

Credit



The Effect of Credit Risk Management on the Financial Performance of Banks: A Study on Selected Private Commercial Banks in Bangladesh

Prahallad Chandra Das FCMA

Associate Professor

Department of Accounting and Information Systems

Jatiya Kabi Kazi Nazrul Islam University

E-mail: prahalladdas@yahoo.com

Md. Riad Hassan

Associate Professor

Department of Accounting and Information Systems

Jatiya Kabi Kazi Nazrul Islam University

E-mail: middipto@gmail.com

Sabuj Chandra Bhowmik ACMA

Assistant Professor

Department of Accounting and Information Systems

Jatiya Kabi Kazi Nazrul Islam University

E-mail: mailme1411@gmail.com

Abstract

This study examined the impact of credit risk management on the financial health of private commercial banks and also attempted to establish if there exists any relationship between the credit risk management determinants and financial performance of private commercial banks in Bangladesh. A causal research design was undertaken in this study and this was facilitated by the use of secondary data which was obtained from the Bangladesh Bank publications and annual reports of selected banks from 2000 to 2018. The study used time series analysis in the analysis of data and the findings have been presented in the form of tables and regression equations. The study found that there exists no co-integration among the study variables. The study also established from time series analysis that there is short run causality between credit risk management indicators and financial performance. In regression analysis, it has also been found that the variables LLP of PCBs and ADR of PCBs have a significant impact on ROA in the short-run. And the variables CAR of PCBs and NPL of PCBs have short-run impact on ROA of PCBs but not statistically significant. This study concludes that credit risk management indicators have short-run influence on the financial health of private commercial banks in Bangladesh. The research work suggested that the commercial banks should follow the guidance of central bank regarding non-performing loans, loan-loss provisions, capital adequacy ratio and advance-deposit ratio to keep the credit risk at optimum level and to maintain sustainability.

Keywords: Return on Assets, Non-Performing Loans, Loan-Loss Provision, Advance-Deposit Ratio, Capital Adequacy Ratio.

1.0 Introduction

Credit risk is the potential loss that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. According to Chijoriga (1997) credit risk is the most posh risk in financial institutions and its influence is more substantial as compared to other risk as it directly threatens the soundness of financial institutions. The extent and level of loss initiated by the credit risk as compared to other kind of risks is severe to cause high level of loan losses and even bank failure. While financial institutions have tackled complications over the years for a multitude of reasons, the major cause of serious banking problems continues to be directly related to slack credit standards for borrowers and counterparties, poor portfolio risk management, or a lack of attention to changes in economic or other circumstances that can lead to a deterioration in the credit standing of a bank's counterparties (Basel, 1999).

Loans and advances are the largest source of credit risk to commercial banks. However, other sources of credit risk exist during the course of the activities of a bank, including in the banking book and in the trading book, and both on and off the balance sheet exposures. Now-a-days, banks are increasingly facing credit risk (or counterparty risk) in various financial instruments other than loans and advances, including acceptances and endorsements, interbank transactions, trade financing, foreign exchange transactions, financial futures, swaps, bonds, equities, options, and in the extension of commitments and guarantees, and the settlement of transactions. The objective of credit risk management is to maximise a bank's risk adjusted rate of return by maintaining credit risk exposure within acceptable limits. Banks need to manage the credit risk inherent to the entire portfolio as well as the risk in individual credits as transactions (Sinkey, 1992). Credit risk management should be at the core of banks operations in order to maintain financial sustainability and soundness. Despite these facts, over the years there has been increased number of significant bank problems in both, matured as well as emerging economies (Brownbridge and Harvey, 1998; Basel, 2004). Among other factors, weakness in credit risk management has all along been cited as the main cause for bank problems (Richard et al., 2008 and Chijoriga, 1997).

Since exposure to credit risk continues to be the

leading source of problems in banks world-wide, banks and their supervisors should be able to draw useful lessons from past experiences. Banks should now have a keen awareness of the need to identify, measure, monitor and control credit risk as well as to determine that they hold adequate capital against these risks and that they are adequately compensated for risks incurred (Basel, 1999).

2.0 Literature Review

The literature review contains the citation of prior studies done on credit risk management and financial performance of financial institutions and the synopsis of those studies. At first, the study included a summary of the studies that have been c on the credit risk management and the financial performance of different countries. And then, it has included the studies done in the context of Bangladesh.

Skridulyte & Freitakas (2012) described the special issue like concentration risk in the loan portfolio. They also used various methods to measures this type of risk. They found that the concentration risk in bank loan portfolios for a single borrower or a group of borrowers is rather high and thus, the risk of loss arises to the bank. They also found that the main reasons of credit concentration risk are specialization of banks, seeking for higher profit and the other externalities beyond the control of the bank. The authors also found that the sources of concentration risk may be diverse but the main source remains large credit for separate borrowers, related borrowers, borrowers of the same sector, loans of the same foreign currency, etc. They used various models to determine the sectorial concentration risk such as: a) The Herfindahl-Hirschman Index (HHI), b) The Gini-coefficient model, c) distance measures, d) Multi-factor models. The Gini index shows that loans disbursed by Lithuanian banks are distributed unevenly. The Herfindahl-Hirschman index (HHI) does not indicate a significant concentration in the portfolio. They concluded that the loan portfolio of the Lithuanian banking sector by sectors of economic activities became more concentrated and dependent on a sector of immovable property and renting during the period concerned.

