

**Risk Management in Banks:
It's Relationship with the Financial Performance
of Commercial Banks in Bangladesh**

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DECLARATION

I has been completed this thesis paper and subsequently made necessary correction as advised by one of the external reviewer of the thesis paper with the guidance of my supervisors as part of completion of Doctor of Business Administration (DBA) in Finance from the University of Dhaka, Bangladesh and has not been presented in any other program of any University in Bangladesh or aboard.

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TABLE OF CONTENTS

		PAGE
	Chapter One – Introductory Part	
1.0	Introduction	2
1.1	Background of the Study	3
1.2	Banking Industry in Bangladesh	3
	1.2.1 Private Banks in Bangladesh	5
	1.2.2 Bangladesh Bank: The Central Bank of Bangladesh	5
	1.2.3 List of Schedule Banks operating in Bangladesh	5
1.3	Risk Management in Bangladeshi Commercial Banks	8
	1.3.1 Risk Management Procedure	8
	1.3.2 Risk Management Authorities	8
	1.3.2.1 The Board of Directors	8
	1.3.2.2 Executive Committee (EC) of the Board	9
	1.3.2.3 Audit Committee of the Board	9
	1.3.2.4 Management Committees	9
	1.3.2.5 Management Units	9
1.4	Risk area addressed in Bangladeshi Commercial Banks	10
	1.4.1 Credit Risk	10
	1.4.1.1 Early Warning System	10
	1.4.1.2 Credit Policy	10
	1.4.1.3 Credit Approval Delegated Properly	10
	1.4.1.4 Independent Credit Risk Management Division	11
	1.4.1.5 Separate Credit Administration Division for Documentation	11
	1.4.1.6 Separate Credit Monitoring & Recovery Division	11
	1.4.1.7 Independent Internal Audit	11
	1.4.2 Market Risk	11
	1.4.2.1 Interest Rate Risk	12
	1.4.2.2 Foreign Exchange Risk	12
	1.4.3 Liquidity Risk	12
	1.4.4 Operational Risk	12
	1.4.4.1 Internal Control & Compliance Risk	12

		PAGE
	1.4.4.2 Money Laundering Risk	13
	1.4.4.3 Business Risk	13
	1.4.4.4 Reputational Risk	13
1.5	Research Question	13
1.6	Significance of the Study	14
1.7	Scope of the Study	15
1.8	Limitation of the Study	16
	Chapter Two – Literature Review	
2.0	Introduction	17
2.1	Literature Review Theoretical	17
	2.1.1 Finance distress theory	17
	2.1.2 Shiftability Theory of Liquidity	18
	2.1.3 Extreme Value Theory	18
2.2	Bangladesh Bank Guidelines Review	19
	2.2.1 Bangladesh Bank Guideline on Risk-Based Capital Adequacy	19
	2.2.2 Risk Management Guidelines for Banks	20
	2.2.3 Bangladesh Bank Guidelines for Managing Core Risks in Banking	22
	2.2.3.1 Bangladesh Bank Guidelines on Credit Risk Management (CRM) in Banks	22
	2.2.3.1.1 Organizing Credit Risk Management	35
	2.2.3.1.2 Managing Credit Risk in the Origination Process	25
	2.2.3.1.3 Managing Credit Risk in the Administration Process	33
	2.2.3.1.4 Timely identification of Problem Assets	34
	2.2.3.1.5 Managing Credit Risk with appropriate MIS	36
	2.2.3.1.6 Rescheduling as a means to manage Credit Risk	36
	2.2.3.1.7 Restructuring as a means to manage Credit Risk	39
	2.2.3.1.8 Credit Recovery	39
	2.2.3.1.9 Write-off, repossession, and disposition of collateral	39
	2.2.3.2 Bangladesh Bank Guidelines on Assets Liability Management (AML)	40
	2.2.3.3 Bangladesh Bank Guidelines on Foreign Exchange Risk Management	42
	2.2.3.4 Bangladesh Bank Guidelines on ICT Security in Banks	43
	2.2.3.5 Bangladesh Bank Guidelines on Internal Control and Compliance in Banks	45

		PAGE
	2.2.3.6 Bangladesh Bank Guidelines on Prevention on Money Laundering	47
	2.2.3.7 Bangladesh Bank Guidelines on Environmental & Social Risk Management for Banks	49
2.3	Empirical Literature Review	52
	2.3.1 Credit Risk and Financial Performance	52
	2.3.2 Market Risk and Financial Performance	58
	2.3.3 Liquidity Risk and Financial Performance	63
	2.3.4 Operational Risk and Financial Performance	67
	2.3.6 Review of literatures using GMM Model	72
2.4	Critique of the Existing Literature	76
2.5	Conceptual Framework	77
2.6	Research Gap and Contribution	79
	Chapter Three – Methodology	
3.0	Introduction	82
3.1	Research Design	82
3.2	Research Strategy	82
3.3	Research Method	83
3.4	Target Population	83
3.5	Study Period	83
3.6	Data Collection Instrument	84
3.7	Data Collection Procedure	84
3.8	Data Processing and Analysis	84
3.9	Measurement of Study Variables	84
	3.9.1 Financial Performance	84
	3.9.2 Banks Credit Risk	85
	3.9.3 Banks Market Risk	86
	3.9.4 Banks Liquidity Risk	87
	3.9.5 Measure of Operational Risk	87
	3.9.6 Bank Size	87
	3.9.7 Dummy Variable	88
	3.9.8 Herfindahl–Hirschman Index (HHI)	88

		PAGE
	3.9.9 GDP Growth Rate	88
	3.9.10 Inflation Rate	88
3.11	Model Specification	88
	3.11.1 Econometric Model – I	89
	3.11.2 Econometric Model – II	90
	3.11.3 Econometric Model – III	92
3.12	Estimation of Panel Data Regression Model	94
	3.12.1 The Fixed Effects Model	94
	3.12.2 Random Effect Model	94
	3.12.3 Random Effect (RE) model Vs Fixed Effect (FE) model	94
	3.12.4 Dynamic Panel Models	95
	3.12.5 Why to use GMM Model	95
	3.12.6 Why to choose System GMM	96
	3.12.7 System GMM Specification	96
	3.12.8 Correlation Analysis	96
	3.12.9 Variance Inflation Factor (VIF)	97
	3.12.10 Hausman Test	97
	3.12.11 The F test and Wald Test	97
	3.12.12 Within and Between R-Square	97
	3.12.13 Hansen J statistic	97
	3.12.14 Arrelano and Bond Autocorrelation Test	97
	Chapter Four – Research Findings & Discussion	
4.0	Introduction	100
4.1	Statistical Analysis	100
4.2	Graphical Analysis	102
4.3	Panel Data Specification Test	108
	4.3.1 Risk Factors and its impact on Financial Performance of Commercial Banks	109
	4.3.2 Co-relation among the variables	109
	4.3.3 Output of VIF Test for Multicollinearity Check among the variables	113
	4.3.4 Panel regression results	114

		PAGE
	4.3.4.1 Effect of Risk Management Factors on Financial Performance of Commercial Banks in Bangladesh considering “Bank Size” as Bank specific control variable	114
	4.3.4.2 Effect of Risk Factors on Financial Performance of Commercial Banks in Bangladesh considering “Bank Size” as Bank specific and “HHI” as banking industry concentration control variables	125
	4.3.4.3 Effect of Risk Factors on Financial Performance of Commercial Banks in Bangladesh considering “Bank Size” as Bank specific and “HHI” as industry specific and “GDP Growth” & “Inflation Rate” as macro-economic control variables	137
	4.3.4.4 Summary of findings of panel regression results	150
	Chapter Five – Conclusion, Recommendation and Scope for further research	
	Chapter Five – Conclusion, Recommendation & Scope of Further Research	
5.0	Introduction	157
5.1	Conclusion	157
5.2	Recommendation	161
5.3	Scope for further research	164
	Reference	166
	Annexure - I	178

LIST OF TABLES

	PAGE
Table -1	Summary of Secondary Data 100
Table -2	Correlation between risk component and return on assets (ROA) 109
Table -3	Correlation between risk component and return on equity (ROE) 111
Table -4	Output of VIF Test for Multicollinearity Check where ROA is considered as dependent variable 113
Table -5	Output of VIF Test for Multicollinearity Check where ROE is considered as dependent variable 114
Table -6	Output of Econometric Model 1.1a and 1.1b, where dependent variable is ROA 115
Table -7	Output of Hausman specification test for econometric Model 1.1a, where dependent variable is ROA 116
Table -8	Output of Econometric Model 1.2a and 1.2b, where dependent variable is ROE 120
Table -9	Output of Hausman specification test for Econometric Model 1.2a, where dependent variable is ROE 122
Table -10	Output of Econometric Model 2.1a and 2.1b, where dependent variable is ROA 126
Table -11	Output of Hausman specification test for Econometric Model 2.1a, where dependent variable is ROA 127
Table -12	Output of Econometric Model 2.2a and 2.2b, where dependent variable is ROE 131
Table -13	Output of Hausman specification test for Econometric Model 2.2a, where dependent variable is ROE 133
Table -14	Output of Econometric Model 3.1a and 3.1b, where dependent variable is ROA 137
Table -15	Output of Hausman specification test for econometric model 3.1a, where dependent variable is ROA 139
Table -16	Output of Econometric Model 3.2a and 3.2b, where dependent variable is ROE 144
Table -17	Output of Hausman specification test for Econometric Model 3.2a, where dependent variable is ROE 145

LIST OF FIGURES

	PAGE
Figure -1.1 Conceptual framework	78

LIST OF GRAPH

		PAGE
Graph -1	Relationship between ROA and NPLR	102
Graph -2	Relationship between ROA and NIM	103
Graph -3	Relationship between ROA and Fex(G/L)	104
Graph -4	Relationship between ROA and LDR	104
Graph -5	Relationship between ROA and CIR	105
Graph -6	Relationship between ROE and NPLR	105
Graph -7	Relationship between ROE and NIM	106
Graph - 8	Relationship between ROE and Fex(G/L)	107
Graph - 9	Relationship between ROE and LDR	107
Graph - 10	Relationship between ROE and CIR	108

LIST OF ANNEXURE

	PAGE
Appendix -I Secondary Data Collection Instrument	177

ABBREVIATIONS AND ACRONYMS

HEFCE	Higher Education Funding Council for England
BCBS	Basel Committee Banking Supervision
BB	Bangladesh Bank
CB	Commercial Banks
PCB	Private Commercial Banks
NCB	Nationalized Commercial Banks
NPL	Non-performing Loans
CAMEL	Capital adequacy, Asset quality, Management, Earnings and Liquidity
ALCO	Asset Liability Committee
DPB	Delegation of Business Power
EC	Executive Committee
SMT	Senior Management Team
CRMC	Credit Risk Management Committee
EAA	Early Alert Account
CRMD	Credit Risk Management Division
CAD	Credit Administration Division
TSD	Trade Services Division
RMD	Risk Management Division
ICCD	Internal Control & Compliance Division
AMLDD	Anti Money Laundering Division
SAMD	Special Assets Management Division
FAD	Financial Administration Division
FMD	Facility Management Division
ID	International Division
ADC	Alternative Delivery Channel

ATM	Automated Teller Machine
MLPA	Money Laundering Prevention Act
ATA	Anti-terrorism Act
KYC	Know Your Customer
TP	Transaction Profile
PEP	Politically Exposed Persons
HHI	Herfindahl–Hirschman Index
GDP	Gross Domestic Product
EVT	Extreme Value Theory
BIS	Bank for International Settlements
BCBS	Basel Committee for Banking Supervision
BRPD	Banking Regulation and Policy Department
CRAR	Capital to Risk-weighted Asset Ratio
DOS	Department of Offsite Supervision
BCP	Basel Core Principles
SME	Small or Medium-sized Enterprises
RAS	Risk Appetite Statement
CP	Credit Policy
ICRRS	Internal Credit Risk Rating System
LRA	Lending Risk Analysis
BDT	Bangladesh Taka
CRG	Credit Risk Grading
ECAI	External Credit Assessment Institutions
RM	Relationship Management
SMA	Special Mention Account
UC	Unclassified
SS	Sub-standard

DF	Doubtful
BL	Bad & Loss
MDB	Multilateral Development Banks
MIS	Management Information System
CIB	Credit Information Bureau
AML	Assets Liability Management
LCR	Liquidity Coverage Ratio
NSFR	Net Stable Funding Ratio
OBU	Off-shore Banking Unit
IMF	International Monetary Fund
FX	Foreign Exchange
MRMD	Market Risk Management Departments
ICT	Information and Communication Technology
NBFI	Non-Bank Financial Institutions
BCP	Business Continuity Plan
IVR	Interactive Voice Response
BATCH	Bangladesh Automated Clearing House
BFTN	Bangladesh Electronic Funds Transfer Network
RTGS	Real Time Gross Settlement
SSC	Shari`ah Supervisory Committee
FATF	Financial Action Task Force
BFIU	Bangladesh Financial Intelligence Unit
CTR	Cash Transaction Report
STR	Suspicious Transaction Report
ESRM	Environment and Social Risk Management
ERM	Environmental Risk Management
PD	Probability of Default

DEFINITION OF TERMS

Risk: Risk is described as an incident that can make disruption of achievement of certain goal or objectives.

Financial Performance: Financial performance of a Bank can be described by analyzing the different financial indicators of its financial reports, such as total assets, total equity with its profitability.

Credit risk: Credit Risk of a Bank can be described as a borrower's unwillingness or inability to repay debt principal or interest or both within predetermined period or tenor or to fulfill certain contractual obligations.

Operation Risk: Chances of loss that occur due to inadequacy or collapse of internal process and structures of a Bank and/ or due to negligence or fraud of any employee of the Bank or any other external individuals.

Market Risk: Chances of loss that occur due to external events of the Banks including market price fluctuations, interest rates changes, foreign exchange rate fluctuation or product price adjustments.

Liquidity Risk: Risk that cannot comply with financial obligation of any Bank, when it becomes due. Liquidity risks can involve failure to liquidate an asset promptly at a fair price.

Interest Rate Risk: Risk due to decrease of net interest income of a Bank due to fluctuation of interest rate levels is the interest rates risk for a Bank.

Foreign Exchange Risk: Risk that reflects a possible loss in both directions due to foreign-currency exchange rate adjustments. Foreign exchange risks occur on both foreign currency assets and liabilities sides.

Business Risk: Business risk occurs due to change in market and / or economic condition, consumer behavior, technological up-gradation that may be changed from the initial assumptions of business planning.

Reputation Risk: Reputation risk is a chance of loss, decreased company's revenue and reduced company value due to reduction of customers' confidence, investor, shareholder, credit rating agencies, regulator and general public.

ABSTRACT

Risk management is an essential element of bank and financial intermediation. Failure to effectively evaluating and managing the risks factors may lead to losses that threaten the health of the bank and the sustainability of the entire financial system. Most of Bangladesh's commercial banks have their own guidelines and procedures for managing the core risk areas i.e. Credit Risks, Market Risks, Operation Risk and Liquidity Risk to ensure the bank's sustainable development and manages all risks factors.

This study analyzes the impact of risk management factors on the financial performance of commercial banks operating in Bangladesh both in the short run and long run considering internal and external control factors. This study also review the existing risk management related policies, guidelines and practices in commercial banks operating in Bangladesh. After reviewing risk management related theories, Bangladesh Bank policies and guidelines related to risk management and empirical literatures, this study identify dependent variables as return of asset (ROA) and return on equity (ROE) as proxy of financial performance and independent variables including log of non-performing loan ratio (LnNPLR) as proxy of credit risk, log of net interest margin (LnNIM) as proxy of interest rate risk, log of foreign exchange gain/ losses (LnFexGL) as proxy of foreign exchange risk (both are component of market risk of the banks), loan to deposit ratio (LDR) as proxy of liquidity risk and log of cost to income ratio (LnCIR) as proxy of operational risk. This study include proxy variable related to type of banking operations in Bangladesh like Islamic banking or Conventional banking in to the econometric models. Gradually, it does include Herfindahl–Hirschman Index (HHI) as proxy of within banking industry concentration control variable and GDP Growth Rate & Inflation Rate as proxy of macro-economic variables into the econometric models. The econometric models have been developed to examine both long run and short run effect of the independent variables on the dependent variables to establish the research questions.

The secondary data has been accumulated from the annual reports of all the commercial banks operating in Bangladesh during the study period, i.e. from 2014 to 2019. After panel data set validation, this study used STATA – 12 version to test long term and short term impact of dependent variables on the independent variables to check the impact of risk factors on the financial performance of local commercial banks operating in Bangladesh during the period. To check the long run effect of the dependent variables on the independent variables, this study examine the output of both random effect GLS regression model and fixed effect regression model for all the econometric models. Hausman Test result has been used to determine the appropriate model for analyzing long run effect of the econometric models. Two step system GMM model has been used to check the short run impact of the dependent variables on the independent variables for all the econometric models.

The empirical output of first econometric models shows that, the bank specific risk factors, credit risk and operational risk has negative impact of both the dependent variables, i.e. financial

performance of commercial banks operating in Bangladesh during the study periods, both in the long run and short run, considering bank specific control factors only, which is also in line with the statistical assumption of this study. The other risk factor, market risk (including both interest rate risk and foreign exchange risk) has positive impact of both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods, both in the long run and short run, considering bank specific control factors only, which is also in line with the statistical assumption of this study. But, the other risk factor, liquidity risk showed different behaviors in different part of this study. Liquidity risk has negative correlation with both the dependent variables, i.e. ROA & ROE in the long run while have positive correlation with ROA and negative correlation with ROE in the short run. When this study included within banking industry concentration control proxy variable “HHI” in to the second econometric model, the liquidity risk behaves differently, i.e. liquidity risk showed positive correlation with both the dependent variables, i.e. ROA & ROE, both in the long run and short run, which is also in line with the statistical assumption of this study.

However, when this study included macro-economic control variables “GDP Growth rate” and “Inflation rate” into the third econometric model along-with within banking industry concentration control proxy variable “HHI” and bank specific control variable “Bank Size”, foreign exchange risk showed negative correlation with ROA but have positive correlation with ROE in the long run while has positive correlation with both ROA & ROE, i.e. financial performance of commercial banks operating in Bangladesh in the short run. The foreign exchange risk behaves differently in the long run with two dependent variables, i.e. ROA and ROE due to different types of dividend payout policies and capital management policies of the commercial banks operating in Bangladesh, which may have influence on the ROE ratio calculation techniques for the Banks. The correlation between other risk factors and profitability of the banks are in line with the statistical assumption of this study considering all the internal and external control factors into the model.

After reviewing all the outputs of the econometric models, it has been observed that, Banks’ can manage their credit risk and operational risk efficiently through implementation of prudent policies, guidelines and ensure proper monitoring, compliances to minimize losses as well as improve their financial performance. But there may have influence of some external factors on the liquidity risk and market risk of the banks. Which has been analyzed and empirically tested through examined econometric models of this study, i.e. bank should analyzed other external factors like banking industry concentration and macro-economic variables like GDP Growth Rate and Inflation Rate carefully while managing the liquidity risk and market risk in addition to all the bank specific risk factors for commercial banks operating in Bangladesh during the study period. Based on the findings, this study made some recommendation for the stake holders of the commercial Banks operating in Bangladesh, which will be effective to manage its risk factors as well as financial performances.

CHAPTER ONE

INTRODUCTORY PART

1.0 Introduction

Risk is described as an incident that can make disruption in the way of accomplishment of specific objectives. The type of risk occurring in a specific situation may depend on internal factors or external factors. This can make a situation more critical when it is exposed by the threat. The safer approach to handle such a situation is to take some constructive steps to detect any risk that can lead to unexpected results. Simply put, the pre-management of risk is much easier than expecting it to happen. Risk management is a measure used in the detection, review and subsequent response to a specific threat. It is a continuous process and a useful tool in decision-making. According to the “HEFCE”, managing risk is not only minimizing the chances of adverse incidents, but also to increase the chances of positive things.

Risk-taking is an important part of banking and financial intermediation. Failure to effectively evaluating and managing risk may be directed to losses that threaten the health of each financial institution and the stability of the whole structure of the financial system. The global financial crisis impels the world’s banking system to felt in a precarious position. In the consequences of the global financial disaster, developing countries such as Bangladesh had also been affected. As a result, worldwide poverty and social disparity increased dramatically, as did the growth of human capital metrics. Although poor risk management practices can’t be seen as particular cause for the financial disaster, weak internal governance and the underlying factor has been identified. Wherever they existed, sound risk management has made the institutions even more prepared than others to survive financial crises. Because of the increase in foreign transaction and deals, the link between local banks in Bangladesh and internationally recognized banks has multiplied. The competition between the Bangladeshi banking companies has greater than before due to adoption of new and multifaceted platforms in technology and services. As a result, the risk in the banking sector of Bangladesh was significantly higher than it had been before. To effectively operate as internationally recognized banks, to upgrade the financial soundness metrics for the banks up to satisfactory standards and to sustain financial constancy in the Bangladeshi banking industry, it is essential to ensure corporate risk management culture and practices.

A sound strategy, including a comprehensive risk management plan and competent management and managerial reporting lines, enables bank management to take calculated risks and manage them as needed. Risk management is an internal control aspect that covers all the areas of the banks.

It is also important to note that there is a substantial correlation between good corporate governance and effective risk management, as well as a positive impact on banks' overall performance. The different roles of a banking institution cannot operate together without proper risk management to achieve the bank’s goals to optimize its capital. It helps the bank’s growth and supports its sustainability and resilience. So for competitive survival, there is no other choice

but to ensure acceptable risk management practices in banks. The banks should give more importance to quality up-gradation of risk management practices and set its performance targets in line with strategic planning and goals. The level of the risk management tasks and the structure continued depend on the size and complication of the banks. Risk is most efficiently managed, when the financial institution applies basic principles and components of risk management consistently.

1.1 Background of the Study

Risk is an unanticipated unpredictability / inconsistency of profitability (Holton, 2004). Risk includes market, liquidity, operational & credit risk, which are main causes for the unpredictability of profitability (Tafri et al., 2009 & Dimitropoulos et al., 2010). The assumption is that, risk factors of a Bank influence the volatility of the financial performance, if not addressed properly. All Banks faces many risks including credit risk, risk of liquidity, market or price risks, operational risk, adherence and legal risk and strategic risk etc.

Credit risk management strategies of Commercial Banks established decision-making mechanisms, which are related to minimizing exposures in the non-performing credit assets and loan loss provision. The Basel Committee of Banking Supervision notes that, the bank risk management issues reduce the possibility of the bank when creditor or counterparty is not being able to fulfill its obligations under the agreed terms (BCBS 2003). The market risk includes the possibility of financial losses as a result of market price fluctuations.

Liquidity risk in commercial banks is characterized as an incident to fulfill the proviso or increases finance in acquisitions, as it come due without unacceptable losses and expenses (Ismail, 2010). Also, it can be considered as an asset risk. The inability to fulfill current cash commitments in a timely and cost-effective manner might have a negative impact on the interests of the bank's customers and other stakeholders, which raises the liquidity risk. Successful capital management ensures that, adequate cash reserves to be retained to minimize liquidity risk and as many funds as possible to be invested to optimize profits.

Tabari et al., (2013) stated that the protection of the banking industry depend on the capital adequacy and profitability of the bank. In market-based banking system, financial performance is a factor that explains the competitive position of the banks and its management approach. This factor helps the banking sector survive from some of the risks in the short term level. Risk management, size, location and time will influence the profitability of the Bank (Haslem, 1968).

1.2 Banking Industry in Bangladesh

Before the partition of India in 1947, there were 49 nos. of banks and other financial institutions operating in British Indian regime. The first commercial bank in Bangladesh region was The Dhaka Bank, established in the year 1806. The first British owned bank started its operation in the year 1784 in British-India was Bengal Bank, which had established its two branches in

Bangladesh region (Sirajganj and Chittagong). In the year 1862, Bengal Bank started its operation in Dhaka through accusation of the operation of Dhaka Bank. In this area, some other Bengal Bank's branches were opened including Chandpur, Narayanganj, Mymensing, Rangpur, and Chittagong till partition (up to 1947).

After British Indian Partition in 1947, the State Bank of Pakistan considers the country's central bank, which was established in July 1948. A strong commercial bank was later formed in 1949 namely The National Bank of Pakistan. Until 1971, there were total 36 nos. of commercial banks continued their operation in Pakistan. Pakistanis owned the majority of the Banks in Pakistan, and only three were held one branch in East Pakistan namely The National Bank of Pakistan, Habib Bank Ltd. and The Australasia Bank Ltd till 1949. Other there Pakistani banks namely Premier Bank Ltd., Bank of Bhowalpur Ltd and Muslim Commercial Bank had opened their branches in East Pakistan during the year 1950 to 1958. The United Bank Ltd., The Union Bank Ltd., Standard Bank Ltd. and The Commerce Bank Ltd. were the four Pakistan owned banks also started banking business in East Pakistan during the year 1959 to 1965.

In East Pakistan, only two banks had their headquarters in Dhaka and owned by local business groups, i.e. The Eastern Mercantile Bank Ltd. (currently Pubali Bank Ltd) and Eastern Banking Company Ltd (currently Uttara Bank Ltd.) which were started its operations in the year 1959 and 1965 respectively. In East Pakistan, there were total 1130 branches of 12 banks had been operating till 1971. After independence, Bangladesh Bank has been established in the year 1972 through Presidential Order No. 127/1972. This order transformed the State Bank of Pakistan in Dhaka into the Bangladesh Bank, a complete central bank of Bangladesh. Bangladesh Bank has been keeping its resources to formulate and manage monetary policy, the banking system, the national and external value stabilization, issuance of currency, preservation of value of Bangladeshi Taka, to promote economic growth of the country, and to promote the creation, maintenance and development of Bangladesh's financial markets and the establishment and management of the banking system.

In the year 1972, Bangladesh Government executed an order for nationalization of all banks operating in Bangladesh (earlier East Pakistan), except foreign ones. By combining the existing banks of that time, six nationalized banks had been created. The growth and development rate for banking sector in Bangladesh was very slow till 1983, when Bangladesh Government permitted private banks to be formed and the process of denationalization began. As a result, the banking system had started to expand everywhere and it's contributed a lot at the initial stage of the financial growth of the country. The banking system was considered to be one of the two main actors (other being business) in the growth process, Schumpeter (1933). Alexander Gerashchenko (1962) also identified the banking system as the main player at some point of the industrialization process in his popularly known Gershenkron's hypothesis.

A strong banking system plays an important role for the economic growth of a country. Due to deregulation, technology advances, globalization and so on, the banking system has adopted several changes in recent years. These improvements in the banking system have also contributed into the revolutionary changes in the economy of Bangladesh.

1.2.1 Private Banks in Bangladesh

Five private commercial banks were established in the year 1983, which result moderate expansion into the banking system of Bangladesh. However, during the year 1973 to 1983, the number of nationalized commercial bank's branches has been increased rapidly, i.e. from 1512 branches to 4603 nos. of branches.

In the year 2006, financial sector transformation has been initiated to strengthen the supervisory and regulatory framework for banks, although it was slower than expectation. Since 2002, the overall performance of banks in Bangladesh improved significantly as its gross non performing loan decreased from 28% p.a. to 14% p.a. and net non performing loan (after deduction of provision) declined from 21% to 8%. As a result the profitability ratios improved significantly. Though, the Private Commercial Banks operating in Bangladesh showed record improvement for managing NPL ratios at 6% level, while four Nationalized Commercial Banks did not showed any significant improvement for managing NPL ratios (25% during the period). The Banks including NCBs also have large amount of capital shortfall against required risk weighted assets ratio at 10.50% (as per BASEL III guideline). During the periods from 2006 to 2019, a large numbers of prudential guidelines have been issued by Bangladesh Bank for managing core risk in banking sectors of Bangladesh. Bangladesh Bank has also published a road map for full implementation of Basel III capital accord by 2020 in banking industry of Bangladesh. After implementation of CAMEL rating by Bangladesh Bank since 1998 the overall rating of banks improved gradually. In the year 2006 this rating model has been updated by Bangladesh Bank through incorporation of market risk into the rating module and the new model has been known as CAMELS.

