

Analyzing How Credit Risk Influences the Performance of Commercial Banks in Bangladesh: A Quantile Regression Modeling

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Abstract

One of the main challenges faced by commercial banks in Bangladesh nowadays is credit risk, which has had a negative impact on the economic progress of the country. The purpose of the study is to scrutinize how, and to what level, the indicators of credit risk influence the profitability of commercial banks in Bangladesh. Using quantile regression analysis, this study examined a panel dataset for 22 sample commercial banks during the years 2008 to 2017. The results show that Loan Loss Provision to NPL ratio and Cost per Loan ratio were found to have a significant positive impact on Return on Assets (ROA), while Capital Adequacy ratio and Leverage ratio have a significant negative impact on the performance of banks. However, Non-Performing Loan ratio, Loan Loss Provision to Total Asset, Loan Loss Provision to Total Loan, Total Loan to Total Asset, and Log of Total Asset and Deposit, were found to have an insignificant impact on the profitability. The findings of the study assert that credit risk has a noteworthy negative impact on profitability. The study recommends that bank management should be more strategic in credit risk assessment, to curtail the exposure to credit risk and to boost profitability.

Keywords: Credit Risk, Return on Assets (ROA), Quantile Regression, Private Commercial Banks, Bangladesh

Introduction

Banks, as financial intermediaries, deal with people's money. Banks are, therefore, exposed to different types of risks, such as credit risk, liquidity risk, operational risk, and market risk, which affect profitability. Poor management of risks jeopardizes the sustainable growth of financial institutions in a country. Credit risk is most predominant in the banking sector (Khalid & Amjad, 2012; Perera et al., 2014). Improper handling of these risks raise a serious problem for banks, and may even lead to bankruptcy. Globally, credit risk alone makes up more than 50 percent of the total risk elements in banks and financial institutions. Whereas the banking sector in Bangladesh is resilient when dealing with other types of risks, it is vulnerable to credit risk, as the latter accounted for 88.0 percent of the total Risk-Weighted Assets (RWA) of the banking system, as of December 2018. On the other hand, the RWA associated with market and operational risks was only around 3.2 percent and 8.8 percent, respectively (Bangladesh Bank [BB], 2018, p. 52). When dealing with credit risk it is difficult to identify the elements responsible for an increase or decrease in the performance of an entity. Prior studies, both in developed and developing countries, have tried to determine the indicators of credit risk and its impact on the performance of the banking industry. During the

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financial crisis of 2008, poor credits and non-performing loans were the primary causes of failure of banks across the world (Golin & Delhaise, 2013). Meta-analysis performed by Narwal and Pathneja (2020) unveiled the existing literature on the existence and effect of NPA on banks around the world. Some other researchers, such as Kiran and Jones (2016); Bhattarai (2016); Akter and Roy (2017); Islam and Rana (2017); Kingu et al. (2018); and Oganda et al. (2018), identified Non-performing Loan (NPL) as the dominant indicator of credit risk. Sushmitha and Nagaraja (2020) identified the mounting amount of NPL as the element responsible for the huge disturbance in the operation of the banking industry in India. Capital Adequacy Ratio (CAR) is a widely used element in credit risk measurement (Mathuva, 2009; Ho & Hsu, 2010; Vyas et al., 2008; Kurawa & Garba, 2014; Million et al., 2015), as the central bank of every country in the world posed a restriction on banks to maintain a minimum capital requirement to the risk-weighted assets, to implement the regulations under Basel-II and Basel-III accords. Researchers also used provision against NPL (Kaaya & Pastory, 2013; Annor & Obeng, 2018; Million et al., 2015), loan loss provision to total assets; loan loss provision to total advances; and cost per loan ratio (Parab & Patil, 2018), as credit risk indicators, to explore the relationship with the performance of banks. On the other hand, Return on Assets (ROA) and/or Return on Equity (ROE) is being used by a majority of the researchers as performance measurement tools. ROA and ROE are relatively appropriate tools for measuring the bank's profitability level (Koch & MacDonald, 2009). Researchers around the world tried to understand the relationship between these credit indicators and the performance measurement tools of banks and financial institutions. Empirical literature shows both positive and negative relationships, taking into consideration the different economic environments. But the indicators which best describe the characteristics of the credit risk of Bangladeshi banks, and level and extent of its impact on financial performance, is a matter of concern and forms the primary objective of this research.