In Japan, Yasuda, Okuda, & Konishi (2004) conducted this empirical study and examined the relationship between bank risk and earnings management. They

found 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.

Singh (2014) studied the impact levels of credit risk management towards the profitability of Indian commercial banks in India. The study was quantitative in nature and intended to comparative study between the state-owned banks and private banks. In this study, he used ROA (Return on Assets) as the dependent variable; NPAs (Non-Performing Assets) and CAR (Capital Adequacy Ratio) as independent variables. Here, the researcher collected data from FBI from 2003 to 2013. 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 the 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 the public sector banks to effectively use technology to counter the challenges posed by the private sector banks and to provide training for the employee to enhance their capacity.

Nayan & Kumaraswamy (2014) focused on the credit risk management practices in public sector banks and management of retail loans and advances in India. They argued that the changing operating environment for the banking sector, underpinned by liberalization, privatization, and globalization, coupled with the reforms of information technology, has resulted in intense competitive pressures and increased the importance of credit risk management. The study used secondary sources of data from FBI's on PSBs. They found that the asset quality of public sector banks improved consistently in the past few years as reflected in the decline in the two ratios i.e. gross NPAs as a percentage of gross advances, and gross NPAs as a percentage of total assets. They also found that the retail credit in public sector banks had been increasing after the economic reforms. They suggested

that the public sector banks must follow the guidelines of the creditworthiness of the borrowers and decide the amount and nature of loan to reduce the NPAs in retail credit by which the risk can be effectively managed and the rate of NPAs can also be reduced in the retail products. They also recommended that the public sector banks should ensure adequate security for retail credit. One of the major drawbacks of the study was the absence of any hypothesis to draw a conclusion.

Maraghni & Rajhi (2015) examined the simultaneous effect between the variations of capital ratio and the level of credit risk in Tunisia. To analyze the panel data, they estimated a structural model in double simultaneous equations by using 3SLS estimation. They found that the regulatory constraints on the requirement of banks' capital in Tunisia exhibit no incidents on the behavior of credit risk. In addition, they found that the stock of capital reserves (Capital Buffer) was negatively related to a significant degree on the level of the capital ratio of these banks.

Angote, Malenya, & Musiega (2015) focused on the relationship between financial leverage and performance of commercial banks in Kenya; determination of how product diversification affects the performance of commercial banks and how credit policies effect on the performance of Kenyan commercial bank. They have used primary data through questionnaire and secondary data also. Data that was collected from respondents were coded appropriately and analyzed using the statistical package for social science (SPSS). The study also used regression analysis to determine the relationship between variables (independent and dependent variables). The descriptive and inferential result showed that there was a positive and significant relationship between the diversification of products and the financial performance. Furthermore, the multiple regression results showed that financial leverage, diversification of products and credit policy all had a significant effect on financial performance. They also found that financial leverage was the most important factor to have a positive effect on financial performance, followed by credit policy and diversification of products. They concluded based on their findings that when the firm used shareholders equity to finance the capital structure, then good financial performance was witnessed. There was also evidence from the study showing that the diversification of products has led

to the improved financial performance of the banks. Finally, credit policy and regulations were found to have positive impact on financial performance. They recommended that banks should be further evaluated for more diversification and they should adhere to credit policies and regulations. They also suggested that banks should train up their staffs on credit management and lending limits.

Kipnetich & Muturi (2015) identified the effect of credit risk management on the financial performance of savings and credit cooperative society. They have used two independent variables namely, capital adequacy and management efficiency; and one dependent variable that was financial performance. They had used a cross-sectional descriptive research design and data were collected from secondary sources. They utilized SPSS program to analyze the collected data and developed a regression model. The empirical results showed that capital adequacy and management efficiency had a positive and statistically significant relationship with financial performance. This indicated that the increase in capital adequacy and management efficiency leads to an increase in financial performance. They recommended that management should make policies by considering the materiality of capital adequacy and should adopt sound credit risk management to ensure suitable credit risk policies. They also suggested that the government and other stakeholders should ensure a favorable external business environment.

Haneef et al (2012) have analyzed the impact of risk management on non-performing loan and profitability of the banking sector of Pakistan. The study was mainly secondary data based. In this study, they argued that there were no proper risk management techniques for managing risk in the banking industry in Pakistan. They concluded that non-performing loans were increasing due to the lack of risk management which threatens the profitability of banks. They suggested that the banking sector can avoid their nonperforming loans by adopting methods suggested by state bank of Pakistan. One of the major drawbacks of the study was that they failed to justify their conclusion empirically.