For promoting economic development of a nation, modern banks play an important role. Banks would provide the funds needed to execute various economic development initiatives under progress. In absence of the banks, huge multitudes all over the world would be idle and unproductive. These distributed quantities are gathered and pooled together to meet the needs of business and industry. Bangladesh's economy is one of the least-developed economies in the world. The underdeveloped banking system may be one of the causes. Both government and numerous international organizations have established several barriers to the economic development process caused by underdeveloped banking systems. They have thus strongly suggested financial industry reform. While 1990, the Govt. of Bangladesh has been initiated a range of steps to transform the financial system to make both the financial sector and the banking sector transparent and various international organizations, such as the World Bank, and the IMF, have been taking part in the implementation of the reform activities.

1.2.2 Bangladesh Bank: The Central Bank of Bangladesh

Since the independence of the country, the Bangladesh Bank (BB) has served as the central bank. Its key jobs include currency issuance, the management and operation of the foreign exchange reserve and all public currency matters for transactions. BB is also plays an important role for planning and executing the government's monetary policy. The Bangladesh Bank has a governing body of nine members, led by the Governor. It has nine branches in addition to the Dhaka headquarters, two in Dhaka City and one in Rajshahi, Bogra, Chittagong, Khulna, Sylhet, and Barisal & Rangpur respectively.

1.2.3 List of Schedule Banks operating in Bangladesh

Nationalized Commercial Banks (NCBs)

- Sonali Bank Limited
- Janata Bank Limited
- Agrani Bank Limited
- Rupali Bank Limited
- BASIC Bank Limited

Local Private Commercial Banks (PCBs)

- Pubali Bank Limited
- National Bank Limited
- The City Bank Limited
- Uttara Bank Limited
- United Commercial Bank Limited
- IFIC Bank Limited
- Arab Bangladesh Bank Limited
- Islami Bank Bangladesh Limited
- ICB Islami Bank Limited (formal Oriental Bank Limited)
- Eastern Bank Ltd.
- National Credit & Commerce Bank Ltd.
- Prime Bank Ltd.
- South East Bank Ltd.
- Dhaka Bank Ltd.
- Al-Arafah Islami Bank Ltd.
- Social Islami Bank Ltd.
- Dutch-Bangla Bank Ltd.
- Mercantile Bank Ltd.
- Standard Bank Ltd.
- One Bank Ltd.
- EXIM Bank Ltd.
- Bangladesh Commerce Bank Ltd.
- Mutual Trust Bank Ltd.

- First Security Islami Bank Ltd.
- The Premier Bank Ltd.
- Bank Asia Ltd.
- Trust Bank Ltd.
- Shah Jalal Islami Bank Limited
- NRB Bank Limited
- Global Islami Bank Ltd (former NRB Global Bank Limited)
- NRB Commercial Bank Limited
- Modhumoti Bank Limited
- Midland Bank Limited
- SBAC Bank Limited
- Meghna Bank Limited
- Shimanto Bank Limited
- Padma Bank Limited (format Farmers Bank Limited)
- Union Bank Limited
- There are also some newly licensed Banks like Community Bank Limited, Bangal Commercial Bank Ltd, and Citizen Bank Limited

Foreign Banks operating in Bangladesh

- Standard Chartered Bank
- Habib Bank
- State Bank of India
- National Bank of Pakistan
- City Bank N.A.
- HSBC
- Woori Bank
- Commercial Bank of Ceylon
- Bank Alfalah

Development Banks

- Bangladesh Krishi Bank
- Rajshahi Krishi Unnayan Bank
- Bangladesh Development Bank Limited

Other Specialized Banks

- Ansar VDP Unnayan Bank
- Bangladesh Samabai Bank Ltd. (BSBL)
- Grameen Bank
- Karmasansthan Bank
- Probashi Kallyon Bank
- Palli Sanchay Bank

1.3 Risk Management in Bangladeshi Commercial Banks

Risk characterized as possible losses or forecasted income, caused by internal and external factors. The goals of managing risks are to define and independently access and analyze possible risks in activities and transactions, liabilities, assets, revenue, expenses & off-balance sheets exposures and to take effective, prompt action to mitigate them in the sense of a risk-return environment. Risks are explicitly defined, mitigated or reduced and removed, if possible, to preserve and optimize shareholder value. It also assured that the bank complies with risk appetite and strategic priorities on its balance sheet and off-balance sheet risks.

Bangladeshi Commercial Banks use a broad variety of techniques & methods to counter and minimize any risk factors in banking operations. Banks put the greatest emphasis on development, sustain and update the risk management infrastructure, processes and procedures. To develop the ability and skills of relevant banking professionals to effectively manage the risk, adequate resources allotted to commercial banks in Bangladesh. Policies and procedures will be accepted and reviewed annually by their respective Boards, so that it can be sufficient enough to properly and reliably handle and minimize risks. The Board of Directors of Commercial Banks will be solely responsible for approving all the related policies and guidelines for successful risk management practices in the bank. To determine the competence of the structure and make sure that the bank works as per approved structures & guidelines, the board and its committees including Audit Committee and Executive Committee develop guidelines and limits to evaluate and track different risks in banking operations. Management committees also monitor and ensure the development of appropriate risk management programs, such as ALCO and Credit Risk Management Committee etc., and implement them regularly to protect the bank's interests.

1.3.1 Risk Management Procedure

Most of the Bangladeshi commercial banks have their own guidelines and procedures for managing all areas of core risk, i.e. Credit Risks, Market Risks, Liquidity Risk & Operation Risk etc. to ensure the banks sustainable development & manages all risks factors. These formulated in light of Bangladesh Bank's published guiding principles on Core Risk Management including Credit Risk Management, Foreign Exchange Risk Management, Asset & Liability Risk Management, Internal Control & Compliance, IT Security Risk Management and Money Laundering Risk Management as well as the overall business condition in which the Bank operates and international better practices.

1.3.2 Risk Management Authorities

Risk management structures are approved, supervised, monitored and mitigated at different stages of almost all the Commercial Banks through their board of directors, its different committee, different management committee, different management department or division and Internal Control & Compliance Division (ICCD) as detailed below:

1.3.2.1 The Board of Directors

The Board of Directors supervises and endorses entire risk management strategies and criteria with market conditions, regulatory specifications, and lessons learned from the past of almost all Commercial Banks in Bangladesh. To ensure better banking operations and to protect against downside risk against possible loss as well as to defend shareholders and depositors' interests, balances has been maintained even as setting policies and guidelines for the credit risk, market risks, liquidity risk and operational risk. The Board of Director's Committee also approved credit memos, administrative memos and significant procurement after recommendation by the Credit / Investment Risk Management Committee, Senior Management Committee and the Management Procurement Committee, according to the approved Business Delegation (DBP).

1.3.2.2 Executive Committee (EC) of the Board of Directors

The Executive Committee of the Board of Directors of all the banks is accountable for supervision of the activities of management committees under the permitted boundaries and delegation for effectively managing and minimizing entire risk factors and for acknowledging the possible risk for losses. After recommendation from the Management Credit/ Investment Committee, Senior Management Committee or Management Procurement Committee, the EC Committee also approved credit proposals, administrative proposals and significant procurement, according to approved Business Delegation (DBP).

1.3.2.3 Audit Committee of the Board of Directors

The Audit Committee of all most all the banks monitors independently all banking activities which involve credit risk, market risks, liquidity risk and operational risk through its ICC Division. Under Bangladesh Bank guidelines, almost all commercial banks have their risk-based audit plan which has been approved by their Board of Audit Committees for execution and regular monitoring of risk parameters to make sure that all risk issues are properly addressed. Bangladesh Bank also controls the operations of all commercial banks in Bangladesh through their different regulatory and monitoring team.

1.3.2.4 Management Committees

Management Committees like Senior Management Team (SMT), Credit/ Investment Risk Management Committee (CRMC), Asset- Liability Management Committee (ALCO), Early Alert Account Monitoring Committee (EAA Committee) and Purchase Committee of all the Commercial Banks in Bangladesh make sure that proper compliance with all appropriate risk management policies/ guidelines approved by their Board of Directors in compliance with Bangladesh Bank guidelines.

1.3.2.5 Management Units

Management units like Credit/ Investment Risk Management Division (CRM), Treasury Division, Credit Administration Division (CAD), Foreign Trade Services Division (TSD), Credit/ Investment Monitoring & Recovery Division, Risk Management Division (RMD),

Internal Audit & Compliance Division, Internal Control & Compliance Division (ICCD), Anti Money Laundering Division (AMLD), Legal Division, Special Assets Management Division (SAMD), Financial Administration Division (FAD), Facility Management Division (FMD), IT Division, International Division (ID), Business Units like Corporate/ Commercial, SME, Retail/ Consumers, Branches Business Networks, Alternative Delivery Channel (ADC) like ATM Network, Agent Banking, Mobile Banking, Credit Cards, Internet Banking, etc. of all most all the Commercial Banks operating in Bangladesh ensuring implementation and monitoring of risk management practices in compliance with all approved policies and procedures at operational level guided by their Board of Directors as per Bangladesh Bank policies and guidelines.

The Commercial Banks' ICC Division make sure that, all the risk management parameters and internal control measures are complied with all internal policies and regulatory requirement on regular basis. Deviations are constantly detected, reported and rectified to reduce risk and make sure that the bank complied all the accepted & defined guidelines. The ICC Division of the Bank report directly to the Audit Committee of the Board, following the Bangladesh Bank Guidelines.

1.4 Risk area addressed in Bangladeshi Commercial Banks

1.4.1 Credit Risk

The largest inherent risk in the banking sector is credit risk. For all types of loan exposure or trade with any counterparties, a bank has some credit risk. The bank's all the risk management policies focuses on credit risk. It planned & continuously updated for recognition, evaluation, management and reduction of credit risk to preserve and enhance lending portfolio quality and to reduce real credit losses and for ensuring proper due diligence in authorizing new loan facilities and renewal.

1.4.1.1 Early Warning System

Most of the commercial Banks in Bangladesh introduced Early Warning System as per Bangladesh Bank guidelines for monitoring the performance of loans regularly. After detection of any deteriorating trend of the performance of the loan portfolio, which enables the banks to take quick measures to maintain the quality portfolio and to grow its credit portfolio sustainably and to make sure that high quality and low risky assets portfolio has been maintained to safeguard the interest of its depositors, investors and shareholders.

1.4.1.2 Credit Policy

Most of the commercial banks operating in Bangladesh have their own board approved Credit Policy as per Bangladesh Bank guidelines addressing their credit growth policy, exposure limits for a specific segment, product, individual customer, company or group of companies, maintaining the regulatory policy and guidelines compliances, risk management procedures and industry better practices.

1.4.1.3 Credit Approval Delegated Properly

To achieve a balance between adequate control and flexibility on lending activities, the majority of banks in Bangladesh delegated their credit approval authority to the Board of Directors, the Board's Executive Committee and the required level of management for complete transparency and accountability at all levels.

1.4.1.4 Independent Credit Risk Management Division

Most of the structured commercial banks in Bangladesh have credit risk management division for assessing credit/ investment related risks factors and recommend risk mitigations procedures or covenants before approval of all credit memos.

1.4.1.5 Separate Credit Administration Division for Documentation

Most of the structured commercial Banks in Bangladesh has separate Credit Administration Division for confirmation of perfected security documentation as per approval before disbursement of any credit facilities.

1.4.1.6 Separate Credit Monitoring & Recovery Division

Most of the bank's credit monitoring and recovery division is actively engaged in continuous supervision, monitoring and follow-up of credit portfolio to protect the probable credit/ investment losses and for ensuring timely collection of depositor's money. It also tracks the efficiency and credit recovery, detects early signal of credit portfolio losses & introduces risk reduction corrections, increases the quality of loans and guarantees, loans recovery on time and initiating legal proceedings. It also tracks the risk position of the credit portfolio and makes sure for the appropriate provision of credit losses.

1.4.1.7 Independent Internal Audit

ICCD of the Bank separately conduct periodic inspection on the credit portfolio and documentation to make sure that all compliances issues including Bank's approved Credit policies & guidelines, BB published policies & guidelines, all the operational structures, compliance of internal control & compliance guidelines and all legal documentation are as per approval. The ICC Division is reported to the Audit Committee of the Board of Directors directly.

1.4.2 Market Risk

Market risk is the risk of losses in or off-balance sheet positions resulting from market price fluctuations such as interest rate, foreign exchange and product price adjustment. The Treasury division controls liquidity, foreign exchange risks and interest rates under supervision of the Asset Liability Management Committee (ALCO) chaired by the Managing Director, comprising senior executives and senior managers. The Committee meets in every month. The main objectives is to supply cost efficient financial support to invest in the loan portfolio and foreign trade connected dealings, minimize cost of deposit and cost of fund, maximize the spread of

landing by utilizing low cost fund along with matching with its maturity period, foreign currency exchange rate and interest rate risks.

1.4.2.1 Interest Rate Risk

The possible decrease in net interest income (NIM) due to changes in interest rate levels is the interest rates risk for a Bank. Most of the commercial banks in Bangladesh strive to reduce their interest rates risk by maintaining good quality assets and also adjust their interest rate considering market conditions to maintain their target spread.

1.4.2.2 Foreign Exchange Risk

Foreign exchange risk reflects possible losses in both directions due to foreign-currency exchange rate adjustments. Foreign exchange risks occur on both foreign currency assets and liabilities sides. Most banks in Bangladesh have centrally managed their foreign-exchange and monetary market operations through Treasury Operation Division. The Bank's treasury division conducts periodic meeting to evaluate the liquidity market situation, exchange rate risk, foreign exchange exposure and pipeline transactions to mitigating foreign exchange risk for the Bank.

1.4.3 Liquidity Risk

Liquidity risk is the risk that cannot comply with financial obligation of any Bank, when it becomes due. Liquidity risks can involve failure to liquidate an asset promptly at a fair price. It is the bank's strategy to keep sufficient liquidity in local as well as foreign currencies at all times. Banks are managed their liquidity risk on the basis of their maturity terms. There are Bangladesh Bank permitted limit for liquid assets to total assets ratio, credit to deposit ratio, deposit maturities tenor variance, off-balance sheet and on-balance sheet assets obligations and money market lending to make sure that stable sources of credit / investment, mismatch of maturity and a cash inflow due to maturity of assets, cash outflow by a comfortable margin through customer deposits maturity even under a stressed liquidity situation.

1.4.4 Operational Risk

Operating risk is the risk of loss that occur as a result for inadequacy or failure of internal process and structures, individuals or external events.

1.4.4.1 Internal Control & Compliance Risk

All commercial banks in Bangladesh have their own board approved internal control and compliance guidelines in line with Bangladesh Bank guidelines. This will lead to a redesign of the bank's organizational chart in line with Bangladesh Bank's instructions to handle core risks. Their respective boards of directors have endorsed the bank's Internal Control & Compliance (ICC) work manual in compliance with Bangladesh Bank guideline. The Internal Control & Compliance Division of banks shall be closely regulated by the Board's Audit Committee, which has adopted the ICC risk management guidelines in detail. To make sure the efficiency, effectiveness and reliability, completeness of financial and manageable information, and the enforcement of legal and regulatory requirements, all of these operations of the ICC Division of

banks are structured to resolve and minimize the bank's operational risks in a more efficient manner.

1.4.4.2 Money Laundering Risk

To prevent money laundering and terrorism financing in Bangladesh, the Money Laundering Prevention Act (MLPA), 2012 and Anti-terrorism Act (ATA), 2013 has been introduced. In the year 2003, Bangladesh Bank undertook a research project to analyze global best practices to manage 5 (five) core risks area for banks that included the risk of monetary laundering.

According to money laundering related laws and related guidelines of Bangladesh Bank, all the banks in Bangladesh have developed internal policies, guidelines & operational procedures for prevention of money laundering and Terrorism Financing through their banking operations. The main objective of this policies and guidelines is to combat money laundering activities and terrorist financing. In line with the approved policies and guidelines, all the banks strictly maintain the Know Your Customer (KYC) process before opening an account or establishing a banking relationship with their customer and monitor the Transaction Profile (TP) of the customer in line with their declaration and income profile on a regular basis to protect money laundering and terrorism financing as guided by Bangladesh Bank. Besides, all the Banks also ensure enhanced due diligence for opening of bank account of the Politically Exposed Persons (PEP) which is guided by the Financial Action Task Force of U.N. Anti-Money Laundering units. In addition, regular training on Anti Money Laundering and Combating Terrorism financing are mandatory for all the Executives and Officers of the banks as per guideline of Bangladesh Bank.

1.4.4.3 Business Risk

Business risk is a function of the market situation, economy, consumer behavior or technological revolution that may be changed in comparison to the assumption prepared at the time of preparation. Business risk involves the risk of losses from minimum non-interest income and maximum costs from the sum expected.

1.4.4.4 Reputational Risk

Reputational risk is a threat of loss, decreased company volume or revenue and reduced company value resulting from events that may decrease the confidence of the clients, shareholders, investors, credit rating agencies, regulators and the general public.

1.5 Research Question

Core risk factors play a significant role in the financial performance of banks. This study realized that the relationship between risk management and financial performance of commercial banks was of great importance. And there is very limited research found, that could clearly explain the relationship of all risk factors and financial performance considering both long run and short run effect for all the commercial banks operating in Bangladesh during the period 2014 to 2019. To

understand the relationship among the risk management factors and financial performance (considering both long run and short run effect) of commercial banks in Bangladesh, the following question should be analyzed throughout the study:

RQ- 1: What are the relationship between the Risk Management factors and Financial Performance of commercial banks in Bangladesh?

RQ- 2: What are the long run effect (captured through random and fixed effect model) and short run effect (captured through two step system GMM application) of the Risk Management factors on Financial Performance of commercial banks in Bangladesh considering bank specific internal determinants?

RQ- 3: What are the long run effect (captured through random and fixed effect model) and short run effect (captured through two step system GMM application) of the Risk Management factors on Financial Performance of commercial banks in Bangladesh considering both bank specific internal determinants and within banking industry concentration factors?

RQ- 4: What are the long run effect (captured through random and fixed effect model) and short run effect (captured through two step system GMM application) of the Risk Management factors on Financial Performance of commercial banks in Bangladesh considering all the internal and external determinants including bank specific, within banking industry concentration and macro-economic factors?

1.7 Significance of the Study

Banks are usually required to manage their risk factors efficiently to avoid high level of risk and therefore deteriorating efficiency. The essence of banking business is so vulnerable because, deposits collected from depositors are more than 85% of its total liability. Banks invest the depositors fund to create loans for their borrowers, which is the key source of their revenue generation. Risk management is an important issue for the sustainability of the banks. So, banks have to manage all the risk factors through implementation of up-to-date policies, guidelines, effective risk management structure or frameworks to ensure its sustainable performance.

Researchers have disagreement regarding the effects of risk management factors on the banks profitability. The key objective of this analysis is to assess the effects of different risk management factors on the profitability of the Banks. However, previous study findings give useful insights into different approaches for bank's risk management. Therefore, this study intended to fill this gap by analyzing the impact (both short run and long run) of risk management factors on the financial performance of commercial banks in Bangladesh considering all the internal and external determinants during the study period.

This study would help the government and the regulatory authorities greatly. This will provide input to the regulator to identify the scope of risk management as well as to improve banking processes through development of policies and guidelines and to monitor its implementation for ensuring sustainable banking practices. By this study, the board of directors, shareholders, executives and investors of all the Bangladeshi scheduled commercial banks have been benefited to understand the overall practices for risk management and its effect on the profitability of the bank. Bank management recognizes about the effect of risk management factors on its financial performance and develops policies and guidelines to manage the risk factors. They may apply the recommendation of this study to mitigate/ manage their banks risk management factors and to maximize its returns. The findings of this study will address the existing research gap to determine both the short run and long run effect of risk management factors on the profitability of Commercial Banks operating in Bangladesh during the period from 2014 to 2019.

1.8 Scope of the Study

This study determines the short run and long run impact of risk management factors on the profitability of commercial banks operating in Bangladesh. The definite context of this study is all the local commercial banks operating in Bangladesh. The population of this study has been considered as all the local commercial banks operating during the full study period, i.e. from 2014 to 2019. Secondary data has been collected from the published financial reports of the local commercial banks operating in Bangladesh. The data collection period is from 2014 to 2019.

1.9 Limitation of the Study

This study has been carried out depending on secondary data analyses. So, the output of this study is dependent on the published annual reports of the banks. There are some banks, who obtained their license but yet to start commercial operation or could not complete their operation for full data period, so this study could not include those new Banks into the data set due to lack of adequate information. Moreover, Bangladesh Bank made some significant changes to different risk related policies and guidelines, which has a great impact on the overall financial performance of the bank.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section presented review of theoretical structures, risk management related policy and guidelines of the central bank and empirical risk-management literatures. It will establishing a conceptual structure, concludes by criticizing current ones and reveals research discrepancies on the effect of risk factors on commercial banks' financial performance in Bangladesh.

2.1 Literature Review Theoretical

As stated by Trochim (2006), theoretical structures direct researchers regarding the variables to calculate and their statistical relationships for analyzing the issues being studied. A theoretical structure is crucial for investigations that test deductive theories. Scientists are using theoretical structure in scientific thesis to establish a hypothesis. The theoretical structure is a basis for research strictures or limits.

This paper analysis its variables on the basis of three theories: (i) Shiftability Theory is linked with liquidity risk (ii) Finance distress theory related to liquidity risk and credit risk and (iii) Extreme value theory related to market risk.

2.1.1 Finance distress theory

According to Baldwin, et al. (1983), a corporation fell because it was unable to meet its financial obligations and ran into financial difficulties. The first sign of financial problem is loan-repayment default & dividend payout loss or decrease. Whitaker (1999) describes financial distress entrance in the first year when cash flows are below long-term debt repayment obligations maturities of a company. The company will pay creditors provided that cash flows meet current credit commitment. The primary issue distinguishing financially distressed businesses is their incapability to pay contractual loan commitment.

Significant financial distress results before failure of payment of debt. Wruck (1990) said companies are experiencing financial distress due to economic distress, deteriorating performance, impoverished risk management. Boritz (1991) defines a financial distress process beginning with an incubation period marked by a cycle of bad financial situation and inept organization committing expensive errors. A liquidity crisis in banks occurs when creditors are unable to meet demand for loans and deposits. Bank credit risks must also be discussed since they may direct to financial problem. Loans & Advances fund management is a significant determinant of company liquidity. Bank can monitor credit and liquidity risk to prevent financial distress.

Financial distress is a concept that takes a Bank's liquidity and credit risk into consideration. This theory provides an impartial assessment of the relationship between credit risk and the economic factors under study. The theories provide a neutral framework for conducting successful empirical investigation of this connection in banks since they provide evidence that the effects of financial stress occur before default risk.

2.1.2 Shiftability Theory of Liquidity

According to the shiftability hypothesis developed by Harold G. and Moulton in 1915, banks can most effectively protect themselves against significant deposit withdrawals by placing diversified credit or investment products on the secondary market as a liquidity reserve. The percentage of liquidity that banks retain as reserves could be trade or sold to other lenders and investors against cash. In addition, this liquidity reserve may be deposited to the Central Bank without any material loss, other than depending on its maturities to overcome their liquidity problems (Ngwu, 2006). It means that liquidity of a bank can be retained, if it has instruments that can be transferred or trade in cash to other creditors or investors. This observation states that, banks will increase its liquidity, if its assets are always sold, and if the Central Bank and the discount market are willing to buy the assets offered at a concession. Therefore, this theory accepts & maintains the characteristics of banks assets including its salability or transferability which is the basis of its liquidity. The study again argues that an excellent source of liquidity is highly marketable security kept by a bank. Dodds (1982) argues that these assets must satisfy three conditions to ensure convertibility without delay and significant losses.

According to Dodds (1982), the Liquidity Management Theory is stated that a bank collecting money from depositors and other investors and invest this money into a proper portfolio for a bank in particular. Different scholars have studied the theory of liquidity. In general, bank might finds it challenging to get the necessary liquidity during a time of distress situation, because of the trust in the market has seriously affected, and the creditworthiness is inevitably lacking. However, liabilities are a significant source of liquidity for a healthy bank. The Liquidity Shifting Theory specifically understands how financial output affected by liquidity risk through liquidity coverage ratio and net stable funding ratio, as outlined in the Basel III context. This study indicates whether the commercial banks' liquidity affects the returns to the stakeholders.

2.1.3 Extreme Value Theory

In the year 1709, Bernoulli stated that, the average distance from the source, when n points are randomly place in the straight line (Johnson, 1995). Financial companies through a large volume of business activities have shown themselves to be very exposed to extreme market movement. In due course, market risk measurement has become a priority for the central bank and their different risk management units. It includes metrics to demonstrate business risk exposure and the impact of risk reduction measures. To explain the risk of the market portfolio, financial institutions used Value-at-Risk (VaR) as a standard tool to measure the risk.

The maximum value loss over a specific period of time because of hazardous market circumstances is assessed at a set degree of confidence (Jorion et al., 1997). Banks fulfill the market risk criteria with a significant trading portfolio. Banks need to keep capital against its specific exposures to market risk which is the feature of the banks' own risk predictions.

Several alternative methods for estimating VaR have therefore been suggested, including the Extreme Value Theory. Extreme Value Theory (EVT) method allow VaR estimates based on the data on the tails only and can make different estimates for the left and right tails as opposed to the whole distribution (Diebold, 2000). To appropriately determine the level of risk portfolio exposure the organization contains, VaR must be evaluated with accuracy. But if the amount of risk is overestimated, banks may require maintaining excess capital to cover that overestimated risk, which may have better use elsewhere (Hull, 2012). The principle of EVT helps to assess the least amount of capital and highest capital to cover the business's risks. The banks must balance the market risk by controlling financial leverage to achieve this objective.

2.2 Bangladesh Bank Guidelines Review

2.2.1 Bangladesh Bank Guideline on Risk-Based Capital Adequacy

Quote:

Basel III is a set of international banking regulations developed by the Bank for International Settlements to promote stability in the international financial system. Basel III regulations are intended to mitigate the economic damage caused by excessive risk taking activities by banks. When the subprime crisis hit in 2007, issues with the initial arrangement were revealed. In November 2010, the members of the Basel Committee on Banking Supervision agreed on Basel III. The regulation was initially introduced from 2013 to 2015, but has been extended multiple times until January 2022. The Basel III regulations include some significant changes to the capital structure of banks. First, the minimum capital adequacy ratio as a percentage of assets has been increased from 2% to 4.5%. An additional 2.5% buffer is also required, which brings the total capital requirement up to 7%.

This buffer can be used during times of financial stress, but banks that do so are limited in their ability to pay dividends or otherwise allocate capital. These improvements must be made by banks within 2019, allowing them plenty of time to avert a sudden lending moratorium while they work to strengthen their balance sheets.

The Basel III refers to the Capital and Liquidity requirements recommended to promote the international banking system's stability by the Bank for International Settlements (BIS). BIS is the International Bank of Central Banks that functions as an international financial institution. One of six BIS committees is the Basel Committee for Banking Supervision (BCBS). In 1988 the Committee adopted the capital norm, known as Basel I. In 2004 it was replaced by Basel II due to certain flaws of Basel I. In the recent global financial crisis, Basel-II again seemed insufficient.

As a result, Basel III was intended to be implemented gradually and fully beginning in 2010 and continuing until January 1, 2013, respectively. Basel III protects the standard of capital and liquidity. In the previous versions, only the capital norm was included. Bangladesh introduced Basel I in the year 1996 and Basel II in 2010 (concurrently with Basel I started in 2009). In

compliance with Basel III, Bangladesh Bank (BB) has issued guidelines on Risk Based Capital Adequacy' vide BRPD circular no. 18 dated December 21, 2014 and gradual implementation of Basel III has started from January 01, 2015. Full implementation of Basel III in Bangladesh has been started from January 2019.