The banking structure of Bangladesh comprises 60 scheduled banks under full control and supervision of the Bangladesh Bank, of which 6 are State-Owned Commercial Banks, 3 are specialized banks, 42 are Private Commercial Banks (34 conventional and 8 Islamic Shariah-based), and 9 are Foreign Commercial

Banks (BB, 2020). The banking sector in Bangladesh has been facing a tough time, with several acute problems due to poor governance for a prolonged period. The operating profit of most of the banks is from commissions, service charges, and export-import earnings. Interest income from investment in loans and advances is very low (Rahman, 2019). The non-performing loans of the banks hit nearly BDT 1 lakh crore at the end of September 2018, the largest yet in Bangladesh's 48-year-history (Uddin, 2018). High non-performing loans, along with an eroding capital-base, increase the risk to financial stability. Weak corporate governance, as well as legal complexities in contract enforcement, adversely affect the banking sector (World Bank, 2019, p. 5). Banking performance indicators by the Bangladesh Bank (BB, 2020) show that NPL of all scheduled banks as of June 30, 2018, was BDT 939.2 billion. The ratio reached 10.3 percent in the calendar year 2018, which is highest between the periods 2011 and 2018. The Net NPL to Total Loans ratio was 2.2 percent; Provision maintenance ratio was 88.4 percent, which was also not satisfactory; and Capital to Risk-Weighted Assets ratio was 12.06 percent, which is above the requirement set by Basel-III accord. Most of the researchers conducted their study at home and abroad to identify the effects of credit risk on the financial performance of banks, considering the post-financial crisis of 2008. The recent turmoil in the banking industry in Bangladesh, where some of the banks are under threat of liquidation, and an unexpected increase in non-performing loans, has opened the window for the researchers to reinvestigate the indicators of credit risk and the level of influence of these indicators on the financial performance of banks in Bangladesh.

Literature Review and Hypotheses Development

Prior studies, pursued worldwide, on the impact of credit risk on the financial performance of commercial banks reveal some interesting findings. Kolapo et al. (2012) used panel data for five commercial banks in Nigeria during 2000-2010, to justify by what percentage the performance (ROA) of banks was influenced by credit risk, which was explained by non-performing loans, and other loan ratios. The results show an insignificant negative relationship and cross-sectional invariant among banks. Poudel (2012) pursued a study on 31 commercial banks in Nepal, which

revealed a significant negative relationship between credit risk measured in Capital Adequacy Ratio (CAR) and default rate, and performance measured by ROA. Ruziqa (2013) examined the effect of liquidity risk and credit risk on the financial performance of large Indonesian banks, and found a significant negative effect of credit risk and significant positive effect of liquidity risk on the profitability measured by ROA and ROE. Uwuigbe et al. (2015) examined the association between credit risk and the performance of banks in Nigeria. They point out a negative relationship between NPL and bad debt, and the performance, and an insignificant positive relationship between the ratio of secured and unsecured loans, and the performance of banks.

The relationship between credit risk and financial performance has been further explored by Alshatti (2015), using 13 commercial banks to generalize on the whole banking system in Jordan. The study finds a significant effect of credit risk on financial performance. A study conducted by Million et al. (2015) reveals a significant impact of NPL, loan loss provisions and CAR to the profitability of commercial banks in Ethiopia. Kayode et al. (2015) showed that the performance of Nigerian commercial banks has a significant negative relation to credit risk. Saeed and Zahid (2016) considered 5 big UK commercial banks and found that credit risk indicators had a positive relationship with the profitability of the banks. Bhattarai (2016) studied 14 commercial banks in Nepal to explore the relationship between credit risk and financial performance. The study discerned an inverse relationship between NPLs and ROE, and a positive relationship between Cost per Loan Assets (CLA) and ROE. Almekhlafi et al. (2016) found an inverse relationship between non-performing loans and the profitability of six concerned banks in Yemen. Veizi et al. (2016) showed a negative impact of NPL on the profitability indicators of commercial banks in Albania.

Annor and Obeng (2018) conducted a study on selected banks in Ghana, which reveal a significant positive relationship between CAR and ROE. However, they found a negative relationship between NPLs and ROE. Ramesh (2019) showed that CAR, non-interest income, and net interest margin have a positive effect on the performance of banks, while intermediation cost to total assets and

NPL have a negative influence. A study conducted on 11 commercial banks, listed at the Nairobi securities exchange, by Kajirwa and Katherine (2019), affirms that credit risk has a significant negative effect on the financial performance of banks, based on ROE. Ekinici and Poyraz (2019) studied 26 commercial banks, consisting of state-owned banks, privately-owned banks and foreign banks, in Turkey, from 2005 to 2017, to determine the impact of credit risk on the performance of banks. The result showed a negative relationship between credit risk and the performance of banks measured in ROA and ROE. A recent study pursued by Ali and Dhiman (2019) using panel data for the period of 2010-2017 measured the statistical impact of credit risk indicators on profitability (ROA) and found a significant influence on the performance of public sector banks in India. Some of the researches have been conducted taking into consideration the Bangladeshi perspective, and the relationship between indicators of credit risk and the financial performance of banks has been investigated. Noman et al. (2015) made an effort to investigate the effect of credit risk on 18 private commercial banks in Bangladesh from 2003 to 2013. Using the OLS random effect model analysis, GLS and system GMM have reported a significant negative effect on NPLGL, LLRGL, and on all profitability measured by ROAA, ROAE, and NIM. Islam et al. (2019) empirically explored the credit risk impact on the performance of 23 conventional commercial banks in Bangladesh listed in the Dhaka Stock Exchange over the period 2006-2015. The results show that Capital Adequacy Ratio (CAR) and Loan to Deposit Ratio (LTDR) have a significant positive effect on the performance of banks, whereas Non-Performing Loan Ratio (NPLR) and Loan-Loss Provision Ratio (LLPR) show an inverse relationship. Noor et al. (2018) investigated credit risk impact on four state-owned commercial banks in Bangladesh from 2000 to 2015 and identified that Percentage of Classified Loan (POCL) has a significant negative impact on ROI.