Vidyashree & Rathod (2015) they focused on the credit risk and its measurement tools to recover Non-performing assets in India. In their study, they highlighted various types of risk which were faced by commercial banks namely; credit risk, market

risk (equity risk, interest rate risk, foreign exchange risk, and commodity risk), operational risk, liquidity risk, and reputational risk. They argued that the risk management process is vital because poor risk management affects the banking industry's financial results and capital. They found that the ratio of gross NPAs marginally increased more in public sectors bank than foreign banks. They recommended that public sectors banks should minimized NPAs by adhering to credit risk controlling tools. They also suggested that employees of banks should take proper initiatives to follow the credit policies. The study was based on secondary sources of data and focused only on NPAs but they failed to exhibit a relationship with other influential factors of credit risk.

Abdelrahim (2013) investigated the determinants, challenges and developing means of credit risk management at Saudi Arabian Banks. He used the research model which was "CAMEL" that indicates the relationship between the independent variables of capital adequacy, asset quality, management soundness, earning, and liquidity, and the dependent variable of Effectiveness of credit risk management. He collected data from both primary and secondary sources. He found that liquidity had significant positive impact beside bank size which had significant negative impact on the effectiveness of credit risk management. While other variables of capital adequacy, asset quality, management soundness and earning had an insignificant impact on the effectiveness of credit risk management. He also found that effective credit risk management was facing some obstacles namely weak corporate governance, low quality of assets, little credit diversification; not conducting serious financial analysis; not charging risk premium on risky loans, corruption of credit officers; priority of profitability at expense of safety and priority of loan guarantees at expense of capacity of repayment. Researcher recommended that an overall strategy for effective credit risk management of Saudi Banks based on enhancing capital adequacy, upgrading asset quality, strengthening management soundness, increasing earnings, having adequate liquidity and reducing sensitivity to market risk besides hedging credit risk; having adequate provisions for doubtful credit; renegotiating loan terms, transferring credit risk to a third party, extending credit maturity and lowering interest rate on insolvent loan.

Espinoza & Prasad (2010) have concluded that the

nonperforming ratios of credit of the GCC banks have increased from 7% to 15% during (1995-2008) due to declining economic growth, increasing interest rates, and risk aversion increase. Such a worsening of nonperforming ratios (NPLs) has a reverse effect on the macroeconomics of GCC countries with semi-elasticity around 0.4 between NPLs and macroeconomics of GCC.

Kodithuwakku (2015) focused on the impact of credit risk management on the performance of the commercial banks in Sri Lanka. The study was based on both primary and secondary data. The study has used a regression model to build up the relationship between dependent variable and independent variables with the help of E-views software. In this study, the researcher used Return on Assets (ROA) as dependent variable and Loan provision to Total Loan (LP/TL), Loan Provision to Non-Performing Loans (LP/NPL), Loan Provision to Total Assets (LP/TA) and Non-Performing Loans/ Total Loans (NPL/TL) were used as independent variables as indicators of credit risk. From the primary data, the researcher found that a clear process for reporting risk would enable the banks to reduce the impact of risk significantly. He also found that the development of effective training programs for the staff members that are based on the latest environmental conditions would be helpful for managing credit risk. Finally, he concluded that the predominant purpose of the training on credit risk management is to improve the expertise and knowledge on credit risk and to avoid unnecessary events of those risks being materialized. Hence, this expertise would enable the banks to reduce the impact of credit risk on financial aspects of the banks and improve the profitability through the reduction of cost. From the secondary data, the empirical results exhibited that individually, all the independent variables except loan provision to total loan have negative impact on profitability. On the other hand, the regression results showed that loan provision to total assets of the banks was significantly positively related to ROA. He concluded based on his study findings that the banks should ensure well-established credit risk management framework. Finally, he recommended that the banks should implement effective tools and techniques to reduce the credit risk and thus will ensure profitability.

Charles, Okaro & Kenneth (2013) 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 a probability sampling technique. Data were obtained from the published financial statements from 2004 to 2009. The 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 are positively correlated 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 study. Based on the findings, they recommended that Nigerian banks should establish appropriate credit risk management strategies by conducting rigorous credit appraisal before loan disbursement and drawdown. They also recommended that adequate attention be paid for Tier-one capital of Nigerian banks.

Vatansever & Hepşen (2013) examined the relationship between the NPLs ratio and several macroeconomic and bank specific factors in Turkey by using ordinary least square estimation approach with integration analysis and the time series from January 2007 to April 2013. They found that industrial production index (IPI), Istanbul Stock Exchange 100 Index (ISE), Inefficiency ratio of all banks (INEF) negatively, and unemployment rate (UR), return on equity (ROE), capital adequacy ratio (CAR) positively affect NPL ratio.

Heydari & Abdoli (2015) focused on the impact of credit risk management and capital adequacy on financial performance of banks in Iran. In this study, they used ROA (Return on Total Assets) as a dependent variable; and Past due credits and loans to total loans and credits (NLP), Loss reserve on total loans and past due credits (LLP), Total loans and credits ratio to total assets (LA), Liquidity ratio (LR), and Capital adequacy ratio (CAR) as independent variables. The study found that there is a negative relationship between loss reserve on loans and previous maturity of credits and banks performance at 5% significant level but on the other hand, the results showed that there is a positive relationship between liquidity ratio and capital adequacy with banks' performance at 5% significant level.