- **Risk area cover under Basel III guidelines:**

- Credit Risk
- Market Risk
- Liquidity Risk
- Operational Risk

- **Capital Standard**

Basel III has two parts: Capital Standard and Liquidity Standard. Capital Standard of Basel III is structured into three aspects, which are known as three pillars:

- ✓ Pillar 1 covers minimum capital, capital buffer, and leverage
- ✓ Pillar 2 covers Risk management and supervision and
- ✓ Pillar 3 covers Market Discipline

Pillar 1 of the Capital standard prescribes some ratios related to capital, which banks have to maintain as a minimum. Two such significant ratios are the Capital to Risk-weighted Asset Ratio (CRAR) and Leverage Ratio. On the other hand Liquidity Standard includes two ratios including Liquidity Coverage Ratio and Net Stable Funding Ratio.

- **Summary of Capital and Liquidity Requirements/ Roadmap of implementation of Basel III in Bangladesh**

	2016	2017	2018	2019	2020
Minimum Total Capital Ratio	10.00%	10.00%	10.00%	10.00%	10.00%
Capital Conservation Buffer	0.625%	1.25%	1.875%	2.50%	2.50%
Minimum Total Capital plus Capital Conservation Buffer	10.625%	11.25%	11.875%	12.50%	12.50%
Leverage Ratio	3%	3% Readjustment	Migration to Pillar 1		
Liquidity Coverage Ratio	≥ 100%	≥ 100%	≥ 100%	≥ 100%	≥ 100%
Net Stable Funding Ratio	>100%	>100%	>100%	>100%	>100%

Un-quote...

2.2.2 Risk Management Guidelines for Banks

Quote:

Because of the last global financial crisis, the banking industry worldwide endured a vulnerable situation. As consequences of the global financial crisis, Bangladesh has also been affected similar to other developing countries. As a result, worldwide poverty and human inequality have

risen considerably, and human capital growth metrics have degraded too. Although not clearly identified as a catalyst to the financial crisis, poor risk management was not identified as an underlying factor together with weak internal governance. Sound risk management strategies, where they existed, made institutions more prepared than others to survive the financial crisis. As foreign exchange and trade have increased, our ties between local banks and internationally renowned banks have grown. The competitions between the banks have improved and a modern & multifaceted stage has been developed for goods/services/technology. This led to a substantial rise in risk in the banking sector relative to previous years. The efficient conduct of business with internationally renowned firms, raising banking metrics of financial soundness to a satisfactory level, and maintaining financial constancy in the banking industry is the key to ensuring risk management culture/practices at the corporate level.

The creation of a workable strategy and risk tolerances at different levels, a thorough risk management strategy, and efficient reporting mechanisms for the management and supervisory responsibilities of the competent authority enable bank management to actively take risks and manage them as needed. Managing risk is an internal control aspect in all banking fields. Good corporate governance and sound risk management are closely related. The different roles of a banking organization cannot collaborate to meet the bank's goals without proper risk management. It is a vital part of the bank's growth and promotion of sustainability and resilience. There is no option but the safeguarding of appropriate risk management strategies in the competitive environment. So, banks must provide more emphasize to the constant development of the process of managing risk factors and set strategic planning/targets for their results. Risk management is best practiced when the core ideas and risk management components are widely applied throughout the banks, despite the fact that the degree and structure of risk management activities vary on the size and complexity of each bank.

The core discipline of each bank is the risk management which covers all the actions that impacted its risk portfolio. For introducing uniform Risk Management practices in banking industry of Bangladesh, Bangladesh Bank published "Risk Management Guidelines for Banks" vide DOS Circular no. 04 dated October 04, 2018.

The Central Bank of Bangladesh issues this policy in line of Section 45, Bank Company Act published in 1991 to identify and analyze possible risk through a structured process and managing the impact of this risk through implementation of appropriate response. This risk management process depends on appropriate planning and implementation of risk transfer, risk prevention, impact mitigation or risk acceptance.

These guides are established in accordance through globally agreed standards and best practices for risk management. These guidelines are consistent by the updated BCP for Successful Banking management released in September, 2012 by the Basel Banking Oversight Board (BCBS). The BCP's Risk Management Mechanism wants that banks should have a well defined

risk management procedure to define, evaluate, analyze, track, report, and reduce all substantive risks in an effective manner (including efficient risk management and supervision of senior management) and to review their capital adequacy and liquidity in connection to the market and economic risk condition. The method of risk management is proportionate to the bank's risk profile and structural significance. Basel's related core elements include Corporate Governance, Capital Adequacy, Credit Risk, Problem Assets Provisions and Reserves, Concentration Risk and Large Exposure Limits, Market Risk, Liquidity Risk, Operational Risk and Interest Rate Risk.

Un-quote ...

2.2.3 Bangladesh Bank Guidelines for Managing Core Risks in Banking

Quote:

As banking businesses are deregulated and globalized, it facing different types of internal and global risk factors at different level. Therefore, efficient risk management is essential for developing effective bank management to make sure sustainable results. The five core risk categories are listed below in the Guidance on the Management of Core Financial Risk Management, which was released in 2003 and recognizes the need of an effective risk management framework: A) Credit Risk; B) Asset and Liability/Balance Sheet Risk; C) Foreign Exchange Risk; D) ICC Risk; and E) Money Laundering Risk.

As a result of the publication of a guideline, banks are now able to estimate and manage the risks associated with their foreign currency holdings, interest rate sensitivity, and liquidity. This manual is used for calculating risks by using the gap analysis. To handle another core risk, a guideline on information & communications technology has been developed to ensure sufficient actions to protect information from illegal entrance, amendment, revelation and damage, so that its customer interest is completely secured. The revised version of ICT Security Guideline for Banks and Financial Institutions has been published in 2010. Banks are advised to follow the risk management guidelines in order to handle different risks factors prudently. It should be viewed as an addition to the current core risk management guidelines namely, risk-based capital adequacy, stress testing, and banking risk management in six key fields.

Un-quote ...

2.2.3.1 Bangladesh Bank Guidelines on Credit Risk Management (CRM) in Banks

Quote:

In 2003, Bangladesh Bank (Central Bank) released Industry Best Practices for 'Banking Core Risk Management' in five (5) regions to improve banks' risk management practices. The most relevant of them is definitely "Credit Risk Management" published in 2003 vide Bangladesh Bank, BRPD Circle No. 17 dated 17 October 2003, which has been subsequently revised through BRPD Circular No. 04 dated 8 March 2016. The guidelines for credit risk management (CRM) are prepared based on the Bank Company Act 1991 (amended in 2013), the Bangladesh Bank circulars and instructions for Credit Risk Management, Risk Management Guidelines, and the Capital Adequacy Structure for risk-based investment according to Basel II & III. All this policy

and guiding principle are used for detection; assessment, management, and control of credit risk in the banks operating in Bangladesh.

These policies constitute minimum principals for credit correlated functions and are not a replacement for good decision and skill. It aims to improve the culture of risk management, develop criteria for the segregation of roles and responsibilities, and contribute to the uninterrupted development in Bangladesh's banking sector. Banks are responsible for developing, nursing, and ensuring compliance on core credit principles to implement very effective credit operations.

- **Credit risk as range of possible outcomes**

- Credits are typically the more extensive and most apparent lending risk source. Credit risk, however, may be influenced by the on-balance sheet and off-balance sheet activities like guarantees. It may result from incapability or a failure to carry out in the contractual fashion previously committed. Credit risk comes from banks dealing with households, SMEs, corporate customers, other banks, financial institutions, or a sovereign from banks dealing with households.
- The credit risk emerges from the probability that the creditor of a bank will fail to compliance with its negotiated terms with the bank, which has a negative impact on the bank's profitability and its capital base.
- "Loan" is used as shortcuts for all potential exposures of a single client or group of client in all the corresponding segments on credit risk management. It should be understood that several transactions, including off-balance sheet transactions, presence of credit risk for the bank and that these guidelines are applicable to all such transactions.

- **Concentration risk**

A bank may have a high credit risk and poor credit risk management even if its policies and processes for managing loans are acceptable, if its credit book is concentrated. A concentration risk occurs when a bank invests most of its assets into individuals, organizations, industries, or instruments. Returns to concentrated operations and sectors might result in significant losses for the bank in terms of its resources or endanger the bank's health or capacity to continue operating its main businesses. The following credit concentration threats should be taken into account by banks:

- Sector-wise exposure,
- Division wise exposure (Geographic Concentration),
- Group wise exposure (Outstanding amount),
- Single borrower wise exposure (Outstanding amount),
- Top borrower wise exposure (Top 10-50 borrowers will be counted)

Banks must set internal concentration limits in all possible concentration risk dimensions. Therefore, if any portion of a bank's loan portfolio is concentrated, it must try to decrease the

amount of loans, collect capital, or combine both actions. The establishment of concentration limits in all possible credit portfolio facets is an integral part of credit risk management.

- **Exposure Limits:** As per Bangladesh Bank prudential guidelines for Banks on selected issue published on January, 2014 vide BB circular no. 02/2014:

a) Single Person/Counterparty or Group:

- The outstanding amount including funded and non-funded on account of a single customer or a group of companies will not be more than 35% of its total capital.
- The outstanding funded amount will not be more than 15% of its capital.
- For export oriented companies, the outstanding amount including funded and non-funded on account of a single customer or a group of companies will not be more than 50% of its total capital. Though, the outstanding funded amount will not be more than 15% of its capital.

b) Large Loan:

- Large loan define as any credit facilities approved by a bank favoring a single customer or a group of companies, which is equal to or greater than 10% of its capital.
- Any banks will approve large loans up to bellow loan limits set as per their individual default loans:

Rate of Net Default loans	Large Loan Portfolio Ceiling against Bank's Total Loans & Advances
Up to 5%	56%
More than 5% but up to 10%	52%
More than 10% but up to 15%	48%
More than 15% but up to 20%	44%
More than 20%	40%

- **Risk appetite statement**

Risk appetite is the degree and type of risk that a bank is competent and ready to take into accounts in its exposures and activities known its business goals and responsibilities for stakeholders (investor, depositors, shareholders, borrowers, regulators). Credit Risk Management starts with a substantial risk appetite statement, which is a robust. The Risk Appetite Statement shall be accepted by its respective board and other delegated authorities. Risk appetite is commonly represented by quantitatively and qualitatively, and will be considered extreme circumstances, actions, and outcomes. The probable effect on profitability, capital, and liquidity would be identified and comply with the Banks' strategies and plans. The credit Risk Appetite Statement shows how the total risk appetite of a bank is accurately stated at all the business level. In case of credit risk, the risk appetite statement should explicitly calculate the bank's estimated maximum loss for all credit products, including off-balance sheet items such as LC and

Guarantees. It is important to define the maximum estimated losses, so that business units that take credit risk know where the bank wants to be in accordance with the risk and return trade. The bank should also indicate the least predictable losses as a bank may take too little risk and face low earnings.

All banks must have a well organized credit policy as part of a total credit risk management system which should be approved by its board of directors. The Credit Policy must be included the bank's view on the business growth importance and the terms of the approved loans. The Credit Policy must be regularly revised on the basis of regular changes into the internal and external situations. In order to make this workable, Credit Policy must be communicated effectively to all part of the bank. It should be circulated to all credit related authorities and loan processing officials. In case of any deviation of the Credit Policy, must be properly communicated to the management authorities and Board and appropriate corrective actions must be taken immediately as guided by the competent authority of the Bank.

2.2.3.1.1 Organizing Credit Risk Management

- **Role of the Board of Directors**

The Board of Directors of a Bank is the supreme authority for loan approval and managing all related risk. The Board is responsible for approving credit risk management related policies and guidelines on the basis of total business policies of the bank. This policies and guidelines should be reviewed regularly by the Bank's Board depending on the updated market conditions.

- **Role of Senior Management**

The Bank's senior management is responsible for transforming policy and procedures of the bank in strategic directions defined by its Board. Senior management must ensure that policies are incorporated into the bank's culture. Senior management shall be responsible for enforcing the Bank's credit risk management policies and ensuring that credit risk management and the quality of the credit portfolio are handled and controlled in compliance with these policies approved by its Board.

- **Role of the Credit Risk Management Committee**

Bank should have a well established credit risk management committee (CRMC) headed by the Chief Risk Officer (CRO) of the Bank and all the business and risk management related unit heads of the bank. This committee shall report to the Risk Committee and the Board, who are empower to control credit risk related actions and overall credit risk management practices of the Bank.

Un-quote ...

2.2.3.1.2 Managing Credit Risk in the Origination Process

Quote :

- **Borrower evaluation**

Borrower evaluation is the first step of credit risk management process, which starts by receiving loan application from the borrower. The most important information for any bank is that, whether or not the borrower has a solid credit history and the ability to repay the loan. If so, the bank should be able to make an adequate return on the loan without charging the borrower higher interest that they might not be able to pay.

- **Internal credit risk rating system (ICRRS)**

An ICRRS should classify all credits into different classes based on the fundamental credit standard. In line with the regulatory authority's prescription, banks should extend an internal credit risk rating system in keeping with the type, scale and complexity of bank's activities. Risk grading should be categorizing as per credit facilities. If any risk deterioration is detected, a borrower's risk rating and facilities should be adjusted immediately. A Bank's board of directors must approve this rating system.

To establish an effective credit risk management system, an up to date credit risk rating system must be introduced. In the year 1993, Bangladesh Bank implemented the Lending Risk Analysis (LRA) framework for all credit facilities over Tk. 1.00 crore. However, the LRA structure did not tried to initiate a Risk Grading System for unclassified credit facilities. In the year 2005, the Central Bank of Bangladesh introduced Credit Risk Grading (CRG) system for all the customers of the banks vide its circular no. BRPD – 18/2005. As per Credit Risk Grading guideline of Bangladesh Bank, risk grading was mandatory for all type of credit exposure excluding SME loan, Consumer Loan, Agriculture Loan and Micro-finance. After a certain period of time, the Central Bank of Bangladesh realized requirement for modernization of Credit Risk Grading system to deal with the increasing complication in the current dynamic banking practices. To adobe the recent changes in the Banking industry, the Central Bank of Bangladesh published guiding principle for modern credit rating system vide its circular no. BRPD- 16 dated 30/10/2018, which is known as Internal Credit Risk Rating (ICRR). It includes 20 different rating outlines for 20 nos. of different industries/sectors as a replacement for one pattern for all the industries/ sectors like CRG model. In ICRR model, separate measures are used for evaluating the customers of different industries/sectors.

The comparison between CRG and ICRRS are as follows:

Particulars	CRG (year 2005 to 2019)	ICRRS (effective from July 01, 2019)
Scope	Valid for all credit facilities other then: 1. Consumer Loan 2. SME Loan 3. Short-Term Agricultural and Micro-Credit.	Valid for all credit facilities other then: 1. Consumer Loan 2. SME Loan exposure less than BDT 5 million. 1. Short-Term Agricultural and Micro-Credit

		2. Loan to Bank, NBFI & Insurance.	
Sector wise rating criteria	Common for all		20 different sectors.
Emphasis	Development of Credit Risk Management System.		Analyze borrower's repayment ability; i.e. DSCR & IC to be derived logically, Coverage has highest score of 15.
Rating Scale	8 notched rating system		4 notched rating system
	Rating Grade	Score	Restriction/condition for extending loan
	Superior	100% covered	No
	Good	85+	No
	Acceptable	75-84	No
	Marginal/ Watch list	65-74	Yes
	Special Mention	55-64	Yes
	Sub Standard	45-54	Yes
	Doubtful	35-44	Yes
	Bad & Loss	<35	Yes
Rating Component and associated weight	Quantitative/ Financial: 50% Qualitative 50%		Quantitative/ Financial: 60% Qualitative 40%
	Risk Component	Weight	Risk Component
	Financial	50%	Financial
	Business/ Industry	18%	Performance Behavior
	Management	12%	Business and Industry
	Security	10%	Management
	Relationship	10%	Security
			Relationship
			Compliance
Components and associated risk weight of Quantitative Indicators	Quantitative Indicators		Weight
	1. Leverage (15%)	Debt Equity Ratio	15
	2. Liquidity (15%)	Current Ratio	15
	3. Profitability	Operating Profit	15
	Quantitative Indicators	Weight	
	1. Leverage ratios (10%)	Debt to Tangible Net-worth	7
		Debt to Total Asset	3
	2. Liquidity ratios	Current Ratio	7

	(15%)	Margin		(10%)	Cash Ratio	3
	4. Coverage (5%)	Interest Coverage	5	3. Profitability ratios (10%)	Net Profit Margin	5
	Total (50%)		50		Return on Asset	3
					Operating Profit to Operating Asset	2
				4. Coverage ratios (15%)	Interest Coverage	3
					Debt Service Coverage Ratio	5
					Financial Debt to Operating Cash Flow	4
					Cash Flow Coverage Ratio (CCR)	3
				5. Operational Efficiency (10%)	Stock Turnover Days (STD)	4
					Trade Debtor Collection Days (TDCD)	3
					Asset Turnover	3
				6. Earning Quality (5%)	Operating Cash Flow to Sales (OCFS)	3
					Cash flow based accrual ratio (CAR)	2
				Total (60%)		60
Components and associated risk weight of Qualitative Indicators	Qualitative Indicators		Weight	Quantitative Indicators		Weight
	1. Business/ Industry Risk (18%)	Size of Business	5	1. Performance Behavior (10%)	Repayment Behavior for Banks Borrowings	9
		Age of Business	3		Repayment Behavior with Suppliers/ Creditors	1
		Business Outlook	3	2. Business and Industry	Sales Growth	2
		Industry Growth	3		Age Of Business	2
		Market Competition	2			

		Entry/ Exit barrier	2	Risk (7%)	Industry Prospects	1
	2. Management Risk (12%)	Experience	5		Long-Term External Credit Rating Of The Borrower	2
		Succession	4	3. Management Risk (7%)	Experience Of The Management	2
		Team Work	3		Existence Of Succession Plan	2
	3. Security Risk (10%)	Security coverage	4		Auditing Firms	2
		Collateral coverage	4		Change In Auditors In Last 4 Years	1
		Support	2	4. Security Risk (11%)	Primary Security	2
	4. Relationship Risk (10%)	Account Conduct	5		Collateral	2
		Utilization of limit	2		Collateral/ Security Coverage	5
		Compliance of covenants/ condition	2		Type Of Guarantee	2
		Personal Deposit	1	5. Relationship Risk (3%)	Account Conduct	3
	Total (50%)		50	6. Compliance Risk (2)	Compliance With Environmental Rules, Regulations And Covenants	1
					Corporate Governance	1
				Total (40%)		40
Supplementary force on rating score	N/a			1. If score of quantitative part is less than 50%, ICRR will be Unacceptable. 2. For new project with projected financial, ICRR shall not be better than Marginal. 3. Companies under large business conglomerate, rating substitution is allowed based on the rating of Corporate Guarantor. 4. If submitted Audited Financial statement is older than 18 months, rating will not be better than Marginal. 5. Rating shall be downgraded if adverse post		

		balance sheet event occurs.
Origination and segregation of job	CRG to be originated by RM in consultation with SRM and to be checked by the Credit Officer in consultation with Senior Credit Officer. Finally Credit Officer to pass the approved CRG to related departments.	Quantitative part to be conducted by Credit Officer/ analyst, and RM/ Branch Manager shall complete qualitative part. Executive Summary of ICRR to be approved and signed by CRO or by respective loan approval authority below CRO. Finally RM to pass the approved ICRR to related departments.
Emphasis on latest Audited Financial	N/A	1. Bank shall use latest Audited Financial Statement. 2. If audited financial is 18 months old for any valid reason, unaudited financial may be accepted for the purpose of ICRR, but rating shall not be better than Marginal for this case. 3. Audited Financial by recognized or BSEC listed auditors will get full score of 2 in rating. 4. Change in auditor in last four years, will also carry 1 mark in rating. 5. Unaudited financials can be taken for Proprietorship and Partnership concerns and due diligence to be conducted.
Audit	N/A	Routine internal audit to check whether ICRRS is functioning as instructed.
Restriction on extension of loan	For large loan only: 1. No fresh sanction of loan, if Marginal. 2. No sanction nor renewal of loan, if Special Mention.	1. No fresh sanction for Unacceptable account, except 100% cash covered, fully guaranteed by Government of MDB or the loan is of state-owned organization/ project. 2. Renewal & Enhancement of Unacceptable account is allowed for maximum 2 times.
Management Action Triggers	In case of Marginal and below, credit risk may be accepted if the exposure is additionally collateralized through cash collateral, good tangible collaterals and strong guarantees.	1. In case of Marginal cautionary measure to be taken and banks must satisfy themselves on the future prospect of the business, additional collateral coverage etc. Close monitoring is required. 2. If any individual risk criteria falls under Marginal/ Unacceptable, whatever the aggregate score is, RM shall evaluate the respective impact on loan repayment and justify how those risks are mitigated.
Maintaining Database	Bank should have comprehensive MIS report on CRG	Bank must maintaining portfolio level database of ICRR and maintain risk appetite/ tolerance level

			for portfolio.
Review Frequency	Superior/ Good/ Acceptable	Annually	At least annually at the time of annual/ regular credit review.
	Marginal/ Watch list	Half Yearly	
	Special Sub Mention/ Standard/ Doubtful/ BL	Quarterly	

- **The role of external credit assessment institutions (ECAIs)**

The ECAI may be very helpful tools for the credit analyst of the banks, while analyzing a borrower's credit worthiness. Banks may use its assessment of the borrowers' worthiness as the critical determinants of its decision making as part of credit risk management policies and credit underwriting practices.

- **Analysis of specific borrower repayment capacity**

Lenders need to know how to review financial statements submitted against loan applicants to make sound credit decisions. In the context of commercial credit analysis operations, lenders are required to adopt sound risk management practices. When creditors try to assess borrowers, there is no substitute for a detailed and comprehensive review of their financial statements. All the historical and projected financial statements represent the capability of the borrowers for repayment of loan timely. However, financial statement is not only parameters for credit decision making, there are some other subjective issues may take into consideration including the management capability of the borrowers while taking credit decision. Management capability evaluation of the borrowers is based on both subjective and objective factors, because only subjective factors, i.e. ratio analysis does not shows the borrowers management's intention or willingness to repay a loan on time. So, the credit analyst of a bank must make serious attempt to decide the capability and integrity of the borrower's management in each case. The lending size should depend on the borrower's credit requirement, repayment capability, business conditions, economic conditions, and the appetite for the banking risk. In order to avoid concentration risk, restrictions should also be set for each commodity, company, specific industry, the economic and geographical areas. If the borrower's credit rating deteriorates, the credit limits should be assessed regularly, at least semi-annually or more often. The borrower sometimes needs to share credit limits with its associated businesses. If transactions are regular and large, banks should review specific arrangements and enforce the required limits.

- **Risk-based loan pricing**

The loan pricing must cover its all cost including a certain number of basis points over the tenor of the loan account as per following details:

- Cost of funds- the cost of deposit and overall cost of the operation of the bank.

- Expected loss- Amount of basis points that match the expected loan loss, which would be higher on high credit-risk and lower on low credit-risk.
- Cost of allocated capital- The cost of the assigned capital shall be the amount of capital provided as a cover of unforeseen loss of the bank as a whole by the bank as the basis point of its target return on equity. For simplification purposes, banks also use the risk-based capital requirement as a proxy for capital allocation.
- Term cost of liquidity- Term cost of liquidity is a base point, which consider additional interest rate risk for matching long term deposit or fund to allow long term credit facilities.
- Cost of liquid asset buffer- In certain conditions, a mixture of current deposit, savings deposit, and fixed funds can become stable funds. However, in extreme adverse and unusual conditions when deposits decreases rapidly, and the bank may be forced to sell its assets at low prices rapidly or to raise new deposits or other funds at high rates to meet the demand. Therefore, for these unforeseen circumstances, a liquid asset buffer must be maintained. Though, from this buffer asset banks may not earn interest income but bank will have to pay interest to the depositors, so that, this cost must be included in the loan pricing.
- Loan administration costs- the administrative cost incurred by the bank to process any loan proposal while calculating risk based loan pricing.
- Competitive margin- Eventually, the bank can apply a number of basis points to gain a margin after all other expenses have been included in the risk based interest rate. This is the only part of the interest, which has been fixed by the banks at their own decision depending on the accepted premium against the level of risk associated with the loan exposure. To take the competitive advantages, in some special cases bank may consider this part as negative margin which will reduce the overall risk base interest rate of a loan exposure.

- **Basic approval authority principles**

The board of directors of a bank may provide management the authority to authorize or approve loans based on their senior management's skills and knowledge. Authority to approve a loan request should be delegated to certain senior managers rather than any executive committees of a bank in order to maintain openness in the approval process. A risk rating hierarchy based approving structure need to develop for a bank where approving authority depends on the risk rating score of the loan proposal or portfolio, i.e. higher level of risk based proposals should be approved by the higher level of authority.

- **Disbursement**

The credit administration division will allow the approved credit limit into the core banking system or banking software after getting loan approval from the competent authority of the bank and completion of loan related documentations as per documentation check list. In case of any deviation of approval/ sanction advice or any documentation deferral, the business unit must obtain approval from the competent authority for allowing loan disbursement. Before completion

of approval or documentation process the credit administration unit must not allow any loan disbursement in any case.

- **Credit Risk Mitigation**

To mitigate credit risk up to a certain level, a bank may execute a contract with the credit customer or any third party to comply certain terms and conditions. Collateral coverage and guarantee may be used as tools to mitigate credit risk as well. The credit risk mitigation strategies are not an alternative for proper credit risk management process. The collateral coverage and guarantees are not the primary source of credit repayment or credit risk mitigation, they are the supporting factors when any customer failed to repay bank debts from its regular cash flows. Realization of loan through sale off collateral against credit facilities or call up the guarantees in any forced situation is a lengthy process and involved additional cost. A credit facility is called collateral dependent when sale proceeds of the collateral or cash generated through operation of collateral are considered as the sources of loan repayment.

Good collateral must have a certain characteristics including its possession, certainty of value, marketability and control over the collateral. Though cash flow is the main sources of credit repayment but proper valuation of collateral property is also necessary considering the forced measure situation. Although, the market value of the collateral property may be change time to time due to different reasons, the bank should conduct revaluation of the collateral properties through any enlisted third party survey company after a certain periodic basis, particularly when a credit facility become NPL. The borrower may initially utilize strong collateral to satisfy bank obligations or supplier credit when credit facilities become NPL.

2.2.3.1.3 Managing Credit Risk in the Administration Process

Banks must closely track the borrowers' financial status on regular basis. Profitability, equity, leverage and liquidity are the key factors to be considered while analyzing financial performance of a borrower. The role of the borrower within the industry, its operation and other external factors such as economic conditions, government policies and regulations should be taken into consideration during such analyzes. For the small and medium-size businesses enterprises where the key management person takes most of the major decisions, the bank must pay special attention while assessing the ability or capabilities of the key management of these types of borrowers. For the existing customers, banks should track the borrower's account transactions, the repayment track record and excesses over credit limits. Banks must track the due dates of trust receipts/ bill maturity or any request for extended tenor, if any for trade finance. The Banks should periodically review the approved credit facilities with a view to ensuring that, the borrower can comply with the financial arrangements written in the credit agreement or sanction advice. Any deviation of the sanction terms should be addressed quickly.

Review of credit facilities involved strengthening the bank's position on borrower accounts and improving bank's interest as well in the event of default situation. The loan analysis should

highlight errors in order to strengthen the bank's security and its ability to address the issues. Greater protection may be advised in the event of declining credits.

2.2.3.1.4 Timely identification of Problem Assets

- **The role of provisioning in managing credit risk**

Loan loss provisions are an accounting entry on the liability side of the balance sheet, which would be accumulated by debiting from operating profit of the income statement. Loan provision amount will be calculated on the basis of possible loan loss against any credit exposure. General provision are calculated on total unclassified and special mention account portfolio of the total loan exposure considering there may be some loan assets which may have potentiality to be default in near future. Special provision is applied for the entire classified loan considering the possible loan losses in future. According to Bangladesh Bank master circular for loan classification and provisioning vide BRPD circular no. 14 dated September 23, 2012 and its subsequent amendments, entire credit facilities are categorized into four types, including (i) Continuous Loan (ii) Demand Loan (iii) Fixed Term Loan and (iv) Short-term Agricultural Loan and Micro-Credit.