The impact of POCL is not significant on ROA and ROE in the short run, but in the long run, it has a significant effect. A study pursued by Jahan and Rahman (2018) on 6 State-owned Commercial banks (SCBs) and 6 Private Commercial Banks (PCBs) in Bangladesh from 2011 to 2015 demonstrates a significant positive relationship between NPL and profitability for PCBs, and an insignificant positive effect for SCBs.

Hypotheses Development

Non-Performing Loans

Non-performing loans in the banking sector in Bangladesh is a major issue in the corporate arena. Research findings taking NPL as an independent variable into consideration have elicited mixed reactions among researchers. Adebisi et al. (2017) found no relationship between NPL and ROA in the Nigerian Banking Industry. However, they found that shareholder return (ROE) is affected by NPL. NPL adversely affects the sustainability of banking in Bangladeshi banks (Alam et al., 2015). Kolapo et al. (2012) found an insignificant negative relationship between NPL and profitability. Research findings show that non-performing loans, in most cases, negatively affect the financial performance of banks and financial institutions (Kiran & Jones, 2016; Bhattarai, 2016; Akter & Roy, 2017; Islam & Rana, 2017; Kingu et al., 2018; Oganda et al., 2018). Therefore, the following hypothesis was examined:

H₁: There is a significant negative relationship between Non-Performing Loan Ratio and ROA.

Capital Adequacy Ratio

Capital Adequacy Ratio (CAR) is one of the important attributes of credit risk. Researchers around the world tried to correlate the performances of banking companies and CAR. Mathuva (2009) identified the relationship between performance and core capital ratio as a positive relation, and the relationship between performance and equity capital ratio as a negative one. Ho and Hsu (2010) observed that restrictions on CAR have an effect on risky investments of firms, as leverage and market share are positively related. Noman et al. (2015) found a significant negative effect of CAR on Return on Average Equity (ROAE). Poudel (2012) and Rasika and Sampath (2016) reached the same conclusion considering ROA and ROE, respectively, as performance measurement tools. On the other hand, Vyas et al. (2008), Kurawa & Garba (2014), and Million et al. (2015), found a positive relationship between CAR and performance. The research findings of Ali & Dhiman (2019) revealed a positive relationship between CAR and ROA. Therefore, the second hypothesis of the study is as follows:

H₂: There is a significant positive relationship between Capital Adequacy Ratio and ROA.

Loan Loss Provision to NPL/Total Assets/Total Loans

Empirical studies show the endeavors of researchers on understanding the impact of LLP on the profitability of banks. Kaaya and Pastory (2013) found a negative correlation between profitability and LLP to gross loan and LLP to net loan. Noman et al. (2015) found a significant negative effect of Loan loss reserve on gross loan. Kani (2017) and Annor and Obeng (2018) also had significant negative results on profitability. Million et al. (2015) show an insignificant positive relationship between LLP and profitability. The findings of Patwary and Tasneem (2019) reveal a similar result. Parab and Patil (2018) also found a significant positive relationship between LLP and total advances; LLP and non-performing assets, and LLP and Total Assets. Therefore, the following hypotheses were examined:

H₃: There is a significant negative relationship between Loan Loss Provision and Non-Performing Loan Ratio and ROA.

H₄: There is a significant negative relationship between Loan Loss Provision and Total Asset Ratio and ROA.

H₅: There is a significant negative relationship between Loan Loss Provision and Total Loan Ratio and ROA.

Loans and Advances

Loans and Advances comprises a major portion of a bank's assets, and inefficient use of these increases credit risk, which, in turn, affects the performance. Kayode et al. (2015) and Bertram and Nwankwo (2019) point out a significant positive relationship between loans and advances and profitability, whereas Annor and Obeng (2018) found a significant negative relationship between loan and total assets, and profitability. The following hypothesis was examined:

H₆: There is a significant positive relationship between Loan Loss Provision and Total Loan Ratio and ROA.

Cost per Loan Asset (CLA)

Cost per Loan Asset (CLA) indicates the operating cost per loan advanced to borrowers. It measures the efficiency of the management in the disbursement of the loan. Poudel (2012) found an insignificant negative relationship between CLA and the performance of the banks. Ho and

Hsu (2010) show that firm size, leverage and financial cost have a significant positive impact on the performance of banks. Kurawa and Garba (2014) and Bhattarai (2016) found a significant positive effect of CLA on profitability. The examined hypothesis for cost per loan is:

H₇: There is a significant negative relationship between Cost per Loan Ratio and ROA.

Methodology

Sample and Data

The population of the study comprises all the scheduled commercial banks in Bangladesh. Due to categorical differences in banks, only scheduled private commercial banks, except Islamic commercial banks, are considered as a sample for the study. Since there is lack of available data

for some banks, authors are convinced to take a sample of 22 scheduled private commercial banks in Bangladesh. The study includes a total of 220 observations of panel data for the 22 sample banks for a period of ten years. Secondary data has been collected from annual reports of the banks covering the period from 2008 to 2017.

Research Design

Variable Measurement

To analyze the impact of credit risk on the financial performance of banks, authors consider ROA as the indicator of the banks' profitability, and identify some components of credit risk based on the related literature review, to investigate the relationship. Table 1 represents the measurement of these variables.

Table 1: Description of Variables

Variables	Abbreviation	Elaboration	Formula
Dependent	ROA	Return on Assets	Profit after Tax / Total Assets
Independent	NPL Ratio	Non-Performing Loan Ratio	Non-Performing Loan / Total Loans and Advances
	CAR	Capital Adequacy Ratio	(Tier 1 Capital + Tier 2 Capital) / Risk-Weighted Assets
	LLP to NPL	Loan Loss Provision to Non-Performing Loan	Loan Loss Provision / Non-Performing Loan
	LLP to TA	Loan Loss Provision to Total Assets	Loan Loss Provision / Total Assets
	LLP to LA	Loan Loss Provision to Total Loans and Advances	Loan Loss Provision / Total Loans and Advances
	LA to TA	Total Loans and Advances to Total Assets	Total Loans and Advances / Total Assets
	CLA Ratio	Cost per Loan Ratio	Total Operating Cost / Total Loans and Advances
Control	LR	Leverage Ratio	Total Debt / Total Shareholders' Equity
	Log10Size	Log Size	Logarithm of Total Assets
	Log10Deposit	Log Deposit	Logarithm of Total Deposit

Conceptual Framework

Conceptual framework is merely a 'map' that a researcher creates, to investigate the connection between the variables (Sampath, 2015). It is evident from prior studies that researchers all over the world used various attributes to measure credit risk and performance of banks. Many researchers used ROA as a dependent variable to measure the performance of banking companies, while others used

ROE as a useful metric of performance measurement. But excessive dependence on ROA or ROE sometimes misleads the user, and hence, some researchers used both ROA and ROE for the performance evaluation of financial institutions. Other researchers, like Noman et al. (2015); Ruziqa (2013); and Parab and Patil (2018), also used Net Interest Margin (NIM), in addition to ROA and ROE. In this research, only ROA has been used as a dependent variable to measure the performance of the sample banks, as it gives a clear picture of the performance output.

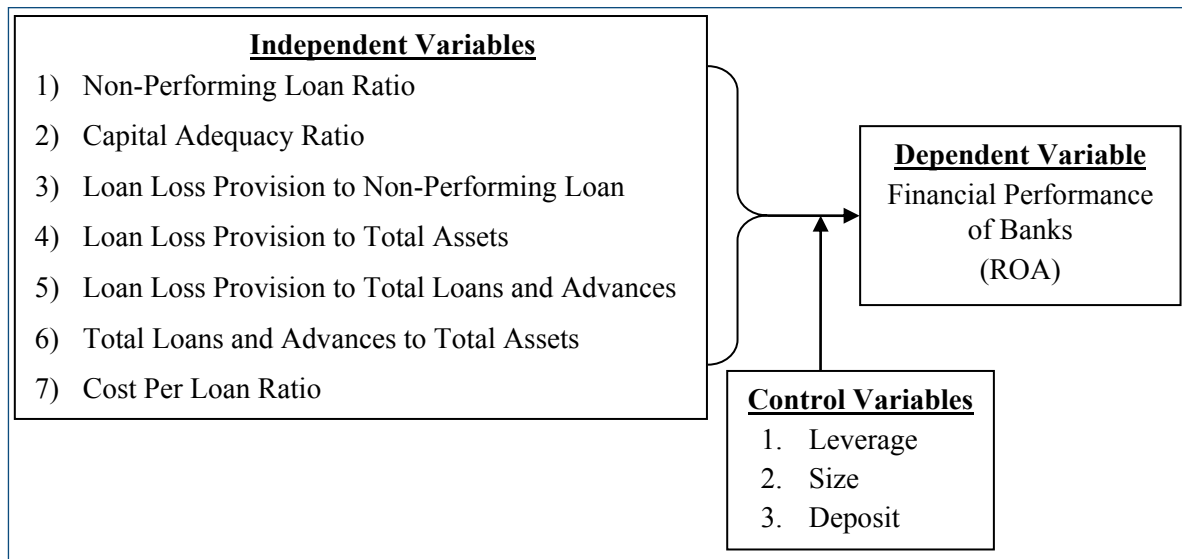


Fig. 1: Conceptual Framework of the Study

Fig. 1 represents a research paradigm of the conceptual framework of the study where one can easily construe the intention of the authors in determining the relationship between the dependent variable ROA and the seven independent variables. Some control variables are also considered, which can influence the relationship between the independent variables and the dependent variable. So, the ultimate objective of the study is to show the relationship between the performance of the firms and the indicators of credit risk on the basis of the stated control variables.

Model Specification

To estimate the relationship between a dependent variable and one or more independent variables, a popular statistical modeling technique used by many researchers is regression analysis. One of the most common regression models is the linear regression model, which is used mainly for continuous response variables (Islam & Bari, 2020). Despite its extensive use, it has some limitations while dealing with outliers in the data set, as it does not provide the actual result when there is too large or small a data compared to other normal data (Huang et al., 2017). For example, in the case of linear regression, Ordinary Least Square method is a parametric model which has many assumptions that need to be met before estimating the regression result. However, in most cases, the assumptions are not fulfilled, which can mislead the results.

Therefore, to get reliable and valid results, without dichotomizing and without loss of data, the Quantile Regression (QR) model can be used for the study. It provides nearly an optimal result with data deviated from normal distribution and even with extreme outliers (Harding & Lamarche, 2012). In addition, QR does not have assumptions about the distribution of the residual, unlike the OLS regression model, and it allows researchers to explore different aspects of the relationship between the dependent variable and the independent variables through analyzing coefficients crosswise over quantiles (Islam & Bari, 2020). One of the important things to understand is why and when one should use quantile regression. The motivation for using the QR model is the existence of high skewness and unknown multimodality in the dependent variables of a study (Canay, 2011). QR parameters estimate and clarify the changes in the outcome for an adjustment of predictors based on a predefined quantile. A model has been developed by Koenker and Bassett to estimate the parameters of the QR model using conditional quantile function (Koenker & Bassett, 1978). However, a quantile regression model has been given in equation (1) for facilitating the researcher to conduct the study.

$$Q_T(Y_i) = \beta_0(T) + \beta_1(T) X_{i0} + \dots + \beta_p(T) X_{ip} \quad (1)$$

$i = 1, 2, \dots, n$

Where $Q_T(T_i) = T^{\text{th}}$ quantile of the conditional distribution of Y_i . Given covariates $X_{i0}, X_{i1}, \dots, X_{ip} = 1$ and regression parameters are $\beta_0, \beta_1, \dots, \beta_p$ (Rodriguez & Yao, 2017).

Accordingly, the study is conducted based on the Quantile Regression model presented in equation (2).

$$Q_T(\text{ROA}_i) = \beta_0(T) + \beta_1(T) \text{NPL ratio} + \beta_2(T) \text{CAR} \\ + \beta_3(T) \text{LLP to NPL} + \beta_4(T) \text{LLP to TA} + \\ \beta_5(T) \text{LLP to LA} + \beta_6(T) \text{LA to TA} + \beta_7(T) \\ \text{CLA ratio} + \beta_8(T) \text{LR} + \beta_9(T) \log_{10}\text{SIZE} + \\ \beta_{10}(T) \log_{10}\text{Deposit} \quad (2)$$

Data Analysis Techniques

The study is quantitative in nature and uses many statistical tools and techniques to analyze panel data based on stated hypotheses. In order to describe the basic features of the data, a summary of descriptive statistics has been done to calculate mean, median, maximum, minimum, standard deviation, and skewness of each variable. From the results of the Normality test (Kolmogorov-Smirnova test and Shapiro-Wilk test), it has been found that there are many outliers in the dataset and therefore, to fit the model, the authors used Spearman's Correlation analysis instead of Pearson Correlation, in identifying the relationship between the variables. Note that, descriptive statistics, normality test, and Spearman's correlation analysis are done through the SPSS 20 software. Finally, the quantile regression model has been run through RStudio to diagnose the effects of the covariates.

Results and Discussion

Summary of Descriptive Statistics

The descriptive statistics would be elucidated based on the results of the study which clutches dataset remaining

outlier. The number of observations is 220. The average ROA is 130.67%, ranging from 0.7% to 363%, with a standard deviation of 64.88%. The figures in Table 2 show irrelevant values to some extent due to the problem of outliers as the dataset is not normal. The data measured for ROA of banks is moderately skewed to the right because the value 0.707 exists between '+0.5 to +1'. It is projected that the NPL Ratio is documented at 4.73%, which indicates that the amount of total outstanding loan is 4.73% of NPL, with a standard deviation of 3.97%. The lowest limit is 0.7% and the highest limit is 44.6%, indicating that some banks have 44.6% NPL to total loans ratio during 2008 to 2017. The specified banks in Bangladesh maintain 12.59% CAR on an average, among which some are maintaining a minimum of 6.3%, while others are maintaining 95% in a few cases, though there is no guideline to keep more than 12.5% CAR for banks under the Basel-III accords. So, it would be justified if the dataset exposes outlier characteristics. The standard deviation for this variable is prescribed at 7.86%.

Loan Loss Provision (LLP) to Non-Performing Loan (NPL) is enumerated on an average of 45.34% in Bangladeshi banks. LLP is kept against NPL at a minimum of 1.6% and a maximum of 393.8%, with a standard deviation of 36.53%, which is high due to the outlier issue. On an average, 1.24% of Total Assets (TA) can be explained by Loan Loss Provision (LLP) in Bangladesh, ranging from 0.1%, the lowest to 9.8%, the highest, with a standard deviation of 1.02%, which leads the minimum variations from mean to the individual variable. Loan Loss Provision (LLP) is at 1.87% on an average of the total amount of Loans and Advances (LA). The LLP to LA is at 17.5%. The LLP to LA of banks is at a minimum of 0.1% minimum in some cases, with a standard deviation of 1.66%.

Table 2: Results of Descriptive Statistics

Variables	Mean	Median	Max.	Min.	Std. Dev.	Skewness
ROA	1.3067	1.2000	3.630	0.007	0.6488	0.707
NPL Ratio	0.0473	0.0430	0.446	0.007	0.0397	7.030
CAR	0.1259	.01170	0.950	0.063	0.0786	9.937
LLP to NPL	0.4534	0.4125	3.938	0.016	0.3653	5.456
LLP to TA	0.0124	0.0110	0.098	0.001	0.0102	5.329
LLP to LA	0.0187	0.0160	0.175	0.001	0.0166	5.831
LA to TA	0.9878	0.6790	9.310	0.088	1.4887	4.506
CLA Ratio	0.0411	0.0350	0.253	0.016	0.0250	4.275
LR	11.390	11.101	19.737	5.464	2.7124	0.543
Log10Size	5.1261	5.1600	5.5900	4.500	0.2428	-0.382
Log10Deposit	5.0001	5.0300	5.440	4.080	0.26021	-0.793

Note: The number of total observations is 220

Source: Authors' own computation

Correlation Analysis

Table 3 indicates that the correlation between Return on Assets (ROA) and Non-Performing Loan Ratio is -0.347, which designates that there is a significantly good inverse relationship between them. There is an insignificantly negative weak relationship between Return on Assets (ROA) and Capital Adequacy Ratio (CAR), as the correlation matrix shows a value of -0.022. The correlation between Return on Assets (ROA) and Loan Loss Provision (LLP) to Non-Performing Loan (NPL) is characterized by +0.098, which depicts an insignificantly positive weak relationship between them. There is a significant negative moderate relationship between Return on Assets (ROA) and Loan Loss Provision (LLP) and Loans and Advances (LA) because the correlation matrix shows a value of -0.193. The correlation between Return on Assets (ROA) and Liquidity Ratio (LR) is defined by a significant inverse moderate relationship as the value is -0.265.

In Table 3, the size of assets, which is a control variable, has a significant positive good relationship with Return on Assets (ROA) of banks in Bangladesh. There is a significant positive strong relationship between LLP to TA and LLP to NPL with a value of +0.543. LLP to TA has a significantly positive, and a very strong relationship, with LLP to TA, because the value is tabulated at +0.971. There is a significant negative good correlation between LA to TA and CLA Ratio, as the value is identified as -0.441. The size of the assets of banks in Bangladesh has a significantly positive, and very strong correlation, i.e. +0.923, with the size of the deposits the banks hold from the depositors during the study period of 2008 to 2017. Therefore, it can be statistically concluded that there is a significant moderate relationship between the dependent variable, i.e. Return on Assets (ROA), and the independent variables.

Table 3: Results of Correlation Analysis

Spearman's Rho	ROA	NPL Ratio	CAR	LLP to NPL	LLP to TA	LLP to LA	LA to TA	CLA Ratio	LR	Size	Deposit
ROA	1.00										
NPL Ratio	-.35**	1.00									
CAR	-.02	0.08	1.00								
LLP to NPL	.09	-.29**	.07	1.00							
LLP to TA	-.15*	.49**	.05	.54**	1.00						
LLP to LA	-.19*	.54**	.07	.52**	.98**	1.00					
LA to TA	.16*	-.32**	-.04	.04	-.03	-.168*	1.00				
CLA Ratio	-.01	.34**	.08	-.18*	-.004	.07	-.44**	1.00			
LR	-.27**	-.08	-.17*	.13	-.013	-.02	-.02	-.02	1.00		
Size	-.40**	.29**	.26**	-.01	.24**	.27**	-.12	-.09	-.12	1.00	
Deposit	-.39**	.26**	.19**	-.06	.16*	.19**	-.13	-.09	-.08	.923**	1.000

Note: ** Correlation is significant at the 0.01 level (2 tailed) and * Correlation is significant at the 0.05 level (2 tailed)

Source: Authors' own computation

Quantile Regression Analysis

Before analyzing the output of regression, it is necessary to check whether the data used for regression are normally distributed or not. Both Kolmogorov-Smirnov and Shapiro-Wilk normality tests are used to check normality of data.

The results from Table 4 show that the data are not normally distributed as none of the variables are significant at the 5% significance mark. In addition, to

diagnose whether any outlier exists in the dependent variable, a boxplot is drawn. Boxplot of ROA presented in Fig. 2 (shown in Appendix-A) reveals that some observations of ROA have mild outliers. Due to the presence of non-normality and outliers in dataset, authors prefer quantile regression for the model. From Fig. 3 (shown in Appendix-B), it is found that the mean absolute error value of ROA is lower between the 40 to 60 index range. Therefore, the median quantile (50th percentile) is employed for the regression analysis.

Table 4: Results of Normality Test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ROA	.081	220	.001	.966	220	.000
NPL ratio	.202	220	.000	.482	220	.000
CAR	.358	220	.000	.181	220	.000
LLP to NPL	.259	220	.000	.559	220	.000
LLP to TA	.166	220	.000	.605	220	.000
LLP to LA	.166	220	.000	.573	220	.000
LA to TA	.489	220	.000	.256	220	.000
CLA ratio	.200	220	.000	.620	220	.000
LR	.083	220	.001	.979	220	.002
Log10Size	.065	220	.024	.977	220	.001
Log10Deposit	.064	220	.030	.959	220	.000

Note: a. Lilliefors Significance Correction and H_0 = the data are normally distributed at .05 significance level

Source: Authors' own computation

Results of regression analysis from Table 5 indicate a significant negative relationship between CAR and ROA ($P < .01$) which is contrary to the prior expectation. The result is also opposite to the findings of Alshatti (2015); Bhattacharya and Sakthivel (2003); Bhattarai (2016); Kurawa and Garba (2014); and Noman et al. (2015), who found the ratio to be insignificant in predicting the profitability of banks. Theoretically, and from the findings of some other researchers (Almekhlafi et al., 2016; Kani, 2017; Kolapo et al., 2012; Million et al., 2015; Noman et al., 2015; Uwuigbe & Ranti, Olubukunola, Babajide, 2015; Veizi et al., 2016), NPL ratio was expected to have a significant negative relationship with the performance of banks. Our study also comes up with similar findings by indicating a negative coefficient for the NPL ratio, but the difference is that the result is not significant.

However, the hypothesis that CAR has a significant effect on the performance of banks is not supported by the findings of this study. Similar to the findings of Bhattarai (2016) and Kurawa and Garba (2014), the result of the regression analysis indicates a positive association between CLA ratio and ROA. Among the three LLP ratios (LLP to NPL, LLP to TA, and LLP to LA), only LLP to NPL is found to be significant at 5%, while other measures are not significant. The results of LLP to TA and LLP to LA are not similar to the study of Parab &

Patil (2018), where both the ratios are reported as positive and significant. In contrast to Alshatti (2015), and in line with the previous result, leverage ratio, one of the control variables, is found to have a significant negative impact on ROA. The result is justified on the grounds that high leverage affects performance negatively because of high bankruptcy cost, credit risk, and cost of financial distress (Myers, 1977). All the other control variables, the company size and total deposit, are found to have no significant relationship with ROA.

Table 5: Results of Regression Analysis

Variables	Quantile Regression (50 th Quantile Estimate)		
	Regression Coefficients	Standard Errors	P-Value
Intercept	2.2500	1.1903	0.06015*
NPL Ratio	0.2424	3.3135	0.94174
CAR	-0.6554	0.2222	0.00357***
LLP to NPL	0.3774	0.1888	0.04697**
LLP to TA	-0.9209	18.2473	0.95980
LLP to LA	-6.2223	10.2813	0.54573
LA to TA	-0.0345	0.0978	0.72458
CLA Ratio	2.1692	1.1174	0.05363*
LR	-0.0699	0.0119	0.00000***
Log10Size	0.2550	0.4193	0.54380
Log10Deposit	-0.2414	0.3564	0.49908

Notes: *** $p < 0.01$, ** $0.01 \leq p < 0.05$, * $p < 0.10$

Source: Authors' own computation

Conclusion and Policy Recommendations

The presence of credit risk is natural in the banking business due to moral hazards and an adverse selection in the lending process, but the excess portfolio of Non-Performing Loans is a burden and curse to the banking industry. On this basis, credit risk over different periods have been researched to give an insight into its nature, and its impact on the internal environment of the banking industry. This study focuses on the inherent characteristics of credit risk and its effects on the performance of banks in Bangladesh, with a view to providing possible suggestions to the decision-making bodies and stakeholders. Due to the outlier issue in the dataset, Quantile Regression analysis has been prescribed, based on the data collected

from 22 commercial banks in Bangladesh, and with 220 observations made during the periods 2008 to 2017. It has been found that Leverage Ratio and Capital Adequacy Ratio (CAR) have significant negative effects on the profitability of banks in Bangladesh. On the other hand, Cost per Loan Ratio and Loan Loss Provision to NPL Ratio, have significant positive effects on the banks' performance.

In this regard, the regulatory authority would come forward and pay attention to whether commercial banks in Bangladesh follow codes and compliances of lending policy or not. Credit Administration Committees, Internal Control and Compliance Authorities, and Credit Risk Management Bodies of banks would be more scientific and strategic in their focus on credit administration, credit analysis, and loan follow-up, by applying credit risk evaluation techniques and effective credit risk management strategies. During assessing and quantifying credit risk, the banks would be able to know the Basel accords for implementing the advanced approaches that will help reduce the non-performing loans and its influence on profitability.

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Appendix-A

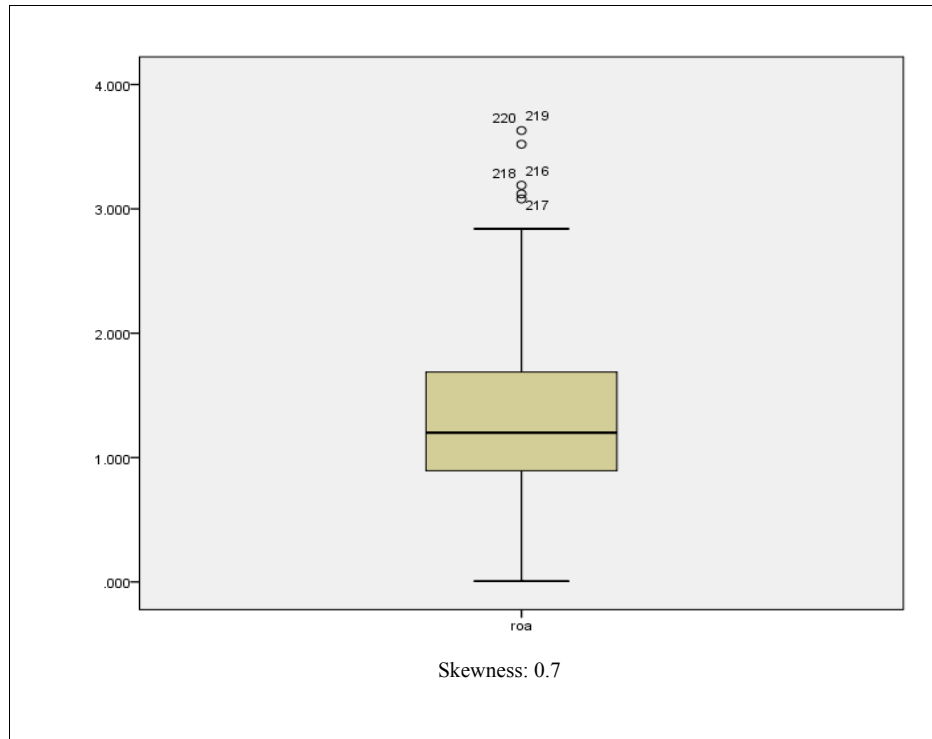


Fig. 2: Box Plot of ROA

Appendix-B

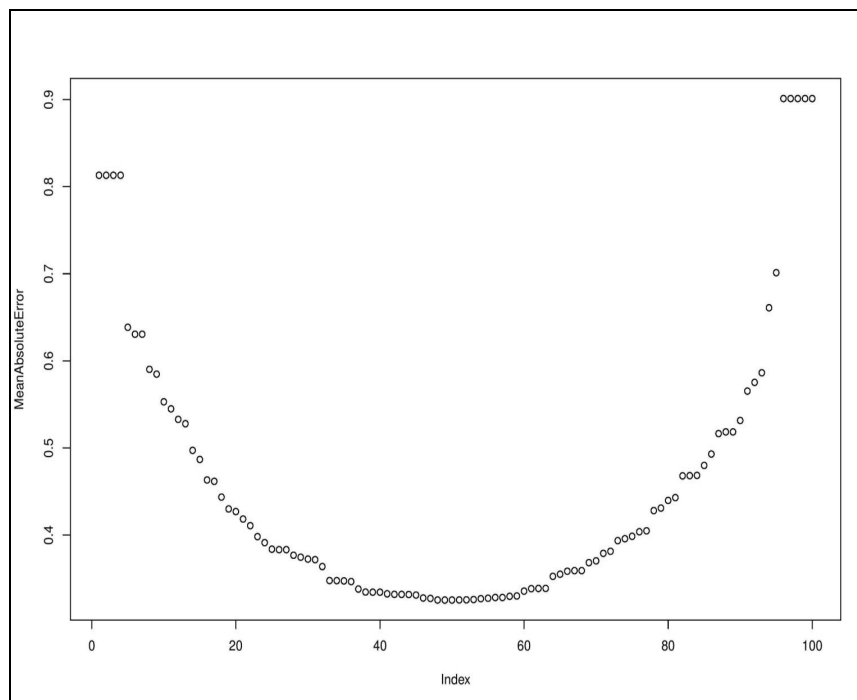


Fig. 3: Mean Absolute Error Plot of ROA