Ghosh, Islam & Hasan (2014) tried to find out areas which are required to be improved for minimizing

risks associated with each individual lending in Bangladesh. Here, researchers took a sample size of 25 respondents out of 200 population. To analyze the qualitative and quantitative data, the researcher used SPSS software to conduct a cross-sectional study. In this study, the researcher used credit risk as the dependent variable, and credit monitoring, reliability and assurance factor as independent variables. He found that Credit Risk Management holds a positive relationship with credit monitoring, reliability and assurance factors. He suggested that to achieving financial goals of banks, it is needed to minimize credit risk by considering credit monitoring, reliability, and assurance factor.

Although numerous studies are conducted in the area of credit risk, the study of credit risk management and its influence on financial health of commercial banks in Bangladesh is almost absent. The present study seeks to examine the influence of credit risk management on financial health of commercial banks in Bangladesh. This study is an extension of the study of Ghosh, Islam & Hasan (2014) on the Bangladeshi banking industry. It may contribute to the existing financial literature.

3.0 Objectives of the study

The broad objective of this research work is to find out the influence of credit risk management on financial performance of private commercial banks in Bangladesh. The specific objectives of this research work are to-

- (i) investigate the co-integration among the variables regarding credit risk management and financial performance.
- (ii) examine whether any long term or short run causality exists between dependent and independent variables.
- (iii) find out the impact of credit risk management on financial performance of private commercial banks in Bangladesh.

4.0 Research Questions

The corresponding research questions are as follows:

1. How are NPL, LLP, CAR, ADR and ROA co-integrated?
2. What is the causality between dependent and independent variables?

3. Is there any influence of credit risk management indicators on financial performance?
4. To what extent does credit risk management indicators influence financial performance?

5.0 Methodology of the study

Data have been collected from secondary sources, which are from the annual reports of the selected banks for the period from 2000 to 2018. Six private commercial banks, namely – United Commercial Bank Ltd., City Bank Ltd., IFIC Bank Ltd., Arab-Bangladesh Bank Ltd., National Bank Ltd., and Pubali Bank Ltd. Data on Profitability measurement of the banks as ROA has been collected. Average of all the selected variables has been calculated for the selected banks. This study has been done to measure the impact of credit risk management indicators on return on assets (ROA) by using Time Series analysis and to test the co-integration among the variables using STATA software. VECM or Unrestricted VAR model has been applied for the study variables to check whether there exists any causality between dependent and independent variables.

5.1 Hypothesis of the study:

This research work has been conducted on the basis of null hypotheses to answer the research questions. The null hypotheses are:

- H_01 : Data regarding credit risk management indicators and financial performance indicator are non-stationery.
- H_02 : There exists no long-run or short-run causality between dependent variable and independent variables.
- H_03 : Credit risk management indicators are not influencing on financial performance.

5.2 The Model Specification

A regression model has been developed. The model examines the relationship between credit risk management and financial performance of private commercial banks in Bangladesh. The regression model is as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e$$

Where a = Intercept

b_i = Regression co-efficient; $i = 1, 2, 3, 4$

Where,

Dependent Variable, Y= Return on Assets (ROA)

Independent Variables,

X_1 = Non-Performing Loans (NPL)

X_2 = Loan -Loss Provision (LLP)

X_3 = Capital Adequacy Ratio (CAR)

X_4 = Advance Deposit Ratio (ADR)

5.3 Definition of the Variables

The variable of this study are derived from the earlier studies such as Ghosh, Islam & Hasan, 2014; Heydari & Abdoli, 2015; Charles, Okaro & Kenneth, 2013; Kodithuwakku, 2015; Abdelrahim, 2013; and Bhattarai, 2015; linking the credit risk management, financial performance and some other variables. The operational definitions of selected variables are given below:

- (a) **Non-Performing Loans (NPL):** 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 in 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 as non-performing loan (NPLs) rather than a defaulted loan if the borrower is still undertaking business (Choudhry, 2011, p. 131).
- (b) **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).
- (c) **Loan -Loss Provision (LLP):** Bank lending to borrowers often gives rise to credit risk if borrowers are unable to repay the principal/ interest on the loan facility due to unfavourable economic conditions and related factors. To mitigate credit risk, in principle, banks will set aside a specific amount as a cushion to absorb expected loss on banks' loan portfolio and this amount is referred to as loan loss provisions (LLPs) or provisions for bad debts; therefore, loan loss provision estimate is a credit risk management tool used by banks to mitigate expected losses on bank loan portfolio (Ozili & Outa, 2017, p-144). It is calculated as the value of actual provisions maintained as the numerator and the total classified loans as the denominator. The equation of LLPR can be defined as $LLPR = \frac{\text{Actual Provisions}}{\text{Total Classified Loans}}$. The study has been identifying the loan-loss provisions as an indicator of credit risk management indicator based on previous research.
- (d) **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 the 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).
- (e) **Return on Assets:** Return on Assets (ROA) is a ratio that measures bank's profitability against its total net assets. It is calculated as $ROA = \frac{EBIT}{\text{Total Assets}}$. 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).

6.0 Analysis and Findings

6.1 Descriptive Analysis

The descriptive statistics consist of the mean, variance, standard deviation, minimum, maximum, skewness and kurtosis statistics corresponding to each of the variables.

Table-1: Descriptive Statistics (n=19)

Variables	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Variance Statistic	Skewness Statistic	Kurtosis Statistic
Return on Assets	.34	2.88	1.1941	.69988	.490	.967	.469
Non-Performing Loans	3.07	33.58	11.1429	10.20305	104.102	1.360	.303
Loan Loss Provisions	25.49	84.23	57.8853	15.33694	235.222	-.420	.691
Capital Adequacy Ratio	8.31	12.26	10.6294	1.25460	1.574	-.502	-1.081
Advance-Deposit Ratio	74.00	84.00	79.6471	2.37016	5.618	-.703	1.174
Valid N (list-wise)							

The descriptive analysis revealed that the minimum and maximum values of average return on assets are 0.34% and 2.88% respectively. For average non-performing loans in the table indicated minimum and maximum values of 3.07% and 33.58% respectively. For average loan-loss provision in the table reported minimum and maximum values of 25.49% and 84.23% respectively. For average capital adequacy ratio in the table reported minimum and maximum values of 8.31% and 12.26% respectively. For average advance-deposit ratio in the table reported minimum and maximum values of 74.00% and 84.00% respectively. From the table it was observed that return on assets and non-performing loans are positively skewed, given the corresponding skewness statistics of 0.967, and 1.360 respectively. The table it was also observed that loan-loss provisions, capital adequacy ratio and advance-deposit ratio are negatively skewed, given the corresponding skewness statistics of -0.420, -0.502 and -0.703 respectively.

6.2 Find out the causality between 'credit risk management indicators' and 'return on assets' of private commercial banks in Bangladesh.

6.2.1 Data stationery test: It is the pre-requisite that the data would be stationery to investigate the casulity whether it is short-run or long-run among the dependent and independent variables. For this reason data for further analysis unit root test for each series has been done. Results of the Augmented Dickey-Fuller test and Phillips-Perron Test of unit root have been portrayed below:

Table-2: ADF Test Statistics for unit root test

Variables	Model-2(Trend & Intercept only)						Remarks
	At Level			Differenced			
	Test Statistic	Critical Value at 5%	P-Value	Test Statistic	Critical Value at 5%	P-Value	
ROA of PCBs	-1.433	-3.600	0.8508	-4.684**	-3.600	0.0007	Stationery at 2nd diff.
NPL of PCBs	-1.144	-3.600	0.9214	-5.735**	-3.600	0.0000	Stationery at 2nd diff.
LLP of PCBs	-1.894	-3.600	0.6579	-5.384*	-3.600	0.0000	Stationery at 1st diff.
CAR of PCBs	-2.367	-3.600	0.3975	-3.970*	-3.600	0.0097	Stationery at 1st diff.
ADR of PCBs	-3.867***	-3.600	0.0135	-6.556*	-3.600	0.0000	Stationery at level.

*At first difference, ** At second difference, *** At Level

Table-2 shows the results of the ADF test statistic used to check the non-stationary property of the data and to determine how many times the variable needs to be differenced to avoid time effect on data.

After the unit root test by using Dicky Fuller unit root test, it is found that ROA of PCBs has unit root at level. It

means that the ROA of PCBs data is not stationary at level. And after the second difference, it is found that the ROA of PCBs data is stationary. That is, there is no time effect on data.

The variable Non-performing loans of PCBs is also not stationary at level. But after converting into the second difference, it becomes stationary. The variables loan-loss provision of PCBs and advance–deposit ratio of PCBs are not stationary at level. But after converting into the first difference, it becomes stationary. Capital adequacy ratio of PCBs data is stationary at level.

The results in table-2 show that the ADF test rejects the null of non-stationary for ROA, NPL, LLP, CAR, and ADR of PCBs at 5 % level. So all the variables are found stationery at unit root test. It can be concluded that data can be used for testing co-integration among the variables to fit an appropriate model to find out the casualty.

Table-3: Phillip-Perron Test Statistics for unit root test

Variables	Model-2(Trend & Intercept only)						Remarks
	At Level			Differenced			
	Test Statistic	Critical Value at 5%	P-Value	Test Statistic	Critical Value at 5%	P-Value	
ROA of SCBs	-1.459	-3.600	0.8428	-5.758**	-3.600	0.0000	Stationery at 2nd diff.
NPL of SCBs	-1.132	-3.600	0.9236	-5.427**	-3.600	0.0000	Stationery at 2nd diff.
LLP of SCBs	-1.646	-3.600	0.7741	-6.604*	-3.600	0.0000	Stationery at 1st diff.
CAR of SCBs	-2.257	-3.600	0.4577	-4.281*	-3.600	0.0034	Stationery at 1st diff.
ADR of SCBs	-3.871***	-3.600	0.0133	-7.372	-3.600	0.0000	Stationery at level.

*At first difference, ** At second difference, *** At Level

Table-3 shows the results of Phillip-Perron test statistic used to check the non-stationary property of the data and to determine how many times the variable needs to be differenced to avoid time effect on data.

After unit root test by using Phillip-Perron test, it is found that ROA of PCBs and NPL of PCBs have unit root at level. It means that ROA of PCBs and NPL of PCBs data are not stationary at level. After the second difference, it is found that the ROA of PCBs and NPL of PCBs data are stationary. That is, there is no time effect on data.

The variable Loan Loss Provisions of PCBs is not stationary at level. But after converting into the first difference, it becomes stationary. The variables Capital adequacy ratio of PCBs is not stationary at level. But after converting into the first difference, it becomes stationary. Advance deposit ratio is stationary at level.

The results in table-3 shows that Phillip-Perron test rejects the null of non-stationary for ROA, NPL, LLP, CAR, and ADR of PCBs at 5% level. So all the variables are found stationery at unit root test. It can be concluded that data can be used for testing co-integration among the variables to fit an appropriate model to find out the casualty.

6.2.2 Lag selection: There are various criteria such as LR, FPE, AIC, HQIC, and SBIC to select a maximum number of lag-orders before analyzing the research data. LR, FPE, AIC, HQIC, and SBIC all of these criteria is good and efficient to select appropriate lag order. The general guideline to select the optimum lag order is 'lower the values of all criteria better the model in all the case'. It is better to take a decision on the basis of the majority must be granted. Actually, the final decision depends on the researcher chose. To introduce VECM model or Unrestricted VAR model to the study, the researcher has use lag 1, applying lag selection criteria on the basis of the values of LR, FPE, AIC, HQIC, and SBIC.

6.2.3 Johansen Test of Co-integration: Before applying the VECM or Unrestricted VAR model, the study has to find out the co-integration level existed among the variables or not.

The hypothesis for Rank # 0

H₀ : There is no co-integration among the study variables.

H₁ : There exists co-integration among the study variables.

From Johansen test for co-integration, we have obtained the following results-

Since the value of Trace statistic value (87.5545) is greater than Critical Value (68.52) for 0 ranks, so we can reject the null hypothesis. That is we can accept the alternative hypothesis that there is co-integration among the variables. It is mentioned that max statistic also gives the same result.

The hypothesis for Rank # 1

H_0 : There is one co-integration exists among the study variables.

H_1 : There is no one co-integration exists among the study variables.

Since the value of Trace statistic (53.8133) is greater than Critical Value (47.21) for 1 rank, so we can reject the null hypothesis rather we accept the alternative hypothesis. That is why we can accept the alternative hypothesis that there is no one co-integration exists among the variables. That means the model is not one co-integration model.

The hypothesis for Rank # 2

H_0 : There is two co-integration exists among the study variables.

H_1 : There is no two co-integration exists among the study variables.

Since the value of Trace statistic (32.4353) is greater than Critical Value (29.68) for 2 ranks, so we can reject the null hypothesis rather we accept alternative hypothesis. That is why we can accept the alternative hypothesis that there are no two co-integrations exists among the variables. That means the model is not two co-integration models.

The hypothesis for Rank # 3

H_0 : There is three co-integration exists among the study variables.

H_1 : There is no three co-integration exists among the study variables.

Since the value of Trace statistic (17.4119) is greater than Critical Value (15.41) for 3 ranks, so we can reject the null hypothesis rather we accept alternative hypothesis. That is why we can accept the alternative hypothesis that there are no three co-integrations exists among the variables. That means the model is not three co-integration models.

The hypothesis for Rank # 4

H_0 : There is four co-integration exists among the study variables.

H_1 : There is no four co-integration exists among the study variables.

Since the value of Trace statistic (8.1640) is greater than Critical Value (3.76) for 4 ranks, so we can reject the null hypothesis rather we accept alternative hypothesis. That is why we can accept the alternative hypothesis that there are no four co-integrations exists among the variables. That means the model is not four co-integration models.

Meaning that our variables such as return on assets of PCBs, non-performing loans of PCBs, loan-loss provision of PCBs, capital adequacy ratio of PCBs and advance –deposit ratio of PCBs are not co-integrated and they may have no long run associations. In the long-run, they do not move together. They would have short-run associations.

So, we can conclude that no co-integration exists among the study variables. Since there is no co-integration among the variables, we can straightforwardly use the Unrestricted VAR model to find out the causality.

6.2.4 VAR Model:

Since there is no co-integration exists among the study variables, we can use Unrestricted VAR (Vector Auto Regression) Model for the study variables to check whether they have short-run association among the variables or not. By applying Unrestricted VAR model, we have the following results from the analysis.