Continuous & Demand Loans are classified as:

- ✓ Sub-standard (SS) - if overdue for 3 months but less than 9 months.
- ✓ Doubtful (DF) - if overdue for 9 months but less than 12 months.
- ✓ Bad & Loss (BL)- if overdue for 12 months or more.

Fixed Term Loans are classified as:

- ✓ Sub-standard (SS) - if overdue for 6 months but less than 12 months.
- ✓ Doubtful (DF) - if overdue for 12 months but less than 18 months.
- ✓ Bad & Loss (BL)- if overdue for 18 months or more.

Short-term Agricultural Loan and Micro Credit are classified as:

- ✓ Sub-standard (SS) - if overdue after a period of 12 (twelve) months.
- ✓ Doubtful (DF) - if overdue after a period of 36 (thirty-six) months.
- ✓ Bad & Loss (BL) - if overdue after a period of 60 (sixty) months.

Any continuous loan, demand loan or fixed term loan remains overdue for 02 months and above but less than 03months than it's categorized as a "Special Mention Account (SMA)".

The Bank has to maintain the following general and specific provision against classified and unclassified loans:

- **General Provision requirement for Unclassified Loans and advances:**

Type of Loan	Standard	Special Mention Account	Standard	SMA
Small & Medium Enterprise Financing (SMEF)			0.25%	0.25%
Consumer Financing (Other than HF & LP)			5%	5%

Consumer Financing (Other than HF & LP) - Credit Card	2%	2%
Consumer Financing (House Financing, HF)	1%	1%
Consumer Financing (Loans for Professional to setup business, LP)	2%	2%
Loans to BHs/ MBs/ SDs against Shares etc.	2%	2%
All Other Credit	1%	1%
Short Term Agri. Credit & Micro Credit	1%	1%

- **Specific Provision requirement for Classified Loans and advances**

Loan Status	Type of Loan	Rate of Provision
Substandard	Short Term Agri Credit & Micro Credit	5%
	Other than Short Term Agri Credit & Micro Credit	20%
Doubtful	Short Term Agri Credit & Micro Credit	5%
	Other than Short Term Agri Credit & Micro Credit	50%
Bad/Loss	All types of credit facilities	100%

- **General Provision requirement for off-balance sheet exposures:**

As per Bangladesh Bank, BRPD circular no. 07 dated June 21, 2018, all banks must be maintained 1% general provision for all the outstanding off-balance sheet exposure. However, according to BRPD circular no. 13 dated October 18, 2018, banks were given exemption from maintaining any provision for those guarantees against which the counter-guarantees are issued only by the Multilateral Development Banks (MDBs)/International Banks having a BB rating grade '1' equivalent outlined in the guidelines on Risk Based Capital Adequacy (Basel III). Now the required provision for the guarantees has been amended in line with their relevant counter-guarantees as per details below:

BB rating grade equivalence of the Bank/financial institution/organization providing the counter-guarantee	Provision requirement (% of the exposure amount)
1	Nil
2	0.50
3 or 4	0.75
Others	1.00

- **Base for Provision:**

For eligible collaterals of the following types, provision will be maintained at the stated rates above on the outstanding balance of the classified loans less the amount of Interest Suspense and the value of eligible collateral:

- Deposit with the same bank under lien against the loan
- Government bond/savings certificate under lien
- Guarantee given by Government or Bangladesh Bank

For all other eligible collaterals, the provision will be maintained at the stated rates above on the balance calculated as the greater of the following two amounts:

- i. Outstanding balance of the classified loan less the amount of Interest Suspense and the value of eligible collateral
- ii. 15% of the outstanding balance of the loan

- **Eligible Collateral:**

In the definition of 'Eligible Collateral' the following collateral will be included as eligible collateral in determining base for provision:

- 100% of deposit under lien against the loan
- 100% of the value of government bond/savings certificate under lien
- 100% of the value of guarantee given by Government or Bangladesh Bank
- 100% of the market value of gold or gold ornaments pledged with the bank.
- 50% of the market value of easily marketable commodities kept under control of the bank
- Maximum 50% of the market value of land and building mortgaged with the bank
- 50% of the average market value for last 06 months or 50% of the face value, whichever is less, of the shares traded in stock exchange.

2.2.3.1.5 Managing Credit Risk with appropriate MIS

For analyzing the current and potential risk and to set strategic planning for managing those risks, the Management Information System (MIS) must generate worthy dataset for the bank's Management and Board of Directors on a periodic basis. The business unit must provide and uphold a correct database for all information related to application of loan for both approved and rejected facilities, collateral and other security. The guideline for managing accurate MIS must be included into the banks Credit Risk Management manual. Data archiving events and MIS must be appropriate for developing credit scores and models to be established when necessary.

2.2.3.1.6 Rescheduling as a means to managing credit risk

The borrower may find itself in financial distress situation for any unusual circumstances and unable to repay the loan as per prescheduled terms and conditions, which results the outstanding loan portfolio become classified. In such situation, the banks may allow rescheduling facility to the borrower for the outstanding classified loan by extending the validity of the outstanding loan and re-fixation of the repayment schedule for regularization of outstanding loan and continuation of smooth business operations. According to Bangladesh Bank, BRPD circular no. 15/ 2012 and BRPD circular no. 06/ 2013, rescheduling facility will be allowed for a minimum reasonable period of time. Time limit for rescheduling of different categories of loans is as follows:

- **Time limit for rescheduling Continuous Loan**

The loan account in which transactions may be made within certain limit and have an expiry date for full adjustment will be treated as Continuous Loan. The classification category wise maximum tenor allowed from the date of rescheduling as details bellow:

Frequency	Classified as Sub-standard (SS)	Classified as Doubtful (DF)	Classified as Bad & Loss (BL)
First time rescheduling	maximum 18 months	maximum 12 months	maximum 12 months
Second time rescheduling	maximum 12 months	Maximum 09 months	Maximum 09 months
Third time rescheduling	Maximum 06 months	Maximum 06 months	Maximum 06 months

Conditions: If the amount of defaulted installments after rescheduling is equal to the amount of 3(monthly) installments, the loan will be classified as Bad & Loss (BL).

- **Time limit for rescheduling Demand Loan**

The loan which becomes repayable on demand by the bank is treated as Demand Loan. The classification category wise maximum tenor allowed from the date of rescheduling as details bellow:

Frequency	Classified as Sub-standard (SS)	Classified as Doubtful (DF)	Classified as Bad & Loss (BL)
First time rescheduling	maximum 12 months	maximum 09 months	maximum 09 months
Second time rescheduling	maximum 09 months	maximum 06 months	maximum 06 months
Third time rescheduling	maximum 06 months	maximum 06 months	maximum 06 months

Conditions: If the amount of defaulted installments after rescheduling is equal to the amount of 3(monthly) installments, the loan will be classified as Bad & Loss (BL).

- **Time limit for rescheduling Fixed Term Loan**

The loan which is repayable within a specified time period under a prescribed repayment schedule is treated as Term Loan. The classification category wise maximum tenor allowed from the date of rescheduling as details bellow:

Frequency	Classified as Sub-standard (SS)	Classified as Doubtful (DF)	Classified as Bad & Loss (BL)
First time rescheduling	maximum 36 months	Maximum 24 months	Maximum 24 months
Second time rescheduling	Maximum 24 months	Maximum 18 months	Maximum 18 months

Third time rescheduling	Maximum 12 months	Maximum 12 months	Maximum 12 months
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Conditions: If the amount of defaulted installments after rescheduling is equal to the amount of 3(monthly) installments, the loan will be classified as Bad & Loss (BL).

- **Time limit for rescheduling for Short-term Agricultural and Micro-Credit**

For rescheduling of classified Short-term Agricultural loan and Micro-Credit, the expiry date will be extended for 06 months from the existing and re-fix the installment repayment schedule; however repayment will be started from the date of rescheduling. In case of rescheduling after the existing expiry date, the time limit will be as details bellow:

First time rescheduling	Time limit should not exceed 2 years from the date of rescheduling.
Second time rescheduling	Maximum year from the date of 2 nd rescheduling.
Third time rescheduling	Maximum 6 months from the date of 3 rd rescheduling.

After third time, the bank will not considered any further rescheduling considering the borrower as a willful defaulter. Any rescheduling proposal should be approved by the authority, which initially approved the credit proposal.

- **Down payment requirement for Term Loans & Agriculture and Micro Credit :**
- Down payment for first time rescheduling will be the cash deposit of minimum 15% amount of the overdue installments or 10% of the total outstanding amount, whichever is lower;
- Down payment for second time rescheduling will be the cash deposit of minimum 30% amount of the overdue installments or 20% of the total outstanding amount, whichever is lower;
- Down payment for third time rescheduling will be the cash deposit of minimum 50% amount of the overdue installments or 30% of the total outstanding amount, whichever is lower;
- The down payments for Short-term Agricultural loan and Micro-Credit will be as above.

- **Down Payment for Demand & Continuous Loan:**

- i) In case of conversion of Continuous Loan or Demand Loan into Term loan, the down payment requirement for first time rescheduling will be as details bellow:

Overdue Loan Amount	Down payment
Any amount up to Tk1.00 crore	15%
From Tk 1.00 crore to Tk.5.00 crore	10% (but minimum Tk.15.00 lac)
More than Tk. 5.00 crore	5% (but minimum Tk.50.00 lac)

- ii) For second time rescheduling down payment will be minimum 30% of the overdue installments or 20% of the total outstanding amount, whichever is lower. Subsequently, for third time rescheduling down payment will be minimum 50% of the overdue installments or 30% of the total outstanding amount, whichever is lower.

However, considering different difficult economic situation of the country and to support smooth business operation Bangladesh Bank allowed relaxation of rescheduling policy for a particular time period like BRPD circular letter no. 05/2019 regarding rescheduling and exit policy of the defaulter borrowers with application deadline up to February 04, 2020. Under the circular BB had opened a special bailout scheme for loan defaulters with 2% down payment and a long 10-year repayment facility with one-year grace period. The circular also extended one time exit facility with maximum interest waiver for the defaulters. The circular said there would be no new credit facility for the defaulted borrowers, who will be the beneficiary of the special rescheduling facility.

2.2.3.1.7 Restructuring as a means to manage Credit Risk

The borrower may find itself in financial distress situation in permanent nature and its cash follow is not supportive to repay the loan as per prescheduled terms and conditions, than restructuring may be necessary by extending the validity of the outstanding loan and re-fixation of the repayment schedule for ensure timely repayment and continuation of smooth business operations. According to Bangladesh Bank, BRPD circular no. 15/ 2012, the term to maturity of a term loan may be extended subject to the following conditions and restrictions:

- a) The outstanding loan must unclassified
- b) The approval must be taken from approving authority from where the loan was initially approved.
- c) The extended maturity date must not exceeding 25% of the residual time to maturity.

2.2.3.1.8 Credit Recovery

Banks shall develop a process follow to ensure that all developments in the recovery process are regularly monitored. During the operation of credit recovery process, the following issues are addressed:

- Identify the plan/strategy for account recovery.
- All available alternatives to maximize recovery.
- Provision is made on the basis of actual and predicted losses.
- Timely monitor the recovery of NPL accounts.

2.2.3.1.9 Write-off, repossession, and disposition of collateral

If a bank realized that, the collection process of any NPL account is longer or uncertain, the bank can 'write off the account (i.e. the outstanding amount of the NPL account is excluded from the assets portion of the balance sheet by debiting from its net income after excluding interest suspense and provision maintained against the account, if any).

Bangladesh Bank vide, BRPD circular no. 02/2003 and BRPD circular no. 13/2013 amended vide BRPD circular no. 01/ 2019 published guidelines for classified loan write off for a Bank. Bad loan Write off is a globally recognized practice in the banking industry. Through write off process bank can able to clean its balance sheet by washing Bad Loan from this total outstanding

Loans & Advances; this will improve its NPL ratios. Banks have to follow the guidelines bellow for write off Bad Loan:

- ✓ Banks may write off any outstanding loan amount classified as Bad & Loss (BL) for more than three years.
- ✓ Bank must try to recover the loan amount by liquidation of mortgaged collateral and or from the guarantors through legal process before write off.
- ✓ Bank must maintain provision after deduction of interest suspense from the loan outstanding amount. Shortfall if any may be adjusted from the current year income of the Bank.
- ✓ Partial loan amount write off are not allowed for any account of the Bank.
- ✓ Bank must obtain approval from their Board of Directors for write off any outstanding loan amount.
- ✓ Bank must continue its effort for realization of write off loans. Before write off any BL account, legal action must be taken through the court of law. However, Bank can write off loan amount up to BDT 2,00,000 without filing any case.
- ✓ A separate "Debt Collection Unit" should be set up in the bank for recovery of written off loans.
- ✓ In order to accelerate the settlement of law suits filed against the written off loans or to realize the receivable written off loans any agency outside the bank can be engaged. A separate ledger must be maintained for written off loans and in the Annual Report/Balance Sheet of banks there must be a separate "notes to the accounts" containing amount of cumulative and current year's loan written off.
- ✓ In-spite of writing off the loans the concerned borrower shall be identified as defaulter as usual. Like other loans and advances, the writing off loans and advances shall be reported to the Credit Information Bureau (CIB) of Bangladesh Bank.

Un-quote ...

2.2.3.2 Bangladesh Bank Guidelines on Assets Liability Management (ALM)

Quote:

One of the main challenges for the banking sector is the management of assets and liabilities to facilitate sustainable growth. The management of liquidity and market-risk in banks has great concern of the global regulators and supervisors after the Global Financial Crisis (from 2007 to 2010). The outcome of this concern has been well expressed in Basel's operations, when Basel III has been formulated. The risk factors are mainly addressed by liquidity (LCR and NSFR) and leverage ratios. For the banking sector, Bangladesh Bank has already adopted the Basel III Guideline. Since September 2015, the Liquidity Ratios have been implemented as per Bangladesh Bank guideline for Basel III. In comparison, the criteria for the leverage ratio will become a separate additional Pillar 1 capital standard for banks from January 2018 as per final adjustment of Basel III guideline by BB in 2017. Banks' Asset and Liability Management (ALM) will be based on the above three ratios after the introduction of Basel III guidelines. Asset and

Liability Management (ALM) is an important mechanism for banking industry, so it should be managed efficiently, otherwise it will create threat for the sustainability of the industry. In accordance with Asset Liability Directive (ALD) guideline published in the year 2016 by the Central Bank of Bangladesh, every commercial bank must have its own ALM policy, which has been approved by its board of directors. The management and the board of a bank shall understand the risks associated with the assets and liabilities to formulate ALM policy.

Asset and Liability Management Committee of a bank mainly developed with its senior management teams who are responsible for managing asset and liability mix as per ALD policies of the bank and determine its pricing including highest and lowest interest/ profit rate range for segment wise deposit and loan products. The Management and the Board of Directors of the banks will take the appropriate precaution in setting any standard under the Bank's ALM Policy and guidelines to define minimum or maximum limits as per Bangladesh Bank Guidelines.

Bangladesh Bank's ALM Guidance offers a summary on what to do and how to handle assets and liabilities of a bank properly. ALM committee is accountable to ensure risk management related to balance sheet of a bank. The ALCO has an important duty to control the assets and liabilities to provide the structural balance sheet stability and maximize profitability. The Managing Director of the bank is the chair and the Treasury Head is the secretary of the ALM Committee. The ALM committee includes the following executives of the bank:

- Managing Director
- Head of Branch banking
- Head of Treasury
- Head of Retail banking & Wholesale Banking
- The Chief Financial Officer
- Head of SME, International Division or Financial Institutions (FIs)
- Head of Risk Management Department (RMD)

The head of Islamic Banking should be another member of the ALCO committee for traditional banks with an Islamic banking window/ branch. Offshore Banking Unit (OBU) head of the bank may also be included in to the ALM Committee as member.

According to Bangladesh Bank, Guidelines for Risk Management published in the year 2012 and Guideline for Asset Liability Management (ALM) published in the year 2016, the major responsibilities of ALM Committees are details below:

- ✓ Proper measurement and reporting of market and liquidity risk.
- ✓ Ensure ideal mix of the assets and liabilities of the bank.
- ✓ Make a decision on the deposit mix of the Bank.
- ✓ Time evaluate the maturity profile of assets and liabilities.
- ✓ Periodic review of interest rate/ profit margin on loan/ investment.

- ✓ Market risk evaluation and introduction of new products.
- ✓ Periodic review of segment wise deposit pricing.
- ✓ Periodic review of emergency funding plan.

The management of the balance sheet risk is not restricted to only data collection. ALCO must understand the proposition of the number produced from analytical data and formulate appropriate strategies for the bank.

Un-quote...

2.2.3.3 Bangladesh Bank Guidelines on Foreign Exchange Risk Management

Quote:

After the failure of Bretton Woods system in the year 1971, several countries adopted floating exchange rate system for international foreign exchange market. The foreign exchange market has appeared to become the largest marketplace all over world, over the period. In the year 1990, many rising markets underwent a perceptual policy change towards the reorientation of their financial markets with regards to different types of new products, institutional and business infrastructure growth and regulatory structure adjustment in line with the liberalized operating structure. In a quick expansion of the foreign-exchange market, the changing contours are reflected in the participants and volumes of the transactions, decreasing transaction costs and more successful risk transfer mechanisms.

To adopt the modern global economy, it is important to strike the right balance between financial markets' growth and their inbuilt risks. Since the early 1990s, Bangladesh began to step up financial sector development reforms and to open up foreign trade and financial flows to improve investment and growth in production. In the mid 1990s, Bangladesh acknowledged the IMF's Article VIII to convert Bangladeshi Taka for external transactions. In the beginning of the 2000s, the exchange rate for BDT was floated with market flexibility. Currently, the Central Bank of Bangladesh does not have any interference into the regular exchange rate determinants but it monitors the exchange market fluctuation on regular basis and implements prudential policies and guidelines for minimizing unusual swing of exchange rate to avoid unfavorable impact on the domestic economy. The exchange rate for any currency is fixed by the market itself on the basis of its market demand and supply on any particular day.

Risk is described as an event that could result in financial losses for any bank, which leads to uncertainty of future business operation. The magnitude of risks that any bank can be exposed to by various risk factors including business scale, difficulties for business conduct, capacity, etc., it is commonly assumed that banks face risks from credit, market, liquidity, operational, compliance, regulatory and reputational risk. All financial institutions conduct various challenging financial operations as part of their business activities, for which they must give proper attention to risk management process of the bank. Risk management covers all events which impact the risk

profile of the bank. The goal of risk management is to determine, evaluate, monitor and control risks factors in order to ensure the core risk management in banking.

Depending on the size of the Bank and the complication of its operation, foreign exchange dealing policies and practices may vary from bank to bank. A robust trade risk management program should be developed by addressing effective MIS, proper planning and applying managerial as well as analytical skills to manage the risk efficiently related to foreign exchange transaction of a Bank. To address this risk, Bangladesh Bank has published a guideline for Foreign Exchange Risk Management in February, 2016 for managing the risk related to foreign exchange dealings effectively, which will be subject to periodic review.

All financial activities involve a certain degree of risk and particularly, the financial institutions of the modern era are engaged in various complex financial activities requiring them to put proper attention to every detail. Risk is an incident that can cause financial or reputational loss or can commit the bank to an uncertain future. Success of the trading business depends on the ability to identify and manage effectively the various risks encountered in the trading environment, and the organization's policies and processes require development over time to ensure that this is done in a controlled way.

According to Bangladesh Bank, Foreign Exchange Risk Management Guideline for Banks published in February, 2016, the key risk factors of Banks could be categorized into:

- ❖ Credit Risk
- ❖ Market Risk
- ❖ Liquidity Risk
- ❖ Operational risk including Legal, Regulatory & Compliance Risk and Reputational Risk
- ❖ Strategic Risk

Risk factors can be effectively managed to reduce the unfavorable consequences as much as possible to maximize profitable opportunities. Risk management process includes the steps bellow:

- ❖ Risk identification
- ❖ Risk measurement
- ❖ Application of Risk management tools.
- ❖ Risk mitigation

Un-quote...

2.2.3.4 Bangladesh Bank Guidelines on ICT Security in Banks

Quote:

In recent years, the banking industry of Bangladesh has modified its customer's services and information processing system. Information and Communication Technology (ICT) has made this customer services modification process faster. Now a day, electronic banking system has become more popular as part of adoption of financial inclusion. So, information security has

more significance for banks than earlier and it is important to ensure that ICT risks should be properly detected and managed. Furthermore, information and ICT systems are crucial assets for banks and also for their clients and other stakeholders. Banks need to ensure appropriate safeguard for this important assets for its sustainability. Banks should take appropriate measures for protecting information against any unauthorized access, alteration, divulgence and destruction of information.

On May 2015, Bangladesh Bank published the guideline for ICT Security for banks for minimum requirements and technical implementation for all commercial banks operating in Bangladesh. This Guideline covers all information that are electronically generated, received, stored, replicated, printed, scanned and manually prepared. The provisions of this Guideline are applicable for:

- a) Banks and NBFIs for all of their Information Systems.
- b) All activities and operations required to ensure data security, ICT risk management, acquisition and development of information systems, usage of hardware and software, disposal policy and protection of copyrights and other intellectual property rights.

- **ICT Security Management**

ICT Security Management must ensure efficient and effective management of ICT functions and operations. The ICT capabilities of banks operating in Bangladesh are identified and the opportunities /threats of potential misuse can be evaluated and recognized. They must ensure that adequate system documentation, especially for systems that support financial transactions and reporting is maintained. Bank must ensure appropriate trained technical personnel for managing ICT security risk efficiently.

- **ICT Risk Management**

ICT risk is an important part of a company's overall risk factors. The Bank also faces strategic risk, environmental risk, risks in the marketplace, credit risk, operational risk, compliance risks, etc. In several businesses, ICT-related risk is seen as an operational risk component. ICT risk is business risk —specially, the business risk related to use, ownership, service, participation, effect and use of ICT within the bank. It consists of events and conditions relating to ICT, which may have an effect on the business. It may take place with both complexity and frequency, generating difficulties in the achievement of strategic objectives.

- **Infrastructure Security Management**

Currently, different types of attacks have been observed in ICT environment. The frequency of such attacks is increasing day by days. The Bank must implement security solutions to adequately resolve relevant threats in the data, application, databases, operating systems and networks. Suitable steps will be taken to safeguard sensitive or delicate information such as personal data of the client, account data and data on transactions stored and processed in the

system. Customer's KYC should be properly completed including verification of confidential personal details or account information before allowing access into online platform.

- **Access Control of Information System**

Bank must allow access into its ICT system to their working people, who are responsible to operate or manage the system. Bank should ensure that, any unauthorized person irrespective of his role and responsibility must not have any right/ access into any confidential information.

- **Business Continuity and Disaster Recovery Management**

Disaster recovery plan are essential for ICT risk management and for recovery of data against any event of major accidents into the datacenter of the bank. Business Continuity Plan (BCP) ensures that a Bank can survive and restore regular business activities after any disaster. The bank shall ensure that, vital operations can resume normal processing within an acceptable timeframe to ensure a low financial and reputational loss against any disaster. The Final Strategy includes the re-starting of business activities and disaster recovery planning. The contingency plan also addressed the method of backup, repair and restore process.

- **Alternative Delivery Channels (ADC) Security Management**

Alternate delivery networks are the way to provide banking services directly to the consumers. Customers can made banking transact via ATM, contact the Call Center in the bank for any inquiry and access the digital IVR, carry out transactions via Internet banking, BATCH, BFTN, RTGS and even on mobile telephones etc. These channels have allowed banks, regardless of time and geographical location, to reach a large customer base. ADCs can ensure improved customer satisfaction at lower operating and transaction costs.

Un-quote...

2.2.3.5 Bangladesh Bank Guidelines on Internal Control and Compliance in Banks

Quote:

Banking is a multidisciplinary and complex financial practice which has been influenced by different risk factors. Effective internal control system includes good governance and transparent presentation of all financial activities, which has been essential for ensuring smooth performance of the banking sector, accountability to its stakeholders and regulatory authorities. An effective framework for internal control & compliance system should developed by the banks to promote effective risk management practices and to ensure the efficient functioning of the banking industry of Bangladesh. Internal control is usually defined by internal auditing; however its scope is not restricted to the audit activities only. Internal monitoring detects the risk factors related with the banking operations and takes steps to reduce or mitigate the risks in connection with its operation. Alternatively, internal audit improves the control process by periodically reviewing the effectiveness of the controls system of the bank.

It is the business units/ branch of a bank that is the first line of protection against any irregularities/ deviation of internal control system causing not to meet its objectives, improper

reporting or non-compliance of laws and regulations. In addition, risk management, compliance and internal audit are the three essential control functions of the bank. The risk management and compliance are the second line of defense against any disaster. The role of internal audit is ultimately the third line of defense. An efficient system of internal control includes establishment of accurate information systems covering all of the main activities of the bank. A system of strong internal controls will help to ensure a banking organization's goals and objectives to meet long-term profitability goal and transparency on financial reporting. So, internal controls are the critical function of the risk management system of the bank. In order to take any corrective steps, it is important to review the framework of internal control process through periodic testing to assess how well the system operates.

As per BB guidelines for "Internal Control and Compliance Guideline in Banks" circulated in the year 2016, internal control mechanism has been conducted by the bank's Board of Directors, management and other executives/ officers, which is intended to provide realistic assurance about the implementation of goal in connection with its overall banking operations, financial reporting and compliance of rules and regulations. Internal control is not a structure, but a process. It is not a separate operation, but rather an integral part of the other operational process. This is an ongoing process for structuring, implementation and monitoring of a chain of operational activities by the Board of Directors and management of the banks at all levels of operations. Internal control and compliance of a bank is comprised of internal policy, guideline and procedure. Policies are decision of the Board/ management of a bank regarding what should/ should not be done for managing risk. Procedures consist of the actions or forms in which it is enforced. Internal control only offers fair assurance in respect of the accomplishment of the goals of the banks. External events can intervene with attainment of goals, regardless of how strong is the internal control system of the bank.

The control situation represents the overall approach to internal control, awareness and intervention of the Bank's Board of Directors and management. It is the system for structuring, enforcing and controlling internal process. It consists of the internal and external risk-based structures and arrangements for the banking business. Control factors include honesty, ethical value and employee competences, the management approach i.e. how the management assigns authority and responsibility to its employees. The efficient internal controls system are designed and enforced to handle these risks carefully by using consistent and integrated control systems.

Factors that make up the control environment together are:

- The Board of Directors actively engaged in implementation of sound corporate governance within the bank and that understands and authentically exercises its responsibilities by ensuring that the Bank is adequately and efficiently regulated and operated.
- Management that properly manages and runs the bank actively and carefully.
- Organizational and process controls assisted by an appropriate information management system to handle risk exposure in a sound and cautious manner.

- An independent audit process to monitor operational and procedural control.

Islamic banking principal practices in the banking industry of Bangladesh as per BB, BRPD circular no. 15/2009 in conformity with Bank Company Act 1991 (amended in 2013). Shari'ah based banks or windows based / independent branch based Islamic Banking must be supervised to ensure that, they are in compliances with Shari'ah guidelines/principles. Therefore, Shari'ah audit must be conducted periodically for ensuring proper practices, implementation and compliance of Islamic Shari'ah.

Un-quote...

2.2.3.6 Bangladesh Bank Guidelines on Prevention on Money Laundering

Quote:

Banking industry plays an important role of the economic development of a country. This is also called lifeline of the economy. Banking industry mobilize fund from the money market and contributes into the productive investment from overall economic development of the country. For sustainable economic development of the country, banking industry needs to be well established and efficient. In the year 1989, the Financial Action Task Force (FATF) established by the organization of G-7 countries has been recommended forty numbers of guidelines for prevention of money laundering and terrorism financing activities which results stability and integrity of international financial system. Bangladesh Bank, the regulator of banking system also played vital role for stabilization and increase efficiency of the financial system of Bangladesh. Bangladesh Bank has been taken several steps through publication of different guidelines under Money Laundering prevention Act, 2002 (amended in 2013) and Anti-terrorism Act, 2009 which specified the roles and responsibilities of commercial banks operating in Bangladesh to prevent money laundering and terrorism financing activities. Bangladesh Financial Intelligence Unit (BFIU) of Bangladesh Bank has been responsible for monitoring the activities of commercial banks regarding provision of money laundering activities.

According to Money Laundering Prevention Act, 2002 (amended in 2013), Bangladesh Bank established Bangladesh Financial Intelligence Unit (BFIU) in the year 2012 which acts as an agency for receiving and analyzing STR/ SAR and CTR from commercial banks operating in Bangladesh and take appropriate actions for prevention. BFIU also responsible for exchange any information related to money laundering and terrorism financing activities with any international agencies as and when requested. The purpose for establishment of BFIU is to implement an effective system for prevention of money laundering activities and combating terrorism financing into the economy of Bangladesh. For full automation of STR/ CTR reporting system analysis and MIS, BFIU has implemented online bases software namely goAML

Money laundering happened, when the money launderers hide the sources of the money earned from any illegal means. It's happen almost all the countries of the world and sometime it is very difficult of identify the origin from where the illegal money has been transferred initially. In the

global financial environment money laundering can be happened easily by depositing money earn from any illegal means into the financial system of any country and then transferred into other country through legal/ illegal financial channels including banks, NBFIs, Insurance, capital market etc. A country's economy may be badly affected due to money laundering activities along with its social, political and cultural development. To develop stable financial sector, a country must take proper initiatives for combating money laundering and terrorist financial activities within its economy. The process of money laundering and terrorist financing is very complicated and dynamic. Because, the money launderers are using different complicated techniques and process by using updated technologies for conducting money laundering and terrorist financing. To deal with these challenges, the international financial community must take different initiatives to deal with ML/TF activities.

- **Stages of Money Laundering**

Obviously there is no single way of laundering money or other property. It can range from the simple method of using it; in the form in which it is acquired to highly complex schemes, involving a network of international businesses and investments. Traditionally it has been accepted that the money laundering process comprises three stages:

- i) **Placement** – Placement is the first stage of the money laundering process, in which illegal funds or assets are brought first into the financial system directly or indirectly.
- ii) **Layering** - Layering is the second stage of the money laundering process, in which illegal funds or assets are moved, dispersed and disguised to conceal their origin. Funds can be hidden in the financial system through a web of complicated transactions.
- iii) **Integration** - Integration is the third stage of the money laundering process, in which the illegal funds or assets are successfully cleansed and appeared legitimate in the financial system.

- **AML & CFT Compliance Policy**

AML &CFT compliance policy must be established, administered, and maintained by the Board of Directors or the Management of each bank to ensure and track proper compliance with the related Acts and the reporting requirements as well. The Board of Directors of the bank must approve such compliance policies.

The AML & CFT policies of the bank must be approved by its Board of Directors, which must be clearly stated the roles and responsibilities within the banks for ensuring policies and procedures are fully complied, so that it can identify the criminal activities by the way of money laundering and terrorist financing through banking channels. The Policies must be updated time to time and should be based on an assessment of the money laundering and terrorist financing risks, the bank's business arrangement and factors such as its size, location, activities, methods of payment, and risks to money laundering and terrorist financing.

It should contain process and procedures to comply with related laws and policies to reduce the prospect of criminal abuse. To ensure Know Your Customer (“KYC”) policy and to identify appropriate process before opening any new accounts, monitoring existing accounts for unusual or suspicious activities, information flows, reporting suspicious transactions, training of employees and establishing a separate audit or internal control team to regularly test the effectiveness of the existing policies and procedures. It’s also includes the roles and responsibilities of the AML & CFT Compliance Officers(s)/Unit and other related authority for monitoring the compliance actions and the efficacy of AML & CFT compliance policies and actions. Bank must introduce and apply proper selection process to ensure high knowledge standards related to AML & CFT policies and guidelines when hiring employees. It should also include AML & CFT compliance issues into the KPI and job descriptions of related employees. Bank must arrange regular training program and workshop related to AML & CFT policies and guidelines for continues update their employees regarding related changes into the policies and guidelines from time to time.

The AML & CFT policies of a bank must be reviewed on regular basis and updated as and when required or minimum ones in a year or immediately after any legal or regulatory changes. Moreover, the AML & CFT policies must highlight the role of each employee to protect the bank from any unusual activities by the money launderers and terrorist financiers, and should set forth the consequence of non-compliance with the applicable laws and the institution’s policy including the criminal, civil and disciplinary penalties and reputational harm that could ensue from any bank with money laundering and terrorist financing activity.

Un-quote...

2.2.3.7 Bangladesh Bank Guidelines on Environmental & Social Risk Management for Banks

Quote:

It is important to maintain sustainable growth for the promising economic countries including Bangladesh. In order to support corporate responsibility and transparency in the environmental and social effects of enterprises on society, new principles and codes of conduct have been established for environmental and social risk management (ESRM) for the financial sector of Bangladesh. From the financial sector viewpoint, the role of ESRM aims to reduce bank’s probability of default for its credit/investment based on environmental and social risks and to integrate sustainable development into their core business model. In the year 2011, Bangladesh Bank published "Environmental Risk Management Guidelines (ERM)," which was a revolutionary initiative by the central bank of Bangladesh, with a view to incorporating sustainability into overall credit administration for banks. The main goal of this guideline is to maintain a minimum standard for assessment of the lending/investment probability of default for banks in order to encourage sustainable business practices in Bangladesh. The ERM guideline concentrated mostly on environmental risk factors and also includes some social risk factors. The approach for evaluating the environmental risks remained qualitative. The ERM guidelines are

focused on the quantitative lending/investment thresholds of the loan categories including SMEs, corporate finance and infrastructure financing. One of the main principles of the ERM guidelines is to understand that, the guidelines are dynamic and need to be revised at least every three years, if necessary, and also includes numbers of recommendations for potential updates.

In the year 2017, ERM Guidelines for Banks and Financial Institutes in Bangladesh were revised in the Bangladesh and renamed as "Environmental & Social Risk Management Guidelines (ESRM)." In addition to the environmental risk assessment factors, the ESRM Guidelines includes a range of social risk factors to assess the social risk parameters. The Guideline also represents the sources of environmental and social risk for banks and emphasizes on the advantages of an Environmental & Social Management System (ESMS) in place.

The main goal of ESRM guidelines is to ensure that banks adopt integrated risk management strategies for the environment and social (E&S) factors and incorporate effective risk management practices in overall credit management in order to increase the credit/investment portfolio instead of avoiding high E&S risk investment. The ESRM Guidelines incorporated following features to become more structured, interactive and user-friendly in compared to the former ERM Guidelines:

- The ESRM Guideline establishes a strong, self-generated, quantitative risk assessment framework to decrease the subjectivity of the qualitative risk assessment process of ERM guideline.
- The ESRM guideline has more focuses social and climate threats that are increasingly important and crucial for Bangladesh.
- It established generic and sector specific checklists for Environment & Social Due Diligence (ESDD) for the Relationship Managers (RM) to carrying out the due diligence process.
- In addition to the investment threshold, the ESRM Guideline determines applicability based on sector specific impacts, including agriculture, retail, microfinance, SMEs, corporate finance and project finance.
- The roles and obligation of the banks listed under the ESRM Guideline are focused on E&S risk factors of the bank on overall credit policy. The ESRM guideline clearly describe the responsibility of a bank and its different functions for E&S risk assessment and decision-making process based on E&S risks rating.
- The ESRM Guideline comprises of ESDD checklist and ten numbers of high risk sectors specific checklist. It therefore has a wide variety, but also a much more efficient mechanism for financial sector professionals to make it easy to use.

- **Risks factors associated with E&S Risk**

Banks has been dealing with different types of E&S risk from their customers. Unmanaged risks may lead to decrease the reputational image of the bank, expensive litigation or revenue losses. An E&S issue depends on various factors, including geographical contexts, industry sector and

type of business transaction for corporate, SMEs, retail, real estate and project finance. The E&S risk of various forms of transactions are as follows:

- i) **Credit risk:** A bank may be exposed to credit risk, when a customer is unable or unwilling to perform as per sanction terms for any transaction related to E&S issues. When a customer faced increased operational cost for compliance of E&S issues or if they are facing any fine or penalty due to environmental wastage management issues, they may not be able to repay financial obligations to the Bank on time. Bank is also bare credit risk due to substantial decrease into the value of collateral security related with credit facilities due to E&S issues. For example, the market value of a collateral security may decrease, if any industrial project which established into the collateral property has been responsible for environmental pollution.
- ii) **Legal risk:** While taking possession on the collateral properties of the customers, a Bank may face liability risk from a customer's legal obligations. This risk includes any fines, penalties or any third party claim due to noncompliance of E&S issues by the customer and cleaning of any polluted wastage materials. So, Bank may be liable for all E&S risks associated with a customer's business operations.
- iii) **Operational risk:** A Bank may face financial risk due to possible disturbance of the customer's business operation as a result of E&S issues. These issues may have influence on a customer's permanence to repay its debts to the Bank, if not handle accurately. Failure to efficiently manage E&S issues may have risk on the customer's business operations as well as for the Bank who is financing the business operation.
- iv) **Liquidity risk:** Bank may also expose to liquidity risk due to E&S issues related with the collateral for any credit facilities of the customer. For example, a Bank may require cleaning up the polluted collateral property at its own cost before trying to liquidate it, to recover their invested money.
- v) **Reputational risk:** A Bank may face reputational risk due to possible negative publicity related with a customer's poor E&S practices. This may affect Bank's image into their stock holders. For example, if a customer exposes strong public opposition against its operations, the Bank's reputation may be tarnished through its association with this particular client.

Once the ESMS has been developed and formally approved by Senior Management/Board of Directors of the Bank, it can be institutionalized and rolled out across the Bank. To implement the ESMS, the Bank should develop an implementation plan, including an ESMS testing phase, with a time schedule for completing each task and the designated staff responsible for doing so. Tasks should include a review of the E&S regulations of the country in which the Bank operates, testing phase, communications and training plan for staff, assigning responsibilities to applicable

staff, review of international best practice that apply to clients and review of the ESMS on a periodic basis for continuous improvement.

Un-quote...

2.3 Empirical Literature Review

Banks must find effective approaches in order to maintain required capital adequacy, increase profitability, strengthen balances, and improve organizational performance. Risk management in recent years has gained greater attention (Fatemi and Glaum, 2000). On the one hand, depending on developments in financial markets, there are external threats. Internal risks often apply when a company internally generates risks factors from its operations (Eichhorn, 2004). The motives for risk management of a bank are to mitigate or manage the risk factors for doing banking business.

Credit risk, liquidity risk and market risk are included in the financial risk and lead together to financial performance volatility (Tafriet et. al., 2009; Dimitropoulos et. al., 2010). The key risk factor which hampers banks' performance is credit risk. There is possibility of fluctuating net assets as a result of the contractor's failure to pay off contractual obligation (Pyle, 1999).

Profitability provides information about the bank's capacity to accept and manage risk. ROE (net revenues/average equities) and ROA (net income/total asset) are the key metrics used in appreciating bank profitability (Dardac and Barbu, 2005). The amount of bank's income is a common indicator of bank's efficiency (Ceylan et al., 2008). Return on asset (ROA) is a ratio of a bank's income to its total assets that, determines the bank's profitability. The pre-tax profit-to-equity ratio (ROE) is another good indicator of bank profitability as banks with higher equity base will also have higher returns (Ceylan et al., 2008). Bank's success is related to its capability to generate an expected return from its assets and equity. A crucial aspect of assessing earnings efficiency is the comparison of financial performance measures, such as returns on assets and returns on equity, with industry benchmarks and peer group standards (Duca and McLaughlin, 1990).

Commercial banks employ risk reduction techniques to ensure that risks are taken on intentionally with clear understanding, a clear goal, and comprehension rather than trying to restrict or discourage taking risks.

2.3.1 Credit Risk and Financial Performance

While accepting deposits from the surplus units and grant credit facilities to the deficit units of the economy, banks are eventually exposed to credit risk. The highest risk that banks face is credit risk, and the profitability of banks' operations depends on measuring and effective management of credit risk (Gieseche, 2004).

Paudel (2012) examined the 11 years data, i.e. from 2001 to 2011 of 31 commercial banks operating in Nepal to evaluate their financial performance. For analyzing the data set, the study used correlation and regression model to find out the impact of all the parameters of credit risk

including default rate, loan provision and capital adequacy ratio on the financial performance, i.e. ROA of the banks operating in Nepal. The results of the study show that all credit risk indicators have a negative effect on the financial performance of the bank. However, the default rate had a significant impact on the banks' financial performance. This study suggested that banks should develop well defined policies that will minimize the credit risk as well as improve the financial performance of the bank.

Boahene et al., (2012) studied the impact of credit risk on the profitability of the banks operating in Ghana for the period from 2005 to 2009. The relationship among the panel data set of this study was analyzed by using fixed effects model. The results of this study found positive relationship between credit risk and profitability of the commercial banks operating in Ghana. The output of Boahene et al., (2012) was also in line with Afriyie and Okotey (2013), examined a positive correlation between NPL and the financial performance of the rural and community banks operating in Ghana.

In the Asia-Pacific Region, Islam et al., (2019) analyze the effect of Credit Risk (CR) on financial performance for 23 commercial banks of Bangladesh during the period 2006 to 2015. This study used fixed effect model and its results showed that NPLR has negatively impact on the financial performance, i.e. ROA and ROE of commercial Banks operating in Bangladesh. While, Saiful & Ayu (2019) sampling 26 nos. of conventional banks and 11 nos. of Sharia based Islamic banks to examine the impact of CR on the profitability of Indonesian banks' for the period from 2012 to 2016. The results showed that the CR has a positive impact on ROA of Indonesian banks. Similarly et al., (2019) analyzed the effect of NPLR and the loan loss provision ratio on the profitability of commercial government banks operating in India during the period from 2010 to 2017. The empirical findings of this study indicated that ROA is positively correlated with Credit Risk.

Al-khouri (2011), analyzed the effect of risk factors on the profitability of 43 public commercial banks in six of the GCC countries for the period from 1998 to 2008. This study used regression analysis technique to analyze the panel dataset. The empirical output showed that credit risk, liquidity risk and capital risk have influenced on ROA but only liquidity risk has impact on ROE. The impact of credit risk variables on bank's profitability proxy by ROA and ROE was examined by Saeed and Zahid (2016) on the sample panel data set of five major United Kingdom's commercial banks during the period from 2007 to 2015, i.e. during the global financial crisis period by using multiple regression analyses. The output of this study showed a positive correlation between the profitability and credit risk related variables of the study banks.

Hanifa, A. et al., (2015) analyzed the effect of credit risk factors on the financial performance of banks operating in Bangladesh. The analysis used unbalanced panel data for 172 nos. of observations from 18 private commercial banks from 2003 to 2013. The study uses the capital adequacy ratio (CAR), the ratio of loan loss reserves to non-performing loans (LLRNPL), the

ratio of loan loss reserves to gross loans (LLRGL), and the ratio of non-performing loans to loan loss reserves (NPLRNPL) as indicators of credit risk. The profitability indicators used are return on average assets (ROAA), return on average equity (ROAE), and net interest margin (NIM). The study discovers a strong negative and substantial effect of NPLGL, LLRGL on all profitability metrics using OLS random effect model, GLS model and system GMM. This study also identifies a significant negative impact of CAR on ROAE. The findings of additional research show that Basel II's adoption has a considerably positive impact on NIM but a significantly negative impact on ROAE.

Using the five banks with the largest asset bases, Nwude, E. C. and Okeke (2018) investigated the effects of credit risk management on the performance of deposit money banks in Nigeria. Ex-post facto research technique was used to generate the dataset for the years 2000 to 2014 from the annual reports and financial statements of the selected deposit money institutions. Indicators of credit risk included NPL to total loan (NPLR), total loan and advance to total asset (TLAR), and natural log of total asset (NLTA), while performance indicators for the bank included return on asset (ROA) and return on equity (ROE). Least squares regression model was used to evaluate and suggest three hypotheses. The results show that credit risk management significantly and positively impacted the deposit money banks' return on equity, return on assets, and total loans and advances.

Abu-Alrop, J.H.A. & Kokh, I. A. (2020) examined the impact of credit risk (CR) on the financial performance of 85 different Russian commercial banks from 2008 to 2017. The results of the empirical analysis were determined using multiple regression models. In this study, ROA and ROE were employed as proxies for the financial performance of Russian commercial banks, while loan loss provision to total assets and total loan to total assets were used to reflect credit risk. The results of this study revealed that the impact of CR on the financial performance of Russian commercial banks varies from year to year, i.e., the impact is not constant. However, this effect is typically negative and significant when CR affects financial performance indicators. In addition, this study found that credit quality has a significant negative impact whereas loan volume has limited or no effect on financial performance indicators.

Suliman, A. A. (2015) examined the impact of CR on the financial performance of 13 different Jordanian commercial banks from 2005 to 2013. Two mathematical models were developed to measure this relationship where financial performance was proxy by ROA, ROE and Credit Risk management is proxy by NPL to Gross Loan, Loan Loss Provision to Total Loan and Leverage Ratio. This study discovered that the variables used to quantify credit risk management significantly affect financial performance indicators. On the basis of findings, the researcher recommended that banks should improve their credit risk management process to maximize their profitability. Banks should establish an effective credit risk management system, a sound credit approval process, and proper credit administration that engage in documentation, monitoring and controls over credit risk management.

Isanzu, J. S. (2017) looked at the effects of CR on the financial performance of five of the largest commercial banks in China using secondary data from the years 2008 to 2014. This study used NPLR, Capital Adequacy Ratio, and Loan Loss Provision to Total Loan as measures of CR and ROA as proxy of financial performance of commercial banks operating in China. A secondary balanced panel data set was analyzed by using regression model. This study discovered that, the financial performance of commercial banks operating in China is significantly impacted by the NPLR and Capital Adequacy Ratio. So, the banks need to efficiently manage its credit risk for maximizing its profitability or financial performance.

Al-Rdaydeh, M. et al. (2017) investigated how financial risks affected the profitability of Jordanian banks from 2006 to 2015. Liquidity risk and credit risk were employed in this study to indicate financial risk while ROA and ROE were utilized to evaluate the profitability of the banks. Secondary balanced panel data sets were used to measure the impact of financial risk on the profitability, where panel data regression model were used to test the hypotheses. The output of the study showed that credit risk has considerable impact on both ROA and ROE of the banks operating in Jordan. Liquidity risk was shown to have no relationship with ROE, but did with ROA. This result makes it very clear to bank management and other business stakeholders that, engaging in riskier lending activities would result greater credit losses, which would force banks to significantly reduce their resources.

Saeed MS., & Zahid N., (2016) examined the effect of CR on the profitability of 05 nos. of commercial banks operating in UK. This study used dependent variables ROA and ROE to measure the profitability whereas CR was proxy by NIM and NPLR as independent variables. The panel data set were collected from annual reports of the banks operating in UK during the period from 2007 to 2015, i.e. the financial crisis period and analyzed by using multiple regression analyses. According to this study, CR has a positive effect on the financial health of UK-based commercial banks. The UK-based banks are exposed to CR during the 2008 financial crisis and make money via interest, fees, and various commissions, among other sources. The results also established a positive correlation between bank size, leverage, and growth rate, as well as the fact that banks were profitable during the credit crisis and improved their management of credit risk over time.

The impact of risk management (RM) techniques on the profitability of a few listed commercial banks operating in Pakistan was examined by Bagh, T. et al. (2017). Sample size of the study was categorized into three groups including small, medium and large commercial banks based on their market share from the 18 nos. of top performing banks for the period from 2004 to 2016. Secondary data for this study were collected from the published annual report of the banks. This study used dependent variable ROE as proxy of financial performance whereas risk management factors, i.e. independent variables were proxy by Capital Adequacy Ratio (CAR), operational risk represented by Operating Profit (OP), Credit Risk represented by NPL, Interest Rate Risk

represented by Interest Rate Return (IRR) and Liquidity Risk represented by Liquidity Ratio (LR). The quantitative research design technique, Descriptive statistics and Eviews software has been applied to test five hypotheses. The output of this study found that, risk management factors have significant impact on the financial performance of small, medium and large commercial banks operating in Pakistan. This study recommended that, banks should focus on loan approval process, related policies and guidelines, credit quality and liquidity risk management. Banks should have effective risk based management strategies and proper corporate governance structure and they should focus on the appropriate implementation of Basel III guidelines.

Al-Tamimi (2002) looked at the commercial banks in the UAE's risk management procedures. Credit risk, market risk, liquidity risk and operational risk are just a few of the numerous types of banking risks that were examined in this study using the survey questionnaire approach. This study employed descriptive statistics analysis, which revealed that credit risk was the most important kind of risk for the chosen institutions. The examination of financial statements and branch managers' inspections were the two techniques identified in this study as being the most often employed for risk detection. In addition, it was noted that the banks in the UAE employed a variety of risk management strategies, such as the development of standards, evaluations of credit worthiness, risk ratings, credit scores and collateral. According to the analysis, these institutions' best risk management approach was found to be a conservative credit policy.

Kithinji (2010) examined how credit risk comprising of loans and advances to total assets and the proportion of non-performing loans to total loans and advances ratios, affected return on assets (ROA) in Kenya's banks between 2004 and 2008. According to the study, the quantity of loans and advance as well as non-performing loans have no effect on the profitability of the majority of commercial banks. During the period 2004 to 2008, Kithinji urged the bank's income to rise on average. The financial performance of banks however vary during the years, but slightly improved over the period from 2004 to 2008 on average. The profit during the study period was generally poor. Customers got a reasonably significant amount of loan, but the downward trend over the period was assumed. Although credit and income levels were relatively low and constant, credit volatility was strong. The findings of Kithinji (2010) give a basis to take into account other factors, which might have an impact on the performance of the bank, as well as a longer time period of research, in order to acquire a true picture of Bank efficiency. Therefore, the impact of credit risk, market risk, liquidity risk, and operational risk was considered in this study as a component of financial risk.

Afriyie (2011) investigated how credit risk affected the financial performance of rural banks in Ghana's Brong Ahafo area. The financial accounts of eleven rural banks from 2006 to 2010 were investigated in the paper. This paper used panel regression model. As indicators for managing credit risk, the Non-Performing Loan Ratio (NPLR) and Capital Adequacy Ratio (CRA) were used, while the return on asset (ROA) was used to assess profitability. The results show that rural banks make money even if there are larger loan losses due to the strong positive correlation

between non-performing loans and profit. This paper discovered a connection between Ghana's chosen rural banks' profitability and credit risk management. Higher capital adequacy allows rural banks to issue more loans, better management of credit losses, and ultimately produce more profit. The outcome of Afriyie and Ogboi (2011) is that, CR and financial performance are related. But, some other factors, particularly in rural areas, which can affect the financial performance of banks. Factors such as low income levels, access to the financial system and the lack of information or knowledge are seen in rural areas.

Kolapo, et al. (2012) conducted a study to examine the quantitative impact of CR on commercial bank's profitability across Nigeria for the period of 11 year i.e. from 2000 to 2010, using a panel model approach. The standard principle of benefit was applied to formulate the return on assets ROA as a function of the NPLR, the LDR and the ratio of loan loss provision to classified loan (LLP/CL) as proxy of credit risk. Cross-sectional panel data set for the 05 commercial banks for the period of 11 years were chosen for this study. The results show that, ROA is decreased by the increased of NPL or LLP/CL, and the impact is similar for all banks covered by this study. However, profitability increases while credit portfolio increases.

Poudel (2012) has analyzed various criteria that affect financial performance for banks in Naples that are applicable to CR management. This study included parameters such as NPLR, Cost per Loan Asset and CAR to measure CR. This study analyzed secondary data from financial report of 31 banks in Naples during the eleven years period from 2001 to 2011 to examine the effect of NPLR, Cost per Loan Asset and CAR on their financial performance during the period. This study used correlation and regression models, and the findings shows that the risk factors have negative impact on the profitability of the selected banks operating in Naples. T-test observation showed that, there are significant negative impact between the dependent variable i.e., ROA and independent variables, which are NPLR and CAR. The NPLR has the most impact on the financial performance of the banks. This study suggested that all the banks should have appropriate policies and guidelines that manage credit risk exposure efficiently as well as increase its income.

The impact of CR management on the financial performance of commercial banks in Kenya was studied by Fredrick (2012). He also tried to determine whether there is a correlation between CAMEL indicators and commercial banks financial performance in Kenya. The study undertook a research by using secondary data collected from financial statements of commercial banks operating in Kenya for the period from 2006 to 2010. The target population of this study was 42 nos. of commercial banks operating in Kenya, which were registered and operative as on 31 December 2011. The study data were examined using multiple regression modeling and Pearson correlation analysis. The results of the study showed that, commercial banks' financial performance was significantly influenced by the CAMEL components. This study also revealed a moderate correlation between financial performance (ROE) and liquidity, asset quality,

management effectiveness, and capital adequacy, i.e. commercial banks operating in Kenya showed correlation between financial performance and bank profitability.

According to Noman et al., (2015) the ratios of loan loss reserves to gross loans (LLRGL) and non-performing loans to gross loans (NPLGL) have a considerable negative influence on profitability metrics. Additionally, a statistically significant negative effect of CAR on ROA was discovered. Additional study has revealed that Basel II's have a significantly positive influence on NIM and a significant negative impact on ROA. Additionally, Kolapo et al. (2012) discovered a favorable correlation between credit risk management and profitability (ROA) of five Nigerian commercial banks during the period from 2000 to 2010.

2.3.2 Market Risk and Financial Performance

Market risk is one of the primary causes of income volatility in financial institutions worldwide. According to economists Koch and MacDonald (2006), the market risk may usually categorize into three risk factors: risks associated with interest rates, stock prices and foreign currency exchange. Worzala (1995) notes that there is also a type of market risk where banks are accepted financial instruments as collateral against loans that are exposed to the volatility of market prices. The price fluctuations or uncertainty varies into the day to day market conditions. Typically, equities that look to perform well during bull markets and badly during down markets are subject to this sort of risk. The likelihood that profitability may be increases as market volatility increases. There are four main types of market risks: risk related to interest rates, risk related to exchange rate fluctuations, risk related to commodity prices, and risk related to any negative change in share prices and commodity prices.

Nimalathasan et al. (2012) analyzed the effect of systemic risk management on the financial performance of Sri Lankan NBFIs during the period from 2007 to 2011. In this study, the dependent variables were financial performance, including Return on Capital Employed (ROCE) and Return on Equity (ROE), and the independent variables were degree of financial leverage (DFL) and degree of operating leverage (DOL), which were used as proxies for systematic risk management. Secondary data were used in the analysis. The findings showed that systematic risk management has a positive relation to financial performance ($r=0.755$, $p<0.05$). The study also revealed that DFL and DOL improve systemic risk management in selected NBFIs of Sri Lanka.

Abid and Mseddi (2004) also analyzed at the degree of operational and financial leverage for a US company over the course of five years, as well as the relationship between the riskiness of the enterprises and their comparative value. This study demonstrated that operational and financial leverage both positively affect a firm's valuation, and that when the levels of operational and financial leverage grow for American enterprises, the value of the company likewise increases as a result of the capital gains. The output of the study started that surplus returns are positive and growing function of financial leverage, operating leverage and systematic risk for sample

companies that explain that revenue improvements are positively correlated with the returns on the business portfolio.

Wong et al. (2009) focused on the connection between bank size and foreign currency exposure. This study examined the stock prices of 14 different listed Chinese banks for the time period spanning 21 July 2005 to February 2008 using a panel dataset. The empirical findings indicate that an appreciation of the independent variables negatively affects the performance of China's banks, and thus the equity prices, with a greater effect on large banks. The results show that decrease in equity values means a higher risk of default.

Muriithi, J. G. (2016) investigated the impact of market risk on the financial performance of Kenyan commercial banks from 2005 to 2014. The independent variables related to market risk was measured by DFL, interest rate risk and foreign exchange exposure and dependent variable i.e. financial performance was measured by ROE. A panel dataset were used for 43 commercial banks operating in Kenya, where data has been collected from the published annual reports of the banks for this study. The time-invariant unobserved firm-specific effects were controlled in this study by using random effects, fixed effects estimates, and a GMM model. Potential endogeneity issues were also mitigated. The findings of this study show that financial leverage, interest rate and foreign exchange exposure have negative and significant relationship with bank's financial performance. It was suggested that commercial banks find a strategy to reduce market risks by utilizing financial instruments like financial derivatives and participating in derivatives markets. This might lessen their exposure to interest rate and foreign exchange risk. In order to lower financial risk, commercial banks must also keep an eye on financial leverage.

Ekinci, A. (2016) looked into how credit and market risk affected Turkish banks' performance. This study uses weekly data from 18.01.2002 to 30.10.2015 period to examine the effects of credit and market risk, specifically interest rate and foreign exchange (FX) rate risk on banks performance for the Turkish banking sector in a time-varying framework using the generalized autoregressive conditional heteroscedastic approach. The findings has two main conclusions: (i) Credit risk has a negative effect on banking sector profitability while FX rate has a positive effect and interest rate has no significant impact; and (ii) credit and market risk have a positive and significant impact on bank's stock return volatility.

The impact of credit risk, liquidity risk, and market risk on the profitability of foreign exchange banks in Indonesia was studied by Badawi, A. (2017). This study used independent variables including NPLR as proxy of credit risk, LDR as proxy of liquidity risk and NIM as proxy of market risk while ROE was used as dependent variable. In order to gather high-quality research data, purposive sampling was used to choose a sample of all banking shares falling under the category of private foreign exchange public banks listed on the Indonesia Stock Exchange (IDX) for the years 2013 to 2015. The findings indicated that whereas NIM significantly affects ROE, NPLR and LDR had no discernible impact.

The impact of interest rate and liquidity risk on profitability and firm value among banks in the ASEAN-5 Countries was investigated by Ebenezer, O.O. et al. (2019). The study used a panel data estimate approach using secondary data collected from 63 commercial banks in the ASEAN-5 nations from 2009 to 2017. According to the empirical findings, LDR has positive impact on company value for ASEAN, but liquid asset ratio and interest rate risk (NIM) have significant negative impacts. For ASEAN banks, the LDR has a substantial positive influence on ROA, whereas NIM and bank size have a big negative impact. GDP and inflation, however, have a significant positive impact on ROA. Additionally, the bank size has a significant negative influence on ROE while the inflation rate has a positive significant impact on ROE. Liquidity risk has a negative significant impact on ROE while NIM has a positive significant impact.

The effect of market risk and fair value on the financial performance of public enterprises in Malaysia was studied by Aziz, A. et al. (2019). Market pricing conditions have resulted for certain substantial write-offs when applying fair value. This study covered the study period from 2007 to 2016. While financial performance was proxy by return on equity (ROE), market risk was determined by the interest rate and inflation. Primary and secondary sources were used to collect study data set. Fair value information was gathered using primary data and market risk information was gathered using secondary data. Regression analysis was also employed by the researcher to examine the relation between dependent and independent variables. The analysis's findings revealed no correlation between market risk and the profitability of Malaysia's public enterprises. Another theory revealed a significant strong correlation between fair value measurement and financial performance. Additionally, the researcher recommended integrating additional variables like exchange rate and financial leverage so that the link between market risk and those variables may be further examined.

Al-Rdaydeh, M. et al. (2022) studied the influence of market risks on bank profitability: Evidence from Jordan. This paper observed the dynamic impact of market risks on the profitability of commercial banks operating in Jordan and listed in Amman Stock Exchange (ASE) for the period from 2010 to 2018. Secondary data were collected from the published annual statements of commercial banks operating in Jordan. One-step GMM model was used to examine the empirical panel data set while controlling endogeneity. The conclusions of the study demonstrated that market risks had an influence on the profitability of Jordanian banks. The profitability of the bank was also examined, along with other parameters including capitalization and bank size. Additionally, the profitability of the previous year has a favorable impact on the profitability of the next year. Additionally, stock market returns (SMRs) have a direct impact on ROA and ROE since rising SMRs boost bank profitability. When boosting a bank's profitability, a bank should take market risk volatility into account.

The association between risk management methods and bank financial performance in the Sultanate of Oman was investigated by Shima, H.A.M. et al. (2022). The secondary data came from public annual reports from eight banks that are listed on the Muscat Stock Exchange. The

results demonstrated that risk management is significant when preventing risk. The research showed a strong correlation between risk management and return on asset (ROA). This finding suggests that management significantly affects banks' performance (ROA). Additionally, the results revealed that risk management had no discernible connection to return on equity (ROE).

Alqisie, A. (2018) investigated how risk management procedures affected Jordanian Commercial Banks' profitability from 2010 to 2015. Secondary data was obtained from the published annual reports of the 13 Jordanian commercial banks. ROA were used as a proxy for banks' profitability, while techniques for managing risks included those related to liquidity, operations, credit, and market risks. Two ratios were employed in the study to represent each category of risk. In order to assess the study's main premise, the fixed effect and random effect models were employed. According to the study, the total risk management strategies are mostly responsible for the variation in bank profitability. The findings also demonstrated that only operational risk management strategies had a major impact on profitability, with little or no impact on liquidity, credit, or market risks. The consequences of these findings suggested that Jordanian commercial banks (JCB) handled liquidity, credit, and market risks well throughout the research period, but failed to control operational risk, which is represented by overheads.

The impact of interest rate risk on the financial performance of NBFIs listed on the Nairobi Stock Exchange (NSE) from 2012 to 2017 is examined by Bimbin, P.C. (2019). The secondary data collected from the annual financial reports of nine listed Kenyan NBFIs. Unbalanced panel data from 9 listed NBFIs from the years 2008 to 2017 were used in the study. The degree of financial leverage was employed as an indication of interest rate risk, while the net profit margin was used to evaluate the NBFIs' financial success. Using random effects models based on the Hausman and LM test specifications, the financial performance was regressed against the market risk indicators. The results show that financial leverage has a considerable useful effect on NBFI performance in Kenya. According to the report, NBFI management should use efficient risk management techniques to mitigate the impact of market risks.

By creating multiple linear regression analysis models, Chen, G. C. et al., (2019) investigated the effect of risk management on the financial performance of listed banks in China, comparing state-owned banks and non-state-owned banks. The first quarter of 2009 to the first quarter of 2017 comprised the study's sample data set. The sample data came from annual reports that were published and made available online by the Shanghai Stock Exchange and the Shenzhen Stock Exchange. The dependable variables of this study were ROA and ROE as proxy of financial performance while CAR, Insolvency Risk Index (IR), LDR, LLR and NPLR were used as independent variables and log of Total Asset was used as control variable. The findings indicated a considerable influence on the IR index, LDR, NPLR, and bank size of state-owned commercial banks' financial performance. The financial performance of state-owned commercial banks is found to be favorably impacted by the IR index and bank size. The financial performance of non-state-owned banks has been significantly influenced by CAR, NPLR, and bank size; with bank size having a positive impact.

Gachua (2011) investigated how exposure to foreign exchange affected a company's financial performance in Kenya. This research was done on a few NSE-listed firms. The study took place between the years from 2001 to 2010. Both qualitative and quantitative data analysis techniques were employed in the study. 32 companies made up the study's sample population. According to the report, listed companies record foreign exchange disparities in their revenue statements and owner's equity accounts. The study came to the conclusion that unrealized foreign currency gains and losses, which were either recorded to the income statement or owner's equity, had an impact on the net income of listed firms. The interest rate risk required to be considered in the study of market risk in order to be thorough. The present study also took into account how much financial leverage is used to handle systemic risks.

Muriithi, J. G. (2016) looked at the impact of market risk on Kenyan commercial banks' profitability. Secondary information was gathered from the 43 commercial banks' published annual reports covering the years from 2005 to 2014 in Kenya. Market risk was assessed using the amount of financial leverage, interest rate risk, and foreign currency exposure, while financial performance was assessed using return on equity (ROE). This study analyzed a panel data set applying random effects, fixed effects estimates, and the generalized method of moments (GMM) in order to eliminate time-invariant unobserved firm-specific effects and to address potential endogeneity problems. The correlations between the variables were conducted pairwise. The coefficient of determination, both within and between R², was used to assess how much variance in the dependent variable is explained by independent variables, while the F-test was employed to assess the significance of the regression. The study's findings showed a strong and negative correlation between bank profitability and financial leverage, interest rates, and currency exposure.

The effect of market risk and fair value on the financial performance of public enterprises in Malaysia was studied by Ali Khan, A.A.N et al. (2019). The years 2007 to 2016 were covered by this study. Inflation and interest rates were used to estimate market risk, whereas ROE was used to estimate financial performance. Primary and secondary data were the main data sources used in this research to acquire data. Fair value information was gathered using primary data, and market risk information was gathered using secondary data. Regression analysis has also been used by researchers to examine the connections between dependent and independent variables. The findings demonstrated that there is no connection between market risk and the profitability of Malaysian public firms. Another theory revealed a significant connection between fair value measurement and financial performance. It was also suggested in this study to further explore the relationship between market risk and other elements, such as the exchange rate and financial leverage.

The effect of risk management procedures on Pakistani banks' financial performance was studied by Bagh, T. et al. (2017). The study's sample pool covered the years 2004 to 2016 and comprised 18 nos. of the best-performing banks in Pakistan. Based on their market shares, these banks were categorized into three groups: big, medium, and small commercial banks. The annual published audited financial reports of the banks under examination were the source of the data for the analysis. Return on equity (ROE) is a proxy for the dependent variable or financial performance.

In order to study risk management, five proxies were used: CAR to evaluate operational risk, NPLR to assess credit risk, interest rate risk, and liquidity risk to measure risk management practices. Risk management practices were used as an independent variable. Five hypotheses have also been formulated for this study. For this study, a quantitative research design with inferential, descriptive statistics, and E. Views software was used. The study's findings showed that risk management strategies have a big influence on how well small, medium, and big banks do financially. Based on the findings, banks should completely focus on the policies, loan quality, and liquidity management as well as the loan evaluation process.

The banking industry supports Bangladesh's economy and serves as a key medium for trade with the rest of the world. Banks can face different types of risk factors during the delivery of financial services. In volatile market conditions, market risks can lead very quickly to significant losses and a full institutional fall in severe cases. Based on the facts presented above, it was necessary to examine the relationship between market risks and the financial performance of commercial banks in Bangladesh.

2.3.3 Liquidity Risk and Financial Performance

According to Goodhart (2008) there are two basic features of liquidity risk and they are maturity transformation (the maturity of a bank's liabilities and assets) and the inherent liquidity of a bank's asset (the extent to which an asset can be sold without incurring a significant loss of value under any market condition). If a bank has assets that can be sold without incurring a loss, they are not concerned about the change of maturity. However, banks need to maintain less liquid assets, which have short term maturity period (Ahmed et al. 2015).

Liquidity mismatch risk can be used to determine how much financial risk a firm is exposed (Central Bank of Barbados, 2008; Brunnermeier and Yogo, 2009). Another term for this is a liquidity gap (Plochan, 2007). The gap between a bank's assets and liabilities is known as the liquidity gap (Falconer, 2001; Plochan, 2007). This difference may be favorable or unfavorable. Whether the organization has more assets than commitments or vice versa will rely on this. If a bank has a negative liquidity gap, it means that the obligations it has taken on are more than its net revenue. After deducting all commitments, the bank has surplus liquid assets, if the liquidity gap is positive.

Apart from the maturity mismatch noted above, several researchers have pointed that liquidity risk can arise due to recessionary economic conditions. This increases the need for depositors, which increases risk of liquidity. Because of the contagion, this might force the banks or even the entire banking system to collapse (Diamond & Rajan, 2005). A highly leveraged bank might begin exploiting the liquidity offered by the source since high liquidity increases leverage (Clementi, 2001). Cash flow delay by the borrower or early termination of the projects may lead to liquidity risks (Diamond & Rajan, 2005).

Koziol et al. (2008) have submitted a study evaluating bank failure risk. The key risks facing by the banks included the liquidity risk. The results were developed using a regression model, which showed that the three elements that had the most impact on Brunei's Islamic banks were risk identification, risk assessment, and risk analysis. These factors needed to be given more consideration in order to improve their risk management practices and recognize how the Basel II agreement really needed to be applied.

The effect of liquidity on the profitability of US banks and Canadian banks was studied by Bordeleau & Graham (2009). The secondary data study was collected from 55 nos. of US Banks and 10 nos. of Canadian Banks operating during the period from 1997 to 2009. The effect of liquidity on bank profitability was assessed using quantitative measurement techniques. The findings of this study found a nonlinear relationship between liquidity and the banks profitability. The profitability of the banks increases, which hold liquid assets, but this profitability reduced for holding excess liquidity after a certain point. Theoretically, this outcome is consistent with the idea that financial markets partially compensate banks for retaining liquid assets, which lowers their liquidity risk. But ultimately, this benefit can be balanced by the opportunity cost of holding such liquid assets with such low yields. At the same time, estimation findings offered some proof that the bank's business strategy and the risk of financial market challenges influenced the link between liquid assets and profitability.

The effects of liquidity risk on the financial performance of the chosen commercial banks operating in the Kingdom of Saudi Arabia from 2002 to 2019 were examined by Hacini, I. et al. (2021). This study used independent variables loan to deposit ratio (LTD) and cash to deposit ratio (CTD) as proxy of liquidity risk and dependent variable return on equity (ROE) as proxy of financial performance and equity to total asset ratio (ETA) as control variable. To assess the study hypothesis, a panel data set was examined using the Pool, Fixed-effects, and Random-effects models. The findings of this study showed that the capacity of Saudi Arabian banks to monitor their financial performance is significantly impacted by liquidity risk.

Uddin, M. R. et al. (2016) investigated the effect of liquidity risk on the performance of a subset of Bangladeshi commercial banks operating from 2010 to 2015. The secondary data were gathered from the annual reports of ten chosen banks that were operative in Bangladesh, within the study period. This study used bank performance (BP) as dependent variables which were proxy by ROA and ROE while independent variables were proxy by current ratio (CR), loan to deposit ratio (LDR) and liquid asset to total asset ratio (LATAR). To achieve research goals, multiple regression analysis has been used. The analysis demonstrates that there is no statistically significant correlation between current ratio and bank performance, although there is correlation between loan to deposit ratio and liquid asset to total asset ratio. According to the study, there is a low correlation between bank performance and both the loan-to-deposit ratio and the ratio of liquid assets to total assets.

Mobarak, M.S. (2020) investigated how liquidity risk management affected the financial profitability of the Islamic banks in Egypt. This research examined financial performance using return on assets (ROA) and return on equity (ROE), and the liquidity risk were measured by loan to deposit ratio (LDR) and cash to total asset ratio (ROE). Secondary information was collected from the publicly available annual reports of the Islamic banks doing business in Egypt from 2013 to 2017. This study used regression analysis to analyze the panel dataset. According to the study's findings, Egyptian Islamic Banks' financial performance would be impacted by the liquidity risk.

Khalid, M. S. et al. (2019) investigated the impact of liquidity risk on the profitability of commercial banks in a developing country like Bangladesh. A study panel dataset were developed by collecting secondary data from the published annual reports for all the listed commercial banks (total 31 nos. of banks) in Dhaka Stock Exchange throughout the year of 2010-2017. The outcome demonstrated that liquidity has no appreciable influence, either positive or negative, on financial performance measured by return on asset (ROA) and return on equity (ROE). The behavior of liquidity risk is consistent across all dependent factors.

Nourrein, A. et al. (2020), examined the determinant factors that affect the liquidity risk of Sudanese Islamic banks. Secondary data were collected from the published annual reports of a sample of 11 commercial banks operating in Sudan during the period from 2012 to 2018. A panel data set was analyzed by using pearson correlation and multiple regression analysis to test the study hypotheses. One microeconomic variable, the Gross Domestic Product (GDP) was added to the independent variables of the bank's including cash position (CASH), investment in short-term securities (SECA), degree of financing the assets from client deposits (DPAS), and bad financing or credit risk (NPL). According to the investigation, CASH and SECA have a strong and negative relationship to the liquidity risk in Islamic banks. The DPAS and NPL variables, on the other hand, show a positive relationship and are significant, whereas the GDP is irrelevant to the liquidity risk in Islamic banks.

İncekara, A. et al. (2019) conducted a competitive analysis on liquidity risk management between Islamic and Conventional banking continued its activities in Turkey. The study used panel data regression model to test the related hypothesis. Secondary data were collected from the quarterly report during the period from 2014 to 2018 of 06 nos. of Islamic and Conventional banks operating in Turkey. The study revealed that, a negative and statistically significant association between liquid assets (LA), gross domestic product (GDP), and inflation (INF) variables and liquidity risk for Islamic banks at 99% level of confidence. NPL has a positive and statistically significant impact on Islamic banking at 95% level of confidence. The relationship between NPL and liquid assets (LA) variables and liquidity risk in conventional banks was negative and statistically significant at 95% and 99% level of confidence, respectively. These results may be used to define the features that conventional and Islamic banks should prioritize for managing liquidity risk.

Nabeel, M. & Hussain, S. M. (2017) examined the effect of liquidity management on profitability of the banking sector of Pakistan. The study used Liquidity risk management as independent variable and profitability as the dependent variable. The secondary data were used for this study collecting from the published annual report of ten banks in Pakistan for the period from 2006 to 2015. Correlation, descriptive statistics, and regression methods were used to evaluate the data by using E-views software. As a measure of liquidity risk, this study used quick, current, cash, interest coverage, and capital adequacy ratios and profitability were measured by return on assets, return on equity, and profits per share. The study's conclusions demonstrated that, cash and current ratios had a negative relationship with bank profitability while interest rate, capital adequacy, and quick ratio had positive effects.

The effect of liquidity on bank's profitability after introduction of Basel III standards was examined by Golubeva, O. et al. (2019). According to the theoretical premise of the article, liquidity ratios have a variety of impacts on bank's profitability based on the particular features and macroeconomic indicators of a bank. This study took into account a number of substitutes for bank liquidity, including the Loan-to-Deposit ratio, the Liquidity Coverage Ratio, a newer measure inspired by the Basel III system, and the Financing Gap Ratio. Earnings before Taxes, Depreciation, and Amortization are considered to be alternative approximations to conventionally used profitability indicators. A quantitative model based on Ordinary Least Squares methods and Weighted Least Squares regression analysis was used to examine a data set of 45 European banks with 180 observations from 2014 to 2017 and 37 observations from 2018. The results of the study demonstrated that only some profitability proxies, and not others, are significantly and positively impacted by liquidity risk indicators. Further research is needed since the Basel III liquidity measure, LCR, contributed insignificantly to all return proxies. The findings also showed that profitability proxies decrease when bank size and net provision for loan losses increase. The study also found inconsistent results about how deposits, profits, and losses on securities affect bank earnings and provided possible explanations.

Mishra et al. (2019) investigated how liquidity management affects private sector banks' financial performance in India. For the years 2013 to 2017, this study examined secondary data from 10 private sector banks in India. The banks' liquidity management was indicated by the Cash-Deposit Ratio (CDR), Credit-Deposit Ratio (CRDR), and Investment-Deposit Ratio (IDR), while the banks' profitability was proxy by Return on Assets (ROA) and Return on Equity (ROE), which were used as dependent variables. It was discovered that CDR and IDR had a considerable negative impact on ROA. However, when all the factors were taken into account with regard to all the chosen commercial banks in India, it was discovered that, there is no substantial correlation between bank profitability and liquidity in the case of ROE. Accordingly, commercial banks may prioritize increasing their profits without losing their liquidity, and vice versa.

2.3.4 Operational Risk and Financial Performance

If the operating risk is not systematically handled, the stakeholders will experience inconsistent performance and income disclosure. So, operational risk exposures have an effect on the bank's profits and net worth position.

Francis and Hess (2004), analyzed the way of managing operational risk or determine the benchmarking of cost income ratio by the ASB Bank of New Zealand (a retail bank) while analyzing the bank's operational risk. This study's primary measure was CIR, and the research found that rather than aiming to reduce it, optimal practices were found by comparing the ratios and cost structures of successful financial organizations. The cost income ratio and the bank's profitability were found to be negatively correlated by the study.

Mathuva (2009) investigated the relationships between both the ratio of capital adequacy and cost income ratio with the financial performance of commercial banks operating in Kenya from 1998 to 2007. This paper used ROA & ROE as proxies for bank profitability. Secondary information was collected from the published annual reports of a sample of 41 Kenyan commercial banks. According to the report, Kenyan banks are not efficient enough to compete worldwide in terms of managing operational risk, as indicated by CIR. This study found that CIR has negative relationship with ROA and ROE. This suggested that banks with effective CIR management might produce higher profit. The study further showed that CIR of the Kenyan banks under investigation was higher than that of industrialized nations.

According to Li and Zou (2014), the CIR also known as the operational cost ratio, may have a mixed effect on financial outcomes. Companies with a greater operational expense ratio would generate revenues that are substantially higher. The relationship between operating costs and financial outcomes is therefore positive. On the other hand, businesses with a higher cost-to-operation ratio cannot match high retained earning that has a negative effect on their financial results. According to Chen et al. (2009), internal bank features such as fund flow management, equity to asset ratio, loan loss ratio, and cost of income ratio have a positive link with financial performance. However, because the banking sector is so dynamic, market conditions are always changing. To prevent inaccurate results in this research model, the study introduced the bank-specific variables into the model as a control variable.

Simamora, R.J.M. (2019) looked at how credit risk, operational risk, and liquidity risk affected the financial performance of commercial banks listed on the Indonesian stock exchange from 2009 to 2017. Secondary data were collected from the sampled 5 commercial banks by using purposive sampling technique. The study analyzed the effects of credit risk proxy by NPLR, operational risk proxy by CIR and liquidity risk proxy by LDR while financial performance proxy by ROA. Multiple linear regression analysis was used as analytical tool in a quantitative technique with associative approach to the research. According to the study's findings, credit risk

had no effect on profitability. Financial performance has significant negative impact on operational risk.

The effects of operational risk management on the financial performance of commercial banks in Nigeria were investigated by Fadun, O.S. & Oye, D. (2020). In this study, operational risk was assessed by using the cost to income ratio (CIR), whereas financial performance was assessed by using the return on assets (ROA) as dependent variable. Secondary data was collected from the annual report of 20 nos. of commercial banks operating in Nigeria from 2008 to 2017. Linear Multiple Regression Model was used to analyze the panel dataset. The results of this study demonstrated a positive correlation between operational risk management and banks profitability. The results showed that good operational risk management procedures had a beneficial effect on banks' financial performance.

Ali et al. (2018), established that efficient risk management practices impact positively on commercial banks performance in Pakistan. This study was collected secondary data from published annual reports of selected 05 large banks and 05 small banks operating in Pakistan during the period from 2005 to 2015. The study used CAR, credit risk, interest rate risk, liquidity risk and operational risk as independent variables while dependent variable i.e. financial performance measured by ROE. Regression model was used to analyze the panel data set. The results of this study demonstrated that for large commercial banks, the risk management variables of credit risk, market risk (interest rate risk), liquidity risk, and operational risk have significant and negative effects on performance; however, for small banks, the impact of operational risk on performance was found to be significant but positive.

Hakimia, A. & Boukaira, S. A. (2020) investigated the interactional relationship between operational risk, credit risk, and liquidity risks on the Tunisian banks performance. In this study, a sample of 10 Tunisian banks from 1990 to 2017 was employed. This study considered capital charged to hedge operational risk (KBIA), total loan to total assets (TLTA), capital adequacy ratio (CAR), Size, Liquidity Ratio, GDP and Inflation as independent variables and Net Interest Margin (NIM) as dependent variable. According to the panel data analysis's findings, the level of bank performance dramatically increases as the amount of capital charge to hedge operational risk is increased. The results also showed that the degree of bank performance is positively and significantly impacted by the relationship between operational risk and loan operations. The relationship between operational and liquidity risk, however, had no significant effect.

Alsyaahrin, D. P. et al. (2018) examined the relations between operational risk, financing risk, and liquidity risk while using bank size as a moderating factor. The financial statements from Indonesian Sharia based Commercial Banks were examined in this analysis for the years from 2012 to 2016. Twelve Sharia based Commercial Banks were chosen as sample for this study utilizing the purposive sampling approach. Panel data were used as the study's data source. These facts were gathered from the website of Sharia Commercial Banks. This study used independent

variables like Financing to Deposit Ratio (FDR) as liquidity risk parameter, NPL Ratio as financing risk parameter, Operational expenses to operational revenue as Operational risk parameter and Sharia Financing as dependent variable and Ln Bank Size as moderating variable. The study data was evaluated by using moderated regression analysis. The outcome demonstrates that, with bank size acting as a moderating variable and producing positive effect, liquidity risk, financing risk, and operational risk significantly influence the financing of Indonesian sharia based banks.

The impact of operational risk on the profitability of commercial banks in Kenya was studied by Muriithi, J. G. and Muigai, R. G. (2017). In this study, financial performance was assessed using ROE, and operational risk was assessed using CIR. Secondary data was collected from the published annual reports of 43 nos. of commercial banks operating in Kenya during the period from 2005 to 2014. Generalized method of moments (GMM) and random effects estimate approaches for panel data were employed to eliminate time-invariant unobserved firm-specific effects and to reduce the risk of endogeneity issues. The significance of the regression was assessed using Wald and F-tests, and the amount of variation in the dependent variable that can be accounted for by the independent variable was assessed using the within and between group coefficients of determination. The results show that cost income ratio has a negative long and short-term relationship with bank profitability.

Said et al. (2008) examined the efficacy of financial ratios in Chinese and Malaysian commercial banks. This study examined the effect on the results, calculated by the average return on assets and return on average capital, the liquidity, loan and capital expenditures and the size of the commercial banks. The researcher analyzed the annual reports of Malaysia and China's commercial banks derived from the Bank Scope database from 2001 to 2007. The balanced panel data set was analyzed by using fixed effect regression model. Logarithms of total assets were used to calculate the bank's size. The study found that, the performance of banks in both countries was unaffected by bank's liquidity risk or size of banks.

The main factors that determinant the efficiency of bank risk management in Nigeria has been empirically examined by Awojobi et al. (2011). This research included seven years annual reports, i.e. for the period from 2003 to 2009, with nine commercial banks in Nigeria covering around 78% of total assets of banking industry. This study examined the long-term equilibrium between capital ratios, macroeconomic factors, and financial ratios with uncertain coefficients, which served as proxies for risk management efficiency. Both banks and macro-determinants specific variable were used the panel regression methodology. Empirical results showed that liquidity, bank size and market risks are positively related with bank's capital adequacy. It was determined that, the impact of bank size were statistically insignificant.

Al-Karim et al. (2013) conducted a study titled "An Evaluation of Financial Performance of Private Commercial Banks in Bangladesh: Ratio Analysis", to assess the impact of bank size,

credit risk, asset management, and operational efficiency on the financial performance of private sector commercial banks in Bangladesh which measured by return on asset (ROA). Three indicators were used to determine the financial performance of the chosen banks: Return on Assets, the Tobin Q model (price/book ratio), and Economic Value. Return on Assets is a financial performance metric used to measure financial performance. Economic Value is an economic performance metric used to measure economic performance. Tobin Q model (price/book ratio) measured the market dependent performance. In order to ascertain the impact of the bank size, credit risk, operating quality, and asset management on the financial performance of the banks, a multiple regression analysis was performed on the time series data for the period from 2008 to 2012 of the selected banks from their respective annual audited reports. Results show that the financial performance of Bangladeshi commercial banks is significantly influenced by bank size, credit risk, operating quality, and asset management.

The size of the bank and its profitability has a positive relationship, according to Flamini et al. (2009) and Smirlock (1985). One explanation might be because large banks offer a wider range of goods and services, which lowers risk and boosts operational effectiveness and profitability. Large banks may also obtain capital at very low costs, giving the impression that they are more profitable. Additionally, several studies have discovered that, in absence of a competitive environment, giant banks retain higher lending rates while offering lower deposit rates to increase profits, resulting in a greater market share (Flamini et al., 2009). However, the relationship is seen negatively by Stiroh and Rumble (2006) and Pasiouras and Kosmidou (2007). They contend that the growth in bank size will lead to higher marketing and operational expenses as well as higher technical costs, which will cause a negative connection between profitability and scale.

Ahmad (2011) examined the seven Jordanian commercial banks' financial statements. While bank size, asset management, and operational efficiency were employed as independent variables in this study, return on asset was used as a dependent variable as a proxy for banks' performance. The research's findings revealed a negative relationship between ROA and bank size, a positive relationship between ROA and asset management ratio, and a negative relationship between ROA and operational efficiency. In a thorough investigation of Pakistani banks' profitability, Ali et al. (2011) discovered a strong correlation between asset management ratio, capital, economic growth, and ROA. They discovered that the ROE is significantly influenced by operational efficiency, asset management, and economic growth.

Aladwan, M. S. (2015) investigated into how different size bank categories affected the profitability of Jordanian listed commercial banks. According to total asset size of the Banks, this study categorizes data set of Jordanian commercial banks into three types. Return on Equity (ROE) was used as a dependent variable to determine profitability. The goal of the study is to determine whether there is a statistically significant effect of asset size on profitability. Dummy

variables were used as proxies for asset size in simple regression. The study's findings showed a significant gap in the profitability of these different sized banks.

The impact of liquidity and bank size on the profitability of Bangladeshi banks from 2011 to 2015 was assessed by Parvin, S. et al. (2019). To perform the study, seven commercial banks in Bangladesh were chosen, and descriptive statistics as well as correlation analysis were employed. Secondary data was collected and examined from the banks' annual reports. According to the findings, the loan to asset ratio and bank size showed a positive relationship with return on asset (ROA), which was used to measure profitability. The findings also indicated that the selected banks' ROA was negatively impacted by the deposit-to-asset ratio. Although there were correlations between liquidity, bank size, and profitability, neither liquidity nor bank size had a major impact on the bank's profitability.

The impact of bank capital and liquidity ratios on banks' profitability in European Banks was examined by Terraza, V. (2015). This empirical study used a sample data set of 1270 European banks during the period from 2005 to 2012. In order to evaluate European banks according to their sizes, three sets of panel data—large, medium, and small banks—were taken into consideration. First, experiments show that major banks behave uniformly. Fixed effects regressions were used to add unique, distinctive effects to the models for the other samples. The study employed Generalized Methods of Moments (GMM) and a dynamic panel model to account for profitability persistence. A medium-sized bank's positive and sizable profitability persistence was shown by the estimation results. Finally, this analysis showed no solid evidence that increased efficiency and bank profitability are positively correlated. Although higher capitalization levels increase bank profitability, the size of the bank affects the liquidity risk.

Mwangi, M. (2018) investigated how size affected the financial performance of Kenyan commercial banks. For the ten-year period from 2007 to 2016, the study employed an unbalanced panel data set containing data from all commercial banks in Kenya. The relationship between size (measured by the log of total assets) and financial performance was determined using regression analysis (ROA & ROE). In Kenya, commercial banks' financial results were found to be positively impacted by size. As the commercial bank became larger, so did the influence.

Mahmud, K. et al. (2016) identified the bank-specific variables impacting the Bangladeshi commercial banks' profitability. The study data was collected from the annual reports of randomly sampled 15 nos. of commercial banks during the period from 2003 to 2013. The dependent variable in the study was ROA, whereas the independent variables were CAR, gearing ratio, liquidity, NPLR, operational expense ratio, and bank size. It was done using the Prais-Winsten correlated panels corrected standard errors (PCSEs) model, which automatically fixes any autocorrelation and heteroskedasticity issues with the panel data. The findings showed that size, operational costs, gearing ratio, and capital were significant factors influencing Bangladeshi

banks' profitability. The other two factors had small impact on Bangladeshi commercial banks. In contrast to the other three statistically significant factors, capital has a positive relationship with bank profitability whereas the other two have a negative relationship with performance. The Bangladeshi banking sector appears to function better and be more profitable when it has appropriate capital, minimal risk, effective expenditure management, and the correct size.

Kawshala, H. & Panditharathna, K. (2017) examined how bank-specific variables affected the profitability of commercial banks in Sri Lanka. Regression analysis was employed in this work for a balanced panel data set with 60 observations for 12 Sri Lankan commercial banks from 2011 to 2015. The dependent variable was profitability, whereas the independent variables were bank size, capital, deposits, and liquidity. ROA was employed in this study to determine profitability together with the logarithm of total assets, capital, deposit ratio, deposit, and liquidity ratio. According to regression output Size (0.001), capital ratio (0.000), and deposit ratio (0.027) were significant bank specific drivers of bank profitability in Sri Lanka. These elements and bank profitability have a positive relationship. Liquidity (0.188) exhibited a negative relation and was an insignificant predictor.

According to some studies, there is a correlation between bank performance and size that is generally positive (Iannotta et al., 2007; Mercieca et al., 2007). However, other studies have indicated that this relationship may not be linear, when bank size increases the profitability of banks increases and decreases due to bureaucratic and other factors (Athanasoglou et al., 2008).

2.3.6 Review of literatures using GMM Model

The profitability of commercial banks in growing Asian nations including Vietnam, Malaysia, and Thailand was evaluated by DAO, B. T. T. et al. (2020). Ten banks in Vietnam, eight in Malaysia, nine in Thailand, i.e. total 27 commercial banks' panel data from the years 2012 to 2016 were used in the study. As profitability indicators, ROA, ROE, and TOBINQ were used in this study. They were influenced by three main types of independent variables: bank-specifics, such as CAR, NPL, Cost to income, Liquidity ratio, and Bank size; industry-specific variables, such as concentration HHI; and macroeconomic-specific variables, such as GDP growth and inflation. Panel data regressions were used to compare and contrast the empirical findings on the study models for each of the three nations, and the overall sample. The most outstanding similarity across these banks was that they have significantly negative relationship between operational risk and bank's profitability. The bank size had a significantly negative impact on profitability on the models of Vietnam and Thailand, but not on the model of Malaysia. The most contentious finding was that, a positive correlation between credit risk and banking profitability as well as a negative relationship between CAR and profitability measures.

The impact of credit risk on Bangladeshi banks' profitability was examined by Hanifa, A. et al. (2015). Secondary data set were collected from the published annual reports of 18 private commercial banks operating in Bangladesh during the period from 2003 to 2013. The study uses

NPL to gross loan (NPLGL), loan loss reserve ratio to gross loan (LLRGL), loan loss reserve to NPL (LLRNPL) and CAR as proxy of credit risk and ROA, ROE and NIM as proxy of profitability private commercial banks operating in Bangladesh. The study found that, NPLGL and LLRGL had a strong negative and significant impact on all profitability measures using the OLS Random Effect Model, GLS, and system GMM. The study also found a significant and negative impact of CAR on ROAE.

The financial performance of Kenyan commercial banks was investigated by Muriithi, J. G. (2016) in relation to market risk. Secondary information was gathered from the 43 commercial banks' published annual reports covering the years 2005 to 2014 in Kenya. Market risk was assessed using the degree of financial leverage, interest rate risk, and foreign currency exposure, while financial performance was assessed using return on equity (ROE). This study used a panel data set using random effects, fixed effects estimates, and the generalized method of moments (GMM) in order to eliminate time-invariant unobserved firm-specific effects and to address potential endogeneity problems. The correlations between the variables were conducted pairwise. The coefficient of determination, both within and between R², was used to assess how much variance in the dependent variable is explained by independent variables, while the F-test was employed to assess the significance of the regression. The results of this study demonstrated a negative and substantial relationship between financial leverage, interest rates, and foreign currency exposure and bank profitability.

With the exception of banks in North America and Europe, Ashraf et al. (2015) analyzed the yearly financial data of 948 banks from 85 countries between 2003 and 2013 in order to assess how effectively Basel III balanced NSFR with overall financial stability. The study considered the financial crisis (from 2007 to 2009), in which banks experienced significant financial and reputational impacts due to excessive risk taking, complex securitization and misalignment in terms of asset liability. The analysis employed a generalized GMM model. The study found that the relationship between NSFR and Z-score is a positive and statistically relevant indicator of banks' fiscal stability. These results confirmed and facilitated the adoption of the regulatory structure under Basel III.

The impact of liquidity risk on the financial performance of commercial banks in Kenya was examined by Muriithi, J.G. and Waweru, K.M. (2017). Secondary information was gathered from the 43 registered commercial banks operating in Kenya from 2005 to 2014 that have published into their annual reports. Return on equity (ROE) was used to measure financial performance, while the liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) served as proxies for liquidity risk. The generalized method of moments (GMM) and random effects estimates were employed in this work to clear time-invariant unobserved firm-specific effects and to reduce the possibility of endogeneity issues. This study conducted pairwise correlations between the variables. With the use of Wald and F-tests, the significance of the regression was determined, and the within and between-group coefficients of determination were

used to determine how much variance in the dependent variable can be accounted for by independent variable. The results show that NSFR is negatively correlated with bank profitability over the long term and in the short term, but LCR has no noticeable impact on the financial health of Kenya's commercial banks over the long term or short term. Overall, it was determined that liquidity risk had a negative impact on financial performance.

Muriithi, J. G. & Muigai, R.G. (2017) examined the effect of operational risk on profitability of commercial banks in Kenya. Secondary data were collected from the published annual reports of 43 registered commercial banks operating in Kenya during the period from 2005 to 2014. Operational risk was measured by CIR while profitability by ROE. The generalized method of moments (GMM) and random effects estimates were employed in this work to clear time-invariant unobserved firm-specific effects and to reduce the possibility of endogeneity issues. The significance of the regression was assessed using Wald and F-tests, and the amount of variation in the dependent variable that can be accounted for by the independent variable was assessed using the within and between-group coefficients of determination. The results of this study showed that CIR was both a long-term and short-term negative predictor of bank profitability.

The impact of bank capital and liquidity ratios on banks' profitability was examined by Terraza, V. (2015). Secondary data were collected from the published annual reports of sampled 1270 nos. of European banks during the period from 2005 to 2012. To evaluate European banks based on size, three panels' data are taken into consideration: large, medium, and small banks. First, experiments show that large banks behave uniformly. Fixed effects regressions are used to add unique, distinct effects to the models for the other data. In this work, Generalized Methods of Moments (GMM) were applied to a dynamic panel model to account for profitability determination. The estimation findings demonstrated a medium-sized bank's assessment of positive and considerable profitability. Finally, this analysis showed no solid evidence that increased efficiency and bank profitability are positively correlated. Although capitalization levels boost bank profitability, liquidity risk is based on bank size.

Muriithi, J. G. et al. (2016) looked at how credit risk affected Kenyan commercial banks' financial performance. The published annual reports of the 43 commercial banks that operated in Kenya between 2005 and 2014 were used to gather secondary data. Capital to risk-weighted assets, asset quality, loan loss provision to loan and advance ratios were all used to evaluate credit risk while financial performance measured through return on equity (ROE). Fixed effects estimate and the generalized method of moments (GMM) were employed in this work to clean time-invariant unobserved firm-specific effects and to reduce the possibility of endogeneity issues. The correlations between the variables were conducted pair-wise. The coefficient of determination, both within and between R², was used to assess how much variance in the dependent variable is explained by independent variables, while the F-test was employed to assess the significance of the regression. The results of this study demonstrated a negative and

substantial link between credit risk and bank profitability. A high percentage of non-performing loans to total assets or low asset quality are both associated with poor bank performance, both in the short and long terms.

The effects of credit risk management and bank-specific variables on the profitability of South Asian commercial banks were studied by Siddique, A. et al. (2021). This study used the public annual reports of 19 commercial banks (10 from Pakistan and 9 from India) from 2009 - 2018 to analyze the impact of credit risk management and bank-specific characteristics on South Asian commercial banks' financial performance (FP). NPL and CAR were utilized as credit risk indicators in this study, while CER, ALR, and LR were employed as bank-specific variables and ROE and ROA were used as measures of financial performance. To counteract the impacts of some endogenous variables, the generalized method of moments (GMM) is used for coefficient estimation. According to the study's findings, CAR and ALR have a considerably positive relationship with the financial performance of Asian commercial banks, whereas NPL, CER, and LR have a significantly negative relationship with ROA and ROE. The study's findings recommended that policymakers in Asian countries should adopt monetary policies that raise interest rates, since doing so, will inevitably help to lower the high ratio of non-performing loans. This will help to establish a healthy financial environment. The company should have a strong liquidity position so that it can survive even in a highly competitive environment.

Ahmed, Z. et al. (2021) investigated the function of financial risk management in forecasting financial performance: a case study of commercial banks in Pakistan. Secondary information was gathered from the published annual reports of commercial banks in Pakistan from 2006 to 2017. Credit risk, interest rate risk, and liquidity risk are used to assess risk management, whereas ROA, ROE, and ROI were used to measure financial performance. The empirical validity of the hypothesis was tested using the dynamic panel model and two step GMM panel estimators. The findings demonstrated that financial risk management substantially lowers the financial performance of Pakistani commercial banks. Results for projecting the financial performance of Pakistan's banking sector using alternative financial risk management metrics were conclusive.

The stability and profitability of the Chinese banking sector were examined by Tan, Y. and Anchor, J. (2016) using data from an auto-regressive distributed linear specification. The goal of this study was to look at the connections between stability and profitability in the Chinese banking sector. Secondary data were collected from a sample of Chinese commercial banks during the period from 2003 to 2013. An auto-regressive distributed linear model was employed in this study to evaluate the connections between the variables. The indicators of stability employed were Z-score and stability inefficiency, whereas the indicator of profitability was Return on Assets (ROA). Generalized Method of Moments (GMM) estimators of various types, such as difference GMM, one-step system GMM, two-step system GMM, and two-step robust GMM, were utilized. Alternative econometric methodologies, such as the ordinary least square (OLS) estimator, between effect estimator, and fixed effect estimate, were utilized to test the

results' robustness. The results of this study demonstrated that higher insolvency risk/lower bank stability causes Chinese commercial banks to be more profitable, whereas higher profitability increases bank weakness.

Researchers Béjaoui and Bouzgarrou, (2014) looked at the factors that affect Tunisian banks' profitability and how they affect profit margins. For 16 Tunisian commercial banks, separated into 11 deposit banks and 5 development banks, this study used a dynamic panel model with the Generalized Methods of Moments (GMM) framework from 1999 to 2010. According to the estimations, there is strong evidence of profit persistence for both deposit and development banks from 2005 to 2010. Deposit banks, as opposed to development banks, are more competitive, according to this study. As a result, Tunisian banks continue to make extraordinary profits, but development banks are more protected by regulations than deposit banks. Profitability and capital have a good link, according to this study. According to the management of liquidity risk by those institutions, the excessive use of deposits to support loans is anticipated to have an adverse effect on the profitability of Tunisian banks. Finally, they demonstrated that, from 1999 to 2010, deposit and development banks suffered from poor loan quality and a lack of provisioning, which had a negative impact on bank's profitability.

2.4 Critique of the Existing Literature

The literature study states that most of the earlier empirical researches have investigated how risk management affects the bank's financial performance on numerous measures. Most of the studies were used ROA & ROE as proxy of banks profitability. In so many research, the researchers examined the impact of risk management on the profitability of commercial banks, the majority have rely largely on the different instruments and techniques to handle financial risk, procedures and approaches used by the different Banks (Mwirigi, 2006; Simiyu, 2008; Wanjira, 2010; Ochola, 2009; Ngare, 2008).

According to empirical data and findings, the pattern of how risk variables affect the profitability of commercial banks has been found to be complicated. Additionally, the literature study provides evidence that inconsistent empirical results have been found even when using the same financial performance indicators. Many of the studies have had significant or insignificant positive or negative relationships of the independent variables with the dependent variables. To some cases, the studies did not suggest any correlation between independent variables and dependent variables. Most of the studies only checked the long run effect of the risk management factors on the profitability of commercial banks. There were very limited studies, which were able to establish a complete relationship between all the risk management factors and financial performance of commercial banks and were check the effect in both long run and short run especially in Bangladeshi banking industry during the period from 2014 to 2019. Therefore, it is still inconclusive how all the risk factors affect the profitability of commercial banks both in the short run and long run especially in Bangladeshi banking industry.

Also this studies reviewed above, were not recognized the dynamism in Bangladesh's banking sector in most of the cases. The research was often performed on the basis of OLS or long-term models. Some of the studies used GMM model to track the dynamism and the effect on current output over the immediate previous era. This is due to the bank management's desire to safeguard the current period's performance based on data from the prior period.

Some studies are not exhaustive since they only looked at the effect of credit risk on the profitability of financial institutions. Some studies did not considered other risk factors including the liquidity risk, operating risk and market risk for the Banks. Like previous studies, some other studies considered only one risk factors ignoring others risk factors while analyzing its effect on financial performance. Some other studies considered all risk factors including credit risk, liquidity risk, market risk and operation risk factors while assessing risk management factors for banks but did not captured bank specific control variable, within industry concentration and macro-economic control variables while analyzing its impact on the financial performance of commercial banks.

Some papers were reviewed on Bangladesh banking industry but most of this was on the basis of analyzing the impact of only one risk factor, largely credit risk on the financial performance of banks. While analyzing the impact of risk management elements on the financial performance of commercial banks in Bangladesh, additional risk factors such as market risk, liquidity risk, and operation risk were overlooked in those study papers. In addition, most of these studies did not considered bank specific control variable, within banking industry concentration and macro-economic control variables while analyzing the impact both in short run and long run of the risk management factors on the financial performance of commercial banks in Bangladesh.

2.5 Conceptual Framework

The purpose of a conceptual framework is to enable the researcher to construct and convey information and understanding about the situation. A conceptual framework is clearly articulated to help researchers understand subsequent results and has a possible utility as a guide. It specifies the potential connections between variables as part of the negotiation package that will be examined, checked, evaluated, and changed following an inquiry (Smith, 2004).

The conceptual framework model displayed in Fig. 1.1 presents the interrelationship between the variables discussed above in order to provide direction for the study:

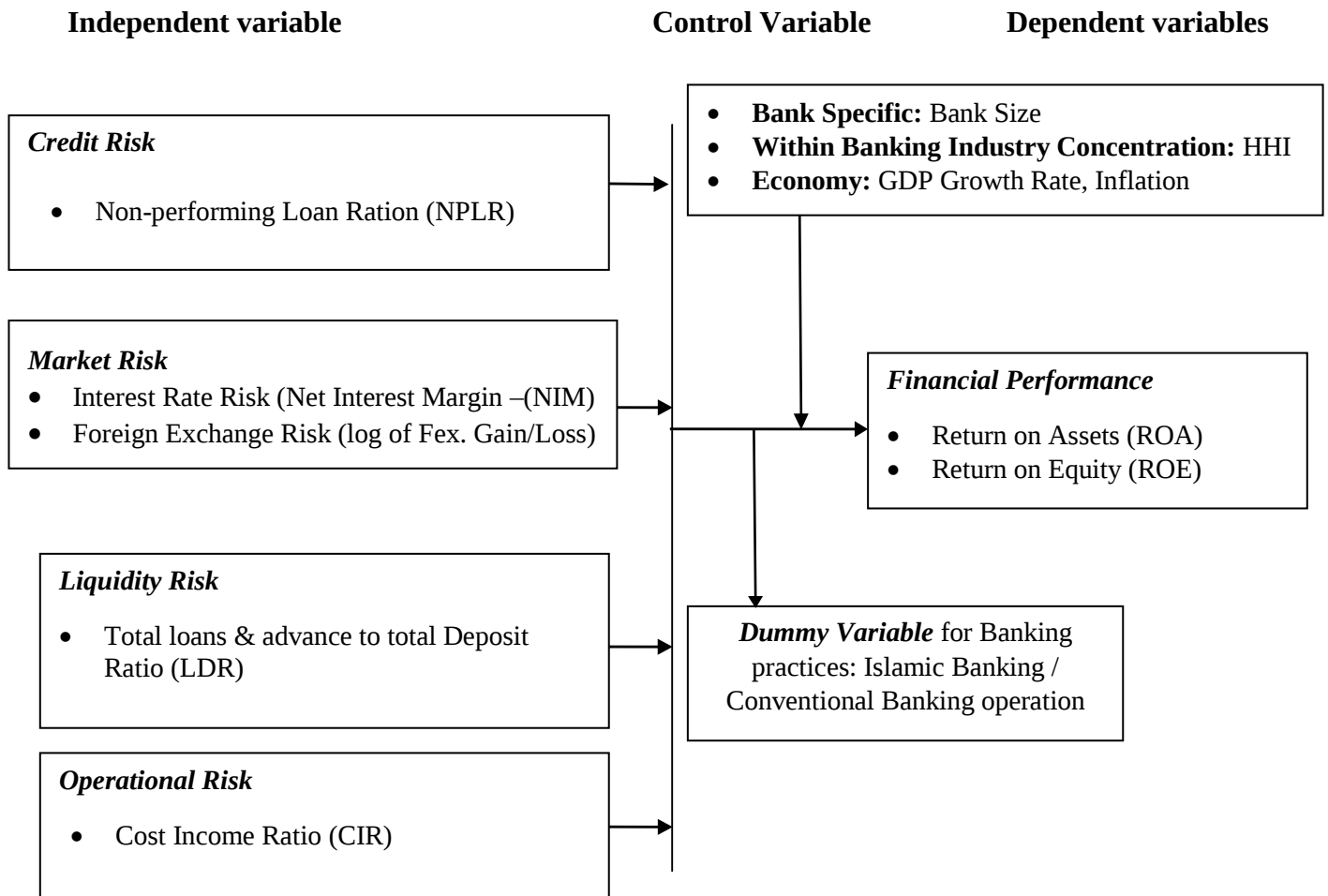


Figure – 1.1: Conceptual framework

The ratio of profit after tax to total/average assets (ROA) and the ratio of profit after tax to total/average equity (ROE) are two frequently used profitability indicators that shows how well an organization uses its assets and how well it generates income from those assets. ROA has previously been studied by Bougatef (2017), Williams (2003) and Haris et al. (2019) and ROE has been used by Jane et al. (2017), Abdul et al. (2019), Badawi A. (2017), Muriithi J.G. (2016), Asif & Razzaq (2017). Whereas both ROA and ROE have been used previously as dependent variable by Mishra et al. (2019), Reaz et al. (2016), Saifullah et al. (2019), Zeeshan et al. (2021), Asima et al. (2021). In addition, this study analyzed multiple risk parameters as they have impact on the financial performance of commercial banks. The Asset Quality Ratio, i.e. non-performing loan ratio (NPLR) that has been used as proxy of credit risk, which has been previously used by Abu et al. (2015), Chuke & Chinedu (2018), Alshatti, A. S. (2015), Saeed & Zahid (2016), Tanveer et al. (2017), Kithinji (2010), Afriyie (2011), Kolapo et al. (2012) and Poudel (2012).

Market risks are usually beyond bank control since the factors that shape the economy as a whole decide (Aruwa & Musa, 2014). The analysis would take into account the impact of the interest rate and foreign currency risk as a measure of market risk since a rate shift might result in a difference between the interest due on a deposit and the interest on loans as well as gains or losses from foreign exchange operations. The probability of interest rate is calculated by the Net Interest Margin (NIM) and foreign exchange risk is calculated by log of Fex. Gain/ Loss. NIM has been used previously as proxy of market risk by Muriithi, J. G. (2016), Ekinci, A. (2016), Badawi, A. (2017), Abdul et al. (2019) while log of Fex Gain/ Loss used as proxy of foreign exchange risk by Muriithi, J. G. (2016), Ekinci, A. (2016) and MacDonald (2006). As measures of the liquidity risk this study will use total loans & advance to total deposit ratio (LDR) which has been previously used by Reaz et al. (2016), Olga et al. (2019), Mishra et al. (2019), Simamora, R. J. M. (2019), Simamora & Oswari (2019) and Bawadi, A. (2017). While reassuring the operational risk this study used cost income ratio (CIR), which has been used previously by Mathuva (2009), Li and Zou (2014), Masood and Ashraf (2012), Olajide & Oye (2020), Simamora and Oswari (2019), Dr. Jane and Dr. Robert (2017).

This studies used log of Bank size or Total Asset as bank specific control variable into the model and Herfindahl–Hirschman Index (HHI) as proxy of within banking industry concentration variable, GDP Growth Rate and Inflation Rate as proxy of macro-economic variables which has been previously used by some studies like Awojobi et al. (2011), Ahmad (2011), Thanh & Phuong (2020), Abdelaziz & Ahmed (2020), Masood and Ashraf (2012), Olga et al. (2019), Ahmet et al. (2019), Ahmed & Ahmed (2020). A dummy variable were used to control the effect of different types of banking operational practices in Bangladesh including Islamic banking and conventional banking operation.

2.6 Research Gap and Contribution

The importance of banks to the expansion and stability of the economy has previously been mentioned. Financial performance and enough capital are key factors in determining a bank's stability (Tabari et al., 2013; p. 1624). We are aware of the lack of a conclusive finding on the relationship between overall risk management variables and the profitability of commercial banks both in the short and long run after a thorough review of prior research on risk management factors and financial performance of banks. Most of researchers have focused on one individual risk factors especially Credit Risk to relate with the overall performance or profitability for several countries and showed different results. However, very few researchers conducted research on overall risk management factors and its relationship with performance of commercial Banks considering both short run and long run effect especially in Bangladeshi banking industry for the period from 2014 to 2019. Moreover, most of the researchers only used bank specific control variable into the model but ignore banking industry concentration and macro-economic variables' impact on the overall performance of the banks. The study identified a research gap as a result and makes an effort to fill it.

From a practical standpoint, the findings of this study will inform and direct bank management, investors, and bank supervisors in introducing better risk management practices and maximizing its profitability while taking into account all bank-specific, within banking industry concentration, and macroeconomic factors. The management of the bank should focus more on controlling all risk factors in order to enhance the performance of the bank. Private investors can also view the impact on financial performance with a more thorough perspective. According to the empirical findings of this research, banks may have more resources for decision-making by analyzing the risk management from the risk report that they offer. Last but not least, additional data on the effects of risk management will be sent to bank regulators so they may assess if further regulation or deregulation is required. If the outcome shows that there is no association, the contribution can be that more research into this topic is not necessary or that more important aspects should be taken into account to establish a stronger relationship.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The part of this study comprises research designing, selection of target population, data collection instrument selection, data collection of the respondent, phase termination, data processing methods, and research variables interpretation and calculation. It also defines the empirical econometric models in which the research variables have been estimated, and the econometric model can be tested and measured throughout the study.

3.1 Research Design

A quantitative research design technique has been used for this study. The required financial ratios have been collected or computed for each local commercial Bank in Bangladesh for the survey period from their published annual report/ financial statements and transformed into a balanced panel to identify and understand the impact of overall risk factors on the profitability of commercial banks operating in Bangladesh. Time Series Cross-Sectional panel data set has been considered for the analysis of this study. The study also use financial ratio analysis as proxy of risk factors through a panel data set for regression analysis considered the time period from 2014 to 2019 to calculate, explain and analyze its effect on the profitability of commercial banks operating in Bangladesh. Although some foreign commercial banks operate their businesses in Bangladesh directly or through corresponding banking practices, the study excluded all those foreign commercial banks due to their globally practiced separate internal risk management system. Besides, this study also excluded all the Government-owned Specialized/ Development Banks in Bangladesh from its population due to their specialized purpose of doing business and separate risk management system. The study period has been selected considering consecutive years after Bangladesh Bank publication of master circulars for loan classification, rescheduling, and written off (modified and re-published), i.e., from 2014 to 2019 to collect most recent data.

To control the heterogeneity for individual specific variables associated with individual banks, this study used panel data estimation technique. More informative data, more variability, more efficiency, more degrees of freedom, and less collinearity among the research variables are produced when cross sectional observations from time series are combined with panel data. Additionally, panel data reduce any bias that might be produced by aggregating one or more individual banks. It also enriches empirical analysis, which may not be possible if only cross sectional data or time series data were used for the study (Ogboi & Unuafé, 2013).

3.2 Research Strategy

The study techniques include analysis, case research, activity research, theory, grounded theory, and research into archives. According to (Saunders et al., 2009; p 141), these research strategies should not be mutually exclusive and equally superior to each other. The research strategy is essential for a study to know whether it will make possible for the researcher to solve the research question. A study's research question will guide a researcher to select the research strategy (Saunders et al., 2009; p 141). This research used an archival technique involving archival record collection. All the secondary data of this study have been collected from Bank's

published annual report or audited financial statements. Therefore, an archival approach is more suitable than other research methods for this analysis.

3.3 Research Method

There are two types of research methods, quantitative and qualitative research. The quantification of data collection and interpretation is emphasized in quantitative analysis (Bryman & Bell, 2007). Quantitative research carries out a deductive approach to the link between theories and emphasizes theory testing (Bryman & Bell, 2007). While qualitative research emphasizes on the theory or words. This approach contributes to an inductive relationship between theory and analysis, aiming at generating theory (Bryman & Bell, 2007). This study selected the deductive approach, i.e., it focuses on testing a theory rather than generating theory. This study collected all the variables data directly from the published annual reports of all the local commercial banks in Bangladesh, which are described numerically. This study did not use any other methods of data collection, like interviews and questionnaires. So, the quantitative data and statistical analysis maintain the objective conception of the study. Therefore, quantitative research technique is more suitable for this study.

3.4 Target Population

All of the local commercial banks operating in Bangladesh, who had begun doing business prior to the research period, were included in the study's population. Bangladesh Bank is the licensing authority for commercial banks in Bangladesh. According to Bangladesh Bank, currently there are total 47 nos. of local Commercial Banks operating in Bangladesh including 6 nos. of state own banks and 41 nos. of local private commercial banks. Among total 47 nos. of banks 43 nos. of banks are in commercial banking operation during the study period, i.e. from 2014- 2019 (excluding 03 newly licensed Banks and one reformed Bank through Government intervention i.e. from Farmer Bank Ltd to Padma Bank Ltd in the year 2016). Therefore, total 43 nos. of local commercial banks operational in Bangladesh during the study period would be the population of this study.

This study excluded total 09 nos. of foreign commercial banks operating their commercial businesses activities in Bangladesh directly or through corresponding banking practices. The study excluded all those foreign commercial banks due to their globally practiced separate risk management system, in addition to all the guidelines of Bangladesh Bank. In addition, this study also excluded all the Government owned Specialized/ Development Banks in Bangladesh from its population due to their specialize purpose of doing business and separate risk management system.

3.5 Study Period

This study collected all the data from secondary sources, i.e., from published audited financial statements of all the local commercial banks in Bangladesh during the period from 2014 to 2019. The study selected period from 2014 to 2019 due to reflection of some policy and guidelines

changes into the data set, including the amendment of a master circular for loan classification and provisioning by Bangladesh Bank in 2012. The introduction of BASEL III guidelines in the year 2014 and to collect recent available published data set.

3.6 Data Collection Instrument

The study has been used secondary data, which is calculated or collected from published annual reports of all the local commercial banks operating in Bangladesh over the 06-year periods, i.e., from 2014 to 2019. A customized data collection instrument has been used to collect/ organize the data set shown in Appendix I.

3.7 Data Collection Procedure

The published annual report or audited financial statements for all the local commercial banks in Bangladesh during the period from 2014 to 2019 has been collected from their Bank's website, DSE website, Bangladesh Bank, and their respective finance division. The customized secondary collection instrument has been prepared by collected or calculated required financial ratios or data from the published annual report or audited financial statements for each Bank for 06 years, i.e., from 2014 to 2019. The required data has accumulated into an Excel data file from the secondary data collection instrument. The Panel data set has been developed for the study from the collected data set through the secondary data collection instrument since it helps to research each Bank's actions over time and space (Baltagi, 2005 and Gujarati, 2003). The secondary analysis of current data is reliable and cost-effective as the most time, and costly aspect of the research project is the data collection process (Polit and Beck, 2010).

3.8 Data Processing and Analysis

The methods and techniques for analyzing data set and testing variables were explored in this section of the report. The secondary published data were collected, arranged and measured using Excel software to collect the study variables in certain financial ratios. The balanced data panel collection was quantitatively analyzed with regression equations which were resolved using version 12 of STATA statistical software.

3.9 Measurement of Study Variables

The profitability of all the individual banks was considered as a dependent variable of the study. Contrarily, the parameters for credit risk, market risk, liquidity risk and operational risk were explanatory variables. Log of Bank Size was considered as Bank Specific control variable, Herfindahl–Hirschman Index (HHI) was used as within banking industry concentration and GDP Growth Rate & Inflation Rate were used as macro-economic control variable. Each research variable was measured and evaluated in this portion of the research.

3.9.1 Financial Performance

Financial performance of commercial Banks operating in Bangladesh was measured by using Return on Assets (ROA), i.e., the ratio of profit to assets and Return on Equity (ROE), i.e., the ratio of profit to equity. ROA indicates that, how profitable a Bank in relative to its total assets.

The return on assets (ROA) ratio measures the value of the bank's management in relation to its total assets (Guru et al. 1999). Return on assets is presented as percentage. The banks' financial performance can be assessed by applying ROA since it shows that Bank's efficiency to manage quality assets reduces NPL for profit maximization and long-term sustainability of a bank. The ratio of net profit to overall assets is calculated.

$$\text{Return on Assets (ROA)} = \frac{\text{Net Income}}{\text{Total Assets}}$$

ROE is the widely used measurement of bank's profitability, which assess how effectively shareholders capital is being used to generate profit. ROE is determined by both the underlying profitability of a bank's assets and the extent to which these are leveraged. The financial ratio, return on equity (ROE) calculates how much net income a corporation makes from its capital investments. ROE helps the investors to understand how efficiently a firm uses its capital to generate profit.

$$\text{Return on Equity (ROE)} = \frac{\text{Net Income}}{\text{Total Shareholder's Equity}}$$

3.9.2 Banks Credit Risk

Credit Risk of commercial Banks operating in Bangladesh has been measured by using non-performing loan (NPL) Ratio. The NPL ratio is calculated by the ratio of non-performing loans to total loans & advances. NPL ratio represents the fact of assets quality of a Bank; higher the NPL ratio leads to poor asset quality of the Bank. The increasing trend in the NPL ratio is a severe problem for the Bank unless it can develop effective management system for timely recognition of potential problem loans. It may result bank failure if not addressed timely. NPL can seriously damage a bank's financial strength and may have an unfavorable impact on its business (Epure & Lafuente, 2015). Due to inefficient NPL Risk management, the Bank's performance and survival become distressed.

$$\text{Non – Performing Loans Ratio (NPLR)} = \frac{\text{Non – Performing Loans}}{\text{Total loans and advance}}$$

Proper implementation and practices of credit risk management guidelines published by Bangladesh Bank, strong internal credit risk management and monitoring system, strong credit risk assessment procedures, maintaining adequate provision against classified loans, and advances and introduction of a strong recovery system can reduce Bank's credit risk. When the NPL ratio is very high, the provision maintained against loans & advances is not adequate to protect default risk (Kwambai & Wandera, 2013).

3.9.3 Banks Market Risk

Market risk is the risk that an institution faces, as a result of changes in market pricing, interest rate, currency exchange rate, and commodity price. Market risk, which comprises the exchange rate and interest rate risk, affects banks' financial performance. Interest rate increases appear unlikely, due to their impact on net interest income, to substantially undermine the banking sector (Ngalawa et al., 2013).

The term "net interest margin" refers to the comparison between a bank's net interest revenue from loans and advances and the interest payments made to holders of various types of interest-bearing credit accounts. Net Interest Margin (NIM) is bank profitability metric, expressed as a percentage. A positive NIM indicates the profitability of a bank, while a negative figure means inefficiency of investment. A bank's NIM can influence multiple factors. If there is strong demand for loan competitors' savings accounts, NIM will decline as the Bank has to pay a higher interest rate than it gets. In comparison, in loan versus savings accounts where more consumers borrow than savings, there is greater demand for a bank NIM.

$$NIM = \frac{\text{Interest Income} - \text{Interest Expenses}}{\text{Total Loans \& Advance}}$$

Monitory policies set by the central bank from time to time also strongly influence the NIM of a bank as these edicts play an important role in controlling savings and credit demand. Consumers may borrow money and save less if the rate is low. This is normally predicted as the higher Bank NIM. This generally results in a higher NIM for a bank. Alternatively, if the interest rate increases, the demand for a loan becomes less, and the customer is more interested in savings, which decreases the NIM of a bank.

The decision made by each bank regarding its exposure to foreign exchange is crucial for managing foreign currency risk (Allayannis et al., 2001). Gains and losses in foreign exchange have a significant influence on profitability, which is the cornerstone of the market's perception of that bank. An indicator of a bank's sensitivity to exchange rate fluctuations is the amount of foreign exchange exposure the institution holds. Foreign currency exposure refers to how much a corporation is influenced by changes in exchange rates. Transaction exposure, commonly referred to as foreign exchange loss or gain on previously undertaken and denominated in a foreign currency transaction, describes the magnitude of the gain or loss resulting from a specific exchange rate movement. As a proxy for the risk of foreign exchange exposure, the study used the log of foreign exchange gain or loss:

$$LnFexGL = Ln(\text{Foreign Exchange Gain / Loss})$$

3.9.4 Banks Liquidity Risk

Loan & advance to Deposit ratio (LDR) is a ratio between the Bank's total loans & advance to incremental deposits. Banks collect a deposit from different surplus units of the economy, including individuals, institutions, and corporations, and lend the fund to the different deficit units, including individuals and business corporations or units. Banks does not allow investing all of their collected deposit into the deficit units due to the maintenance of liquidity safety fund into Bangladesh Bank in the form of Cash Reserve Ratio (CRR) and Statutory Liquidity Reserve (SLR) as per the guidance of the Central Bank. However, the rate of CRR and SRL are different for Islami Banks and Conventional Banks. Banks should try to invest at the highest proportion of available funds (excluding CRR and SRL deposit) to maximize their return. If a bank's LDR is too high, banks can lack adequate liquidity to meet unforeseen financing needs or economic crises. On the other hand, Banks may not have maximized their return if LDR is low. This study considers LDR as a liquidity risk because it indicates banks' ability to resist withdraws from deposits and banks' ability by reducing their cash reserves to meet the demand for loans.

$$LDR = \frac{\text{Total Loans and Advance}}{\text{Total Deposit}}$$

3.9.5 Measure of Operational Risk

The cost-effectiveness ratio (also called the cost-effectiveness ratio) is determined by dividing operating expenses into the produced operating revenues. The cost-income ratio, especially important in valuing the Bank, is a key financial measure. In terms of earnings, it indicates the expense of a bank. Reducing costs for a given income level would represent higher profit levels and vice versa. The ratio gives investors a straight forward picture of the Bank's performance. The more profitable it is, the lower the percentage. Changes in the ratio may also illustrate the potential problem, which means the expense is higher than income, if the ratio increases from one time to the next. The volatility of the cost to revenue ratio of a bank may thus be the best indicator of volatility in a bank's cost output. The cost-to-income ratio is the non-interest (operating) cost ratio minus a bad, doubted debt to the Bank's net profit plus interest-free income.

$$\text{Cost Income Ratio (CIR)} = \frac{\text{Operating Cost}}{\text{Operating Income}}$$

3.9.6 Bank Size

This study measured the Bank Size by its Total Assets (Smirlock, 1985). For analyzing the performance of a bank, this study used Bank Size as a bank specific control variable. Bank scale has been assessing by using the Natural Total Asset Logarithm (LnTA). The profitability effect of bank size is often anticipated to be favorable (Smirlock, 1985).

$$\text{Bank Size} = \ln(\text{Total Assets})$$

3.9.7 Dummy Variable

This study use a dummy control variable as proxy representing two types of banking operational practices in Bangladesh including Conventional banking operation and Islamic banking operations.

IslamiConv = Dummy variable for two types of banking operations

3.9.8 Herfindahl–Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI) is a measure of a company's size in relation to the market it serves as well as a measure of its level of competition. HHI is determined by squaring the market shares of each competing Bank in the industry, where the market shares are given as fractions or points, and then adding the resulting values. The outcome is weighted by market share and is proportional to the average market share. In respect to measures like the concentration ratio, Herfindahl Index's main advantage is that it gives larger firms more weight. For analyzing the performance of a bank, this study used HHI as proxy of within banking industry concentration control variable.

3.9.9 GDP Growth Rate

GDP Growth Rate of Bangladesh during the period from 2014 to 2019 has been collected from Bangladesh Bank web site to use as control variable related to economic concentration for analyzing the performance of a Bank.

3.9.10 Inflation Rate

Inflation Rate of Bangladesh during the period from 2014 to 2019 has been collected from Bangladesh Bank web site to use as control variable related to economic concentration for analyzing the performance of a Bank.

3.11 Model Specification

According to Baitagi, 1995, Panel data can include time effects and control individual heterogeneity of firm-specific fixed or random effects components. However, it produces biased conclusions when ignored in cross-section or time-series calculations. As a result, this study used short term dynamic panel models and long term statistical models to predict how commercial banks' risk variables in Bangladesh affected their financial performance. To ensure that a bank's current period performance was unaffected by its past period performance, the long-run model does not take into account lagged dependent explanatory variables. While the short-run model assumes that immediate last year performance, i.e., lagged dependent explanatory variable, influences the current period performance. The short-run models made the assumption that the performance process of a bank had not yet been fully adjusted. A partial modification is applied to the short-run model since, for instance, banks can leverage their past performance to safeguard their future performance.

3.11.1 Econometric Model – I

Using the log of bank size as a control variable, the analysis's initial objective was to demonstrate if credit risks, market risks, liquidity risks, and operational risks had an impact on the financial performance of commercial banks in Bangladesh. In this analysis, the ROA and ROE is considered as dependent variables for calculating the financial performance. The independent variables includes log of non-performance loan ratio (LnNPLR) as a measure of credit risk, interest rate risk or log of net interest margin (LnNIM) and log of foreign exchange gain/ loss (LnFexGL) are used to measure market risk, total loan to total deposit ratio (LDR) is used to measure liquidity risk, log of cost income ratio (LnCIR) is used to measure operational risk. A dummy variable (*IslamiConv*) is used to check the impact of two different types of banking system practices in Bangladesh, i.e. conventional banking and Islamic banking. The log of Bank Size or total assets is used as bank specific control variable. This analysis assumed the general functional relationship Cobb Douglas was generalized in all the independent variables and dependent variable, which has shown in equation 1.1 and 1.2:

$$ROA = f (LnNPLR, LnNIM, LnFexGL, LDR, LnCIR, IslamiConv, LnBS) \dots\dots\dots (1.1)$$

The loan run model was as follows:

$$ROA_{it} = \beta_0 + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 LnCIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \theta_i + \varepsilon_{it} \dots\dots\dots (1.1a)$$

Where $i=1,2,\dots\dots\dots n$ and $t=1,2,\dots\dots,6$

The short-run model was as follows:

$$ROA_{it} = \beta_0 + \lambda ROA_{it-1} + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 LnCIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \theta_i + \varepsilon_{it} \dots\dots\dots (1.1b)$$

Where $i=1,2,\dots\dots\dots n$ and $t=1,2,\dots\dots,6$

Here, ROA_{it} refer to the financial performance of bank i on time t . β_0 is the constant of the model or intercept, β_1 is coefficient of the independent variables. ROA_{it-1} is the lagged of bank's financial performance, $LnNPLR_{it}$ stands for log of non-performing loan ratio of Bank i at time t . $LnNIM_{it}$ stands for log of net interest margin ratio of bank i at time t . $LnFexGL_{it}$ stands for log of foreign exchange gain/ loss of bank i at time t . LDR_{it} is the loan & advance to deposit ratio of bank i at time t . $LnCIR_{it}$ is the log of cost income ratio of bank i at time t . $IslamiConv_{it}$ is the dummy variable added into the model for two types of banking system operating in Bangladesh i.e. islami banking and conventional banking system for bank i at time t and $LnBS_{it}$ stands for log of Bank Size (assets size) of bank i at time t . θ_i stands for bank specific impact, which is

anticipated to have normal distribution with constant variance, and ε_{it} is error term of the model, which is anticipated to be normally distributed.

$$ROE = f (LnNPLR, LnNIM, LnFexGL, LDR, CIR, IslamiConv, LnBS) \dots\dots\dots (1.2)$$

The loan run model was as follows:

$$ROE_{it} = \beta_0 + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 CIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \theta_i + \varepsilon_{it} \dots\dots\dots (1.2a)$$

Where $i = 1, 2, \dots, n$ and $t = 1, 2, \dots, 6$

The short-run model was as follows:

$$ROE_{it} = \beta_0 + \lambda ROE_{it-1} + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 CIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \theta_i + \varepsilon_{it} \dots\dots\dots (1.2b)$$

Where $i = 1, 2, \dots, n$ and $t = 1, 2, \dots, 6$

Here, ROE_{it} refer to the financial performance of bank i on time t . β_0 is the constant of the model or intercept, β_i is coefficient of the independent variables. ROE_{it-1} is the lagged of bank's financial performance, $LnNPLR_{it}$ stands for log of non-performing loan ratio of Bank i at time t . $LnNIM_{it}$ stands for log of net interest margin ratio of bank i at time t . $LnFexGL_{it}$ stands for log of foreign exchange gain/ loss of bank i at time t . LDR_{it} is the loan & advance to deposit ratio of bank i at time t . CIR_{it} is the cost income ratio of bank i at time t . $IslamiConv_{it}$ is the dummy variable added into the model for two types of banking system operating in Bangladesh i.e. islami banking and conventional banking system for bank i at time t and $LnBS_{it}$ stands for log of Bank Size (assets size) of bank i at time t . θ_i stands for bank specific impact, which is anticipated to have normal distribution with constant variance, and ε_{it} is error term of the model, which is anticipated to be normally distributed.

3.11.2 Econometric Model – II

Model – II includes Herfindahl–Hirschman Index as proxy of within banking industry concentration which shown in equation 2.1. The Herfindahl-Hirschman Index, a widely used index of market concentration, is referred to as "HHI." This econometric model examines the impact of independent variables into the dependent variable after inclusion of HHI as proxy of within banking industry concentration. This analysis assumed the general functional relationship Cobb Douglas was generalized in all the independent variables and dependent variable, which has shown in equation 2.1 and 2.2:

$$ROA = f (LnNPLR, LnNIM, LnFexGL, LDR, LnCIR, IslamiConv, LnBS, HHI) \dots\dots\dots (2.1)$$

The loan run model was as follows:

$$ROA_{it} = \beta_0 + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 LnCIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \theta_i + \varepsilon_{it} \quad (2.1a)$$

Where $i=1,2,\dots,n$ and $t=1,2,\dots,6$

The short-run model was as follows:

$$ROA_{it} = \beta_0 + \lambda ROA_{it-1} + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 LnCIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \theta_i + \varepsilon_{it} \quad (2.1b)$$

Where $i=1,2,\dots,n$ and $t=1,2,\dots,6$

Here, ROA_{it} refer to the financial performance of bank i on time t . β_0 is the constant of the model or intercept, β_1 is coefficient of the independent variables. ROA_{it-1} is the lagged of bank's financial performance, $LnNPLR_{it}$ stands for log of non-performing loan ratio of Bank i at time t . $LnNIM_{it}$ stands for log of net interest margin ratio of bank i at time t . $LnFexGL_{it}$ stands for log of foreign exchange gain/ loss of bank i at time t . LDR_{it} is the loan & advance to deposit ratio of bank i at time t . $LnCIR_{it}$ is the log of cost income ratio of bank i at time t . $IslamiConv_{it}$ is the dummy variable added into the model for two types of banking system operating in Bangladesh i.e. islami banking and conventional banking system for bank i at time t and $LnBS_{it}$ stands for log of Bank Size (assets size) of bank i at time t . HHI_{it} is the Herfindahl–Hirschman Index as proxy of within banking industry concentration of bank i at time t . θ_i stands for bank specific impact, which is anticipated to have normal distribution with constant variance, and ε_{it} is error term of the model, which is anticipated to be normally distributed.

$$ROE = f (LnNPLR, LnNIM, LnFexGL, LDR, CIR, IslamiConv, LnBS, HHI) \quad (2.2)$$

The loan run model was as follows:

$$ROE_{it} = \beta_0 + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 CIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \theta_i + \varepsilon_{it} \quad (2.2a)$$

Where $i=1,2,\dots,n$ and $t=1,2,\dots,6$

The short-run model was as follows:

$$ROE_{it} = \beta_0 + \lambda ROE_{it-1} + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 CIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \theta_i + \varepsilon_{it} \quad (2.2b)$$

Where $i=1,2,\dots,n$ and $t=1,2,\dots,6$

Here, ROE_{it} refer to the financial performance of bank i on time t . β_0 is the constant of the model or intercept, β_1 is coefficient of the independent variables. ROE_{it-1} is the lagged of bank's financial performance, $LnNPLR_{it}$ stands for log of non-performing loan ratio of Bank i at time t . $LnNIM_{it}$ stands for log of net interest margin ratio of bank i at time t . $LnFexGL_{it}$ stands for log of foreign exchange gain/ loss of bank i at time t . LDR_{it} is the loan & advance to deposit ratio of bank i at time t . CIR_{it} is the cost income ratio of bank i at time t . $IslamiConv_{it}$ is the dummy variable added into the model for two types of banking system operating in Bangladesh i.e. islami banking and conventional banking system for bank i at time t and $LnBS_{it}$ stands for log of Bank Size (assets size) of bank i at time t . HHI_{it} is the Herfindahl–Hirschman Index as proxy of within banking industry concentration of bank i at time t . θ_i stands for bank specific impact, which is anticipated to have normal distribution with constant variance, and ε_{it} is error term of the model, which is anticipated to be normally distributed.

3.11.3 Econometric Model – III

Model – III includes GDP Growth Rate and Inflation Rate in Bangladesh for the study period, i.e. from 2014 to 2019 as proxy of economic concentration. This econometric model examines the impact of independent variables into the dependent variable after inclusion of HHI as proxy of within banking industry concentration and GDP Growth Rate and Inflation Rate in Bangladesh during 2014 to 2019 as proxy of macro-economic concentration. This analysis assumed the general functional relationship Cobb Douglas was generalized in all the independent variables and dependent variable, which has shown in equation 3.1 and 3.2:

$$ROA = f(LnNPLR, LnNIM, LnFexGL, LDR, LnCIR, IslamiConv, LnBS, HHI, Inflation, GDPGrowth) \quad (3.1)$$

The loan run model was as follows:

$$ROA_{it} = \beta_0 + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 LnCIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \beta_9 Inflation_{it} + \beta_{10} GDPGrowth_{it} + \theta_i + \varepsilon_{it} \quad (3.1a)$$

Where $i=1,2,\dots,n$ and $t=1,2,\dots,6$

The short-run model was as follows:

$$ROA_{it} = \beta_0 + \lambda ROA_{it-1} + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 LnCIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \beta_9 Inflation_{it} + \beta_{10} GDPGrowth_{it} + \theta_i + \varepsilon_{it} \quad (3.1b)$$

Where $i=1,2,\dots,n$ and $t=1,2,\dots,6$

Here, ROA_{it} refer to the financial performance of bank i on time t . β_0 is the constant of the model or intercept, β_1 is coefficient of the independent variables. ROA_{it-1} is the lagged of bank's financial performance, $LnNPLR_{it}$ stands for log of non-performing loan ratio of Bank i at time t . $LnNIM_{it}$ stands for log of net interest margin ratio of bank i at time t . $LnFexGL_{it}$ stands for log of foreign exchange gain/ loss of bank i at time t . LDR_{it} is the loan & advance to deposit ratio of bank i at time t . $LnCIR_{it}$ is the log of cost income ratio of bank i at time t . $IslamiConv_{it}$ is the dummy variable added into the model for two types of banking system operating in Bangladesh i.e. islami banking and conventional banking system for bank i at time t and $LnBS_{it}$ stands for log of Bank Size (assets size) of bank i at time t . HHI_{it} is the Herfindahl–Hirschman Index as proxy of within banking industry concentration of bank i at time t . $Inflation_{it}$ is the Inflation Rate as proxy of macroeconomic concentration on bank i at time t . $GDPGrowth_{it}$ stands for proxy of macroeconomic concentration on bank i at time t . θ_i stands for bank specific impact, which is anticipated to have normal distribution with constant variance, and ε_{it} is error term of the model, which is anticipated to be normally distributed.

$$ROE = f (LnNPLR, LnNIM, LnFexGL, LDR, CIR, IslamiConv, LnBS, HHI, Inflation, GDPGrowth) \quad (3.2)$$

The loan run model was as follows:

$$ROE_{it} = \beta_0 + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 CIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \beta_9 Inflation_{it} + \beta_{10} GDPGrowth_{it} + \theta_i + \varepsilon_{it} \quad (3.2a)$$

Where $i = 1, 2, \dots, n$ and $t = 1, 2, \dots, 6$

The short-run model was as follows:

$$ROE_{it} = \beta_0 + \lambda ROE_{it-1} + \beta_1 LnNPLR_{it} + \beta_2 LnNIM_{it} + \beta_3 LnFexGL_{it} + \beta_4 LDR_{it} + \beta_5 CIR_{it} + \beta_6 IslamiConv_{it} + \beta_7 LnBS_{it} + \beta_8 HHI_{it} + \beta_9 Inflation_{it} + \beta_{10} GDPGrowth_{it} + \theta_i + \varepsilon_{it} \quad (3.1b)$$

Where $i = 1, 2, \dots, n$ and $t = 1, 2, \dots, 6$

Here, ROE_{it} refer to the financial performance of bank i on time t . β_0 is the constant of the model or intercept, β_1 is coefficient of the independent variables. ROE_{it-1} is the lagged of bank's financial performance, $LnNPLR_{it}$ stands for log of non-performing loan ratio of Bank i at time t . $LnNIM_{it}$ stands for log of net interest margin ratio of bank i at time t . $LnFexGL_{it}$ stands for log of foreign exchange gain/ loss of bank i at time t . LDR_{it} is the loan & advance to deposit ratio of

bank i at time t . CIR_{it} is the cost income ratio of bank i at time t . $IslamiConv_{it}$ is the dummy variable added into the model for two types of banking system operating in Bangladesh i.e. islami banking and conventional banking system for bank i at time t and $LnBS_{it}$ stands for log of Bank Size (assets size) of bank i at time t . HHI_{it} is the Herfindahl–Hirschman Index as proxy of within banking industry concentration of bank i at time t . $Inflation_{it}$ is the Inflation Rate as proxy of macroeconomic concentration on bank i at time t . $GDPGrowth_{it}$ stands for proxy of macroeconomic concentration on bank i at time t . θ_i stands for bank specific impact, which is anticipated to have normal distribution with constant variance, and ε_{it} is error term of the model, which is anticipated to be normally distributed.

3.12 Estimation of Panel Data Regression Model

This study used both fixed and random effect estimators to check both static and dynamic specifications for estimating panel data. This study also used some other panel data analytic model including constant coefficients models and dynamic panel models.

3.12.1 The Fixed Effects Model

A fixed-effect regression is an analysis technique that manages time-invariant, unobserved individual data that is associated with the observed independent variables in a panel data set. This panel model has constant slopes, but its interceptors change depending on the cross-section, therefore there are no temporal effects. According to this study, the banks under this kind of model might be very different. Cross-sectional (group) intercept may differ between Banks, although it may or may not change over time.

3.12.2 Random Effