assets of state-owned commercial banks and private commercial banks are not equal.

Table-01: Group Statistics					
	Type of the Bank	N	Mean	Std. Deviation	Std. Error Mean
Return on Asset	SCB	68	.5216	1.09445	.13272
	PCB	102	1.1937	.89580	.08870

Table-02: Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ROA	Equal variances assumed	.125	.724	-4.381	168	.000	-.67211	.15340	-.97496	-.36926
	Equal variances not assumed			-4.210	123.827	.000	-.67211	.15963	-.98807	-.35615

Interpretation :

Mean values of Return on Assets of state-owned commercial banks is .5216 and private commercial banks is 1.1937. Mean difference is -.67211.

The value of “t” is -4.210 and it is significant (p value < 0.01) at 1% level. That means there is significant difference between Return on Assets of state-owned commercial banks and private commercial banks. Here, Return on Assets of private commercial banks is significantly higher than that of state-owned commercial banks.

8.1.2 T-test for Non-performing loans (NPL)

Hypothesis :

H₀: Mean of Non-performing Loans of state-owned commercial banks and private commercial banks are equal.

H₁: Mean of Non-performing Loans of state-owned commercial banks and private commercial banks are not equal.

Table-03: Group Statistics					
	Type of the Bank	N	Mean	Std. Deviation	Std. Error Mean
Non-Performing Loan	SCB	68	22.9013	10.00303	1.21305
	PCB	102	11.1437	10.31266	1.02111

Table-04: Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
NPL	Equal variances assumed	.102	.749	7.370	168	.000	11.75760	1.59535	8.60807	14.90712
	Equal variances not assumed			7.415	146.721	.000	11.75760	1.58560	8.62403	14.89117

Interpretation :

Mean values of Non-performing loan of state-owned commercial banks is 22.9013 and private commercial banks is 11.1437. Mean difference is 11.75760.

The value of “t” is 7.415 and it is significant (p value < 0.01) at 1% level. That means there is significant difference between Non-performing loan of state-owned commercial banks and private commercial banks. Here, Non-performing loan of private commercial banks is significantly lower than that of state-owned commercial banks.

8.1.3 T-test for Advance –Deposit Ratio (ADR)

Hypothesis

H₀: Mean of Advance–Deposit Ratio of state-owned commercial banks and private commercial banks are equal.

H₁: Mean of Advance–Deposit Ratio of state-owned commercial banks and private commercial banks are

not equal.

Table-05 : Group Statistics					
	Type of the Bank	N	Mean	Std. Deviation	Std. Error Mean
Advance-Deposit Ratio	SCB	68	66.9232	13.18704	1.59916
	PCB	102	80.2879	8.53607	.84520

Table-06 : Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
				F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
		Lower	Upper							
ADR	Equal variances assumed	7.407	.007	-8.025	168	.000	-13.36471	1.66537	-16.65246	-10.07695
	Equal variances not assumed			-7.389	104.262	.000	-13.36471	1.80878	-16.95148	-9.77794

Interpretation :

Mean values of Advance-Deposit Ratio of state-owned commercial banks is 66.9232 and private commercial banks is 80.2879. Mean difference is --13.36471.

The value of "t" is -7.389 and it is significant (p value < 0.01) at 1% level. That means there is significant difference between Advance-Deposit Ratio of state-owned commercial banks and private commercial banks. Here, Advance-Deposit Ratio of private commercial banks is significantly higher than that of state-owned commercial banks.

8.1.4 T-test for Capital Adequacy Ratio (CAR)

Hypothesis :

H0 : Mean Capital Adequacy Ratio of state-owned commercial banks and private commercial banks are equal.

H1: Mean of Capital Adequacy Ratio of state-owned commercial banks and private commercial banks are not equal.

Table-07: Group Statistics					
	Type of the Bank	N	Mean	Std. Deviation	Std. Error Mean
Capital Adequacy Ratio	SCB	68	4.4447	9.17024	1.11205
	PCB	102	10.6292	1.79277	.17751

Table-08 : Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
				F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
		Lower	Upper							

CAR	Equal variances assumed	39.309	.000	-6.633	168	.000	-6.18451	.93239	-8.02522	-4.34380
	Equal variances not assumed			-5.492	70.427	.000	-6.18451	1.12613	-8.43027	-3.93875

Interpretation :

Mean values of Capital Adequacy Ratio of state-owned commercial banks is 4.4447 and private commercial banks is 10.6292. Mean difference is -6.18451.

The value of “t” is -5.492 and it is significant (p value < 0.01) at 1% level. That means there is significant difference between Capital Adequacy Ratio of state-owned commercial banks and private commercial banks. Here, Capital Adequacy Ratio of private commercial banks is significantly higher than that of state-owned commercial banks.

8.1.5 Findings from T-test:

The study found from T-test that Return on Assets, Advance-Deposit Ratio and Capital Adequacy Ratio of private commercial banks were significantly higher than that of state-owned commercial banks. Inversely it was also found that Non-performing loan of private commercial banks is significantly lower than that of state-owned commercial banks.

8.2 Correlations among the variables related to credit risk ratios:

Table-09 : Correlations					
		ROA	NPL	CAR	ADR
ROA	Pearson Correlation	1	-.437**	.204**	.461**
	Sig. (2-tailed)		.000	.008	.000
	N	170	170	170	170
NPL	Pearson Correlation	-.437**	1	-.464**	-.230**
	Sig. (2-tailed)	.000		.000	.003
	N	170	170	170	170
CAR	Pearson Correlation	.204**	-.464**	1	.184*
	Sig. (2-tailed)	.008	.000		.017
	N	170	170	170	170
ADR	Pearson Correlation	.461**	-.230**	.184*	1
	Sig. (2-tailed)	.000	.003	.017	
	N	170	170	170	170
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

Correlation coefficient analysis

Interpretation : Correlation co-efficient between return on assets and non-performing loan is $r = -0.437$ which is significant (p value < .01) at 1% level. That means there is significantly negative relationship between return on assets and non-performing loan. Correlation co-efficient between return on assets and Capital Adequacy Ratio is $r = 0.204$ which is significant (p value < .01) at 1% level. That means there is significantly positive relationship between return on assets and Capital Adequacy Ratio. Correlation co-efficient between

return on assets and Advance-Deposit Ratio is $r = 0.461$ which is significant (p value $< .01$) at 1% level. That means there is significantly positive relationship between return on assets and Advance-Deposit Ratio. Correlation co-efficient between non-performing loan and Capital Adequacy Ratio is $r = -0.464$ which is significant (p value $< .01$) at 1% level. That means there is significantly negative relationship between non-performing loan and Capital Adequacy Ratio. Correlation co-efficient between non-performing loan and Advance-Deposit Ratio is $r = -0.230$ which is significant (p value $< .01$) at 1% level. That means there is significantly negative relationship between non-performing loan and Advance-Deposit Ratio.

Correlation co-efficient between Capital Adequacy Ratio and Advance-Deposit Ratio is $r = 0.184$ which is significant (p value $< .05$) at 5% level. That means there is significantly positive relationship between Capital Adequacy Ratio and Advance-Deposit Ratio. The study found that there is no perfect or nearly perfect correlation among the independent variables. That is the variables are free from multi-collinearity effects. Since the independent variables are free from multi-collinearity effects, so it is logical to fit regression model of profitability variable on credit risk variables.

8.2.1 Findings from Correlation analysis

A significant and negative correlation can be seen in between non-performing loan ratio and return on equity since correlation coefficient is between those two variables is -0.437 at the 0.000 significant levels. So, NPL β coefficient is -0.437 which means that one unit increase in NPL decreases ROA by 0.437 units while CAR, and ADR is held constant. A moderate, significant and positive correlation can be found between capital adequacy ratio and return on equity 0.204 “r” value indicates the positive and moderate relationship between these two variables at 0.000 significant levels. The CAR has a positive β coefficient of 0.204. This indicates that one unit increase in CAR will increase ROA by 0.204 units held NPL and ADR constant. A moderate, significant and positive correlation can be found between advance-deposit ratio and return on equity 0.461 “r” value indicates the positive and moderate relationship between these two variables at 0.000 significant levels. The ADR has a positive β coefficient of 0.461. This indicates that one unit increase in ADR will increase ROA by 0.461 units held NPL and CAR constant. Thus the results of the analysis states that the Non Performing Loan Ratio has negative and relatively significant effect on Return on Assets, inversely capital adequacy ratio and advance deposit ratio have positive and statistically significant effect on return on assets.

8.3 Multiple regression analysis

Table-10: Model Summaryb				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.574a	.329	.317	.85224
a. Predictors: (Constant), Advance-Deposit Ratio, Capital Adequacy Ratio, Non-Performing Loan				
b. Dependent Variable: Return on Asset				

Table 10 shows the model summary of regression analysis. R2 shows the degree to which extent the variance of the dependent variable is explained by independent variables. According to the table 10 the correlation coefficient of 0.574 ($R=0.574$) indicates that the linearity of the variable. R2 represents the prediction level of variance in Return on Assets by Non -Performing Loan, Capital Adequacy Ratio and Advance-Deposit Ratio which is 0.329. This means that 32.90% of Return on Assets can be predicted from by Non -Performing Loan, Capital Adequacy Ratio and Advance-Deposit Ratio. Among three independent variables NPL and ADR are more reliable predictors for ROA.

8.3.1 Analysis of Variance

Table-11: ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.164	3	19.721	27.153	.000b
	Residual	120.569	166	.726		
	Total	179.733	169			
a. Dependent Variable: Return on Asset						
b. Predictors: (Constant), Advance-Deposit Ratio, Capital Adequacy Ratio, Non-Performing Loan						

From the above Table 11, the sum of squares due to regression is 59.169 with three degrees of freedom while the sum of squares residual due to 166 degrees of freedom is 120.569. The mean square gives a more accurate level of relationship and influence with the three variables. Further, the ANOVA test shows the value of "F" is equal to 27.153 that the regression model is significant since the significant level is 0.000 which is less than 0.05. Thus, the model fit of the regression model can be perceived.

8.3.2 Analysis of Regression coefficients:

Table-12: Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	
1	(Constant)	-.889	.451		-1.972	.050		
	Non-Performing Loan	-.032	.006	-.366	-5.033	.000	.763	1.311
	Capital Adequacy Ratio	-.006	.011	-.037	-.512	.610	.778	1.285
	Advance-Deposit Ratio	.032	.005	.383	5.839	.000	.939	1.064
a. Dependent Variable: Return on Asset								

Table 12 shows in above, the coefficient table of the regression analysis. β value of the table represents the degree to which extent the dependent variable can be affected by a certain independent variable while other independent variables remain constant. β_1 coefficient for non-performing loan ratio is -0.032 indicates that increasing one unit of non-performing loan ratio causes to decrease return on equity in 0.032 units while other independent variables remain constant. The value of "t" is -5.033 and it is statistically significant at 5% level. Nevertheless, this conclusion can be done with the 100% of confident level since the significant value is 0.000. So it can be concluded that non-performing loans has negative impact on return on assets, and it is statistically significant. Capital Adequacy Ratio involves -0.006 β_2 value, which denotes when Capital Adequacy Ratio increase one unit return on equity also decrease by 0.006 units while other independent variables remain constant. The value of "t" is -.512 and it is not significant at 5% level. This conclusion can also be done with 39% confident interval. Because, significant value is 0.61, which denotes the probability of rejecting this conclusion is 61%. So it can be concluded that Capital Adequacy Ratio has negative impact on return on assets, but it is statistically insignificant. Advance Deposit Ratio involves 0.032 β_3 value, which denotes when Advance Deposit Ratio increase one unit return on equity also increase by 0.032 units while other independent variables remain constant. The value of "t" is 5.839 and it is statistically significant at 5% level. This conclusion can also be done with 100% confident interval. Because, significant value is 0.000, which denotes the probability of rejecting this conclusion is 0.00%. So it can be concluded that Advance-Deposit Ratio has significant positive impact on return on assets, and it is statistically significant.

Thus, the results of the analysis states that the non-performing loan ratio has significantly negative effect and capital adequacy ratio has negative effect on return on assets but it has no statistically significant effect. Moreover, non-performing loans ratio has higher significant effect on return on assets in comparison to capital adequacy ratio. Inversely advance deposit ratio has significantly positive effect on return on assets.

Based on the results, regression equation can be carved as follows,:

$$\text{ROA} = -0.889 - 0.032 \text{ NPL} - 0.006 \text{ CAR} + 0.032 \text{ ADR} + \varepsilon$$

8.3.3 Hypotheses Testing

Hypothesis can be tested by using the P- value (Sig. Level) of each β coefficient of independent variables. Confidence interval of accepting hypotheses is 95%. To achieve this confident interval, P - value should be equal to or less than 0.05. If it is not equal to or less than 0.05, null hypothesis cannot be rejected. P - Value of β coefficient of Non-Performing Loan Ratio is 0.000 which denotes that Non Performing Loan Ratio effect on Return on Assets with 100% confident interval. Here the probability of rejecting null hypothesis is 100% since the P - value is 0.000 which is less than 0.05. Based on this result, H1 can be accepted and H0 is rejected. Non-Performing Loan Ratio has a significant effect on Return on Assets. P- Value of β coefficient of Capital Adequacy Ratio is 0.610 which indicates that the Capital Adequacy Ratio effect on Return on Assets with 39% confident interval. Here the probability of rejecting null hypothesis is 61% since the P- value is 0.610, which is more than 0.05. Based on this result H2 can be rejected and H0 is accepted. So it can be said that, Capital Adequacy Ratio effect on Return on Equity but not statistically significant. P- Value of β coefficient of Advance Deposit Ratio is 0.000 which indicates that the Advance Deposit Ratio effect on Return on Assets with 100% confident interval. Here the probability of rejecting null hypothesis is 100% since the P- value is 0.000, which is less than 0.05. Based on this result H3 can be accepted and H0 is rejected. So it can be said that, Advance Deposit Ratio effect on Return on Equity that is statistically significant.

From the above analysis it is found that, the most


of the coefficients are significant at 5% level. So, null hypothesis that there is no significant impact of credit risk management on Return on Assets (ROA) of commercial banks in Bangladesh can be rejected.

The study found that Capital Adequacy Ratio has no statistically significant impact on Return on assets. And it also found that Non-Performing Loan has negative impact and Advance-Deposit Ratio has positive impact on return on assets, and it is statistically significant. So it can be concluded that credit risk management has significant impact on return on assets.

9.0 Conclusion and Recommendations

The study afford that non-Performing Loan has statistically significant effect on Return on Assets with $-0.032 \beta_1$ coefficient at 1% significant level. This result opted that, NPL significantly negative effect on ROA since the significant value is less than 0.05. This results in similar to findings of Bhattarai (2015), Singh (2014), Godlewski (2005), Gopalakrishnan (2004), Kerlin (2013), Nawaz et al. (2012) and Ruziqa (2013). The study proved that Capital Adequacy Ratio has effect on ROA with $-0.006 \beta_2$ coefficient at 0.610 significant level. This result also supports to conclude that, CAR has negative effect on ROA but not statistically significant since the significant value is more than 0.05. This result is dissimilar from the studies conducted by Bhattarai (2015) and Charles, Okaro & Kenneth (2013). The study also proved that Advance Deposit Ratio significantly effect on ROA with $0.032 \beta_3$ coefficient at 0.000 significant level. This result also supports to conclude that, ADR has significantly positive effect on ROA since the significant value is less than 0.05. This result is dissimilar from the studies conducted by Charles, Okaro & Kenneth (2013) in Nigeria. The study also found from T-test that Return on Assets, Advance-Deposit Ratio and Capital Adequacy Ratio of private commercial banks were significantly higher than that of state-owned commercial banks. Inversely it was also found that Non-performing loan of private commercial banks is significantly lower than that of state-owned commercial banks. The study concluded that credit risk stagnant remains a major concern for the commercial banks in Bangladesh, since credit risk is an important forecaster of bank financial performance.

9.1 Policy Recommendations

The problem of non-performing loans may increase due to the improper and inefficient management of credit risk of the commercial banks or as a problem of financial system of a country. Hence there should be updated periodically in these system and enhance the capability of the bankers those who are engage in the process of management of credit risk. The profitability of the bank may affect through non-performing loans due to aggressive lending without proper analysis of borrowers willingness and capacity to repay the loan amounts. Therefore banks should analyse the borrowers' capacity and willingness to repay the loan before sanctioning. The credit risk management guidelines should be updated at least annually according to the changes of economic environment and bank's loan portfolio. Banks need to develop and implement comprehensive procedures and information systems to monitor credit risk properly. Banks need to develop and implement effective and efficient an internal risk rating system in managing credit risk. Internal risk rating should be assigned to individual borrowers to assess risk and examined periodically. Bank must have information system and analytical techniques to measure credit risk in all on-and off-balance sheet activities. Banks should take into consideration potential changes in economic conditions to manage credit risk exposures. Senior management must have role to assess whether the bank maintain adequate level of capital to mitigate the related credit risk of on-and off-balance sheet activities. 

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