Table-4: Vector Auto Regression Model

Sample: 2001-2018			No. of Obs. = 18		
Log Likelihood = -112.8592			AIC = 17.85741		
FPE = 47.47996			HQIC = 17.93159		
Det (Sigma_ml) = .9212911			SBIC = 19.30601		
Equation	Parms	RMSE	R-sq	Chi2	P>chi2
a_roaof pcbs	6	.384109	0.8009	64.35997	0.0000
a_nplof pcbs	6	2.6412	0.9383	243.3481	0.0000
a_llpof pcbs	6	8.05223	0.7552	49.3564	0.0000
a_carof pcbs	6	.650809	0.7985	63.40975	0.0000
a_adrof pcbs	6	1.32481	0.8061	66.50771	0.0000

Beta	Coef.	Std. Error	Z	P> Z	[95% Conf. Interval]	
_cel						
a_roaf PCBs						
a_roaf PCBs LI.	.9742362	.188433	5.17	0.000	.6049143	1.343558
a_nplof PCBs						
a_nplof PCBs LI.	-.0328584	.0246684	-1.33	.183	-.0812076	-.0154908
a_llpof PCBs						
a_llpof PCBs LI.	-.0261099	.0110119	-2.37	0.018	-.0476927	-.004527
a_carof PCBs						
a_carof PCBs LI.	.0048848	.1293191	0.04	0.970	-.2485761	.2583456
a_adrof PCBs						
a_adrof PCBs LI.	-.125409	.0432336	-2.90	0.004	-.2101453	-.0406727
_cons	11.97031	3.087332	3.88	0.000	5.919249	18.02137

Table-5: Granger causality Wald tests

Equation	Excluded	Chi2	df	Prob>chi2
a_roaf PCBs	a_nplof PCBs	1.7742	1	0.183
	a_llpof PCBs	5.622	1	0.018
	a_carof pcbs	.00143	1	0.970
	a_adrof PCBs	8.4142	1	0.004
	All	23.561	4	0.000

It is found that co-efficient which is known as error correction term for our targeted dependent variable is positive (0.9742362) and which is significant (P-value<0.000) at 5% level, so it can be concluded that there is no long term causality of return on assets of PCBs with non-performing loans of PCBs, loan-loss provision of PCBs, capital adequacy ratio of PCBs and advance –deposit ratio of PCBs. But they may have short-run causality among the variables. We have to check now through Granger causality Wald test whether they have a short-run association or not.

Table-5 shows that as a whole chi2 value 23.561 which is significant at 5% level. Here p-value is very small, meaning that they are not equal to zero. Null hypothesis should be rejected. The alternative hypothesis should be accepted, meaning that there is a short-run casualty running from NPL, LLP, CAR and ADR to ROA of PCBs.

Now after analyzing VAR, VAR model is found as follows:

$$\text{ROA of PCBs} = \beta_0 + \beta_1 \text{NPL} + \beta_2 \text{LLP} + \beta_3 \text{CAR} + \beta_4 \text{ADR} + \varepsilon$$

$$\text{ROA of PCBs} = 11.97031 - .03285847 \text{NPL} - .0261099 \text{LLP} + .0048848 \text{CAR} - .125409 \text{ADR} + \varepsilon$$

It is found from the model that the variables LLP of PCBs and ADR of PCBs have a significant impact on ROA in the short–run. And the variables CAR of PCBs and NPL of PCBs have Short–run impact on ROA of PCBs but not statistically significant. As a whole, they have short-run causality among the variables.

From the above analysis by using VAR model and Granger causality Wald test, there is no long-run casualty running from NPL, LLP, CAR, and ADR to ROA of PCBs because of the coefficient of target model is not negative. That’s why, it can be decided that there is short-run causality of return on assets of PCBs with non-performing loans of PCBs, loan-loss provision of PCBs, capital adequacy ratio of PCBs and advance –deposit ratio of PCBs. Meaning that in the short-run they moved together i.e. they have short-run associations. Among the variables, LLP of PCBs and ADR of PCBs have a short-run significant impact on ROA of PCBs but CAR of PCBs and NPLof PCBs have no significant impact.

7.0 Conclusion and Recommendations

This research work has been designed to measure the impact of credit risk management on financial health of private commercial banks in Bangladesh and to test the co-integration among the variables. In the study, it has been found that there no exists co-integration among the study variables. In regression analysis, it has also been found that the variables LLP of PCBs and ADR of PCBs have a significant impact on ROA in the short-run. And the variables CAR of PCBs and NPL of PCBs have short-run impact on ROA of PCBs but not statistically significant. It has also been found from time series analysis that there is short run causality between credit risk management indicators and return on assets. The research findings can also contribute to developing new insights and understanding on credit risk management of private commercial banks in Bangladesh. Private commercial banks should follow the prescribed rules, regulations and respective guidelines regarding non-performing loans, loan-loss provisions, capital adequacy ratio and advance-deposit ratio. Private commercial banks sometimes excuse that there is extra burden of rules, regulations and guidelines and some of them they ignore or show-off or window-dressed in their annual reports but they don't comply. The researcher suggested that the compliance of prescribed rules, regulations and guidance of Bangladesh Bank should be full, not partial, and not window-dressed. 

Reference

- Abdelrahim, K. E., (2013). Effectiveness of Credit Risk Management of Saudi Banks in the Light of Global Financial Crisis: A Qualitative Study, *Asian Transactions on Basic and Applied Sciences*, 3(2), pp. 73-91.
- Angote, A. V.W., Malenya, A. A., & Musiega, D., (2015). Effect of Enterprise Financial Risk Management on Performance in Kenya Commercial Bank, Western Region. *International Journal of Business and Management Invention*, 4 (6), (June), pp. 19-40.
- Basel. (1999). Principles for the Management of Credit Risk. Basel Committee on Banking Supervision, Basel.
- Basel II. (2004). Bank Failures in Modern Economies. Basel Committee on Banking Supervision, Basel.
- Bhattarai, Y. R., (2015). Effect of Credit Risk on the Performance of Nepalese Commercial Banks, *NRB Economic Review*, pp. 41-64.
- Brownbridge, M. & Harvey, N. (1998). *Banking in Africa*. James Currey Ltd, USA.
- Charles, Kenneth, O., (2013). Impact of Credit Risk Management and Capital Adequacy on the Financial Performance of Commercial Banks in Nigeria, *Journal of Emerging Issues in Economics, Finance and Banking, An Online International Monthly Journal*, 2(3), (September), pp:703-717.
- Chijoriga, M. M. (1997). Application of Credit Scoring and Financial Distress Prediction Models to Commercial Banks Lending: The Case of Tanzania. Ph.D Dissertation, WirtsCHAFTSUNIVERSITÄT WIEN (WU), Vienna.
- Espinoza, R. A., & Prasad, A., (2010) Nonperforming Loans in the GCC Banking System and Their Macroeconomic Effects (October). IMF Working Papers, pp. 1-24, Available at SSRN: <https://ssrn.com/abstract=1750712>
- Ghosh, P., Islam, A., & Hasan, M., (2010), "Credit Risk Management: An Empirical Study on BRAC Bank Ltd." *Journal of Business Management and Strategy*, Vol.5, No.1, (June): pp. 145-163.
- Haneef, S., Riaz, T., Ramzan, M., Rana, M. A., Ishaq, H. M., & Karim, Y., (2012). Impact of Risk Management on Non-Performing Loans and Profitability of Banking Sector of Pakistan, *International Journal of Business and Social Science*, 3(7), (April), pp. 307-315.
- Heydari, M., & Abdoli, R., (2015). The Effect of Credit Risk Management and Capital Adequacy on Financial Performance of Business Banks. *Indian Journal of Science and Technology*, Vol.8, No. S8(April), pp: 196-200.
- Kipngetchi, S., & Muturi, W., (2015). Effect of Credit Risk Management on Financial Performance of Savings and Credit Co-operative Society in Kenya, *Strategic Journal of Business & Change Management*, 2(44), (May), pp. 900-915.
- Kodithuwakku, S., (2015). Impact of Credit Risk Management on the Performance of Commercial Banks in Sri Lanka, *International Journal of Scientific Research and Innovative Technology*, 2(7), (July), pp. 24-29.
- Maraghni, H., & Rajhi, M. T., (2015). Examining the Relationships between Capital Ratio, Credit Risk, Capital Buffer and Prudential Regulation in Tunisian Banking. *European Journal of Business and Management*, 7 (9), pp. 106-122.
- Nayan, J., & Kumaraswamy, M., (2014). Retail Credit Risk Management in Indian Public Sector Banks. *Global Journal for Research Analysis*, 3 (8), (August), pp. 31-37.
- Richard, E., Chijoriga, M., Kajjage, E., Peterson, C., & Bohman, H. (2008). Credit Risk Management System of a Commercial Bank in Tanzania, *International Journal of Emerging Markets* 3(3), 323 – 332.
- Singh, A., (2014). Performance of Credit Risk Management in Indian Commercial Banks. *International Journal of Management and Business Research*, Vol. 5. No. 3, pp: 169-188.
- Sinkey, J. F. (1992). *Commercial Bank Financial Management*. Macmillan Perspective Publishing Company.
- Skridulyte, R., & Freitakas, E., (2012), "The Measurement of Concentration Risk in Loan Portfolios." *Economics & Sociology*, Vol. 5, No 1, 2012, (April): pp. 51-61.
- Vatansever, M., & Hepşen, A., (2013), "Determining Impacts on Non-Performing Loan Ratio in Turkey," *Journal of Finance and Investment Analysis*, vol. 2, no. 4, (November), pp. 119-129.
- Vidyashree, D. V., & Rathod, P., (2015). Credit Risk Management – A study on Public sector, Private Sector and Foreign Banks in India., *International Journal of Research in Finance and Marketing*, 5(7), pp. 23-28.
- Yasuda, Y., Okuda, S. & Konishi, M. (2004). The Relationship Between Bank Risk and Earnings Management: Evidence from Japan. *Review of Quantitative Finance and Accounting*, Vol. 22. No. 3, pp: 233-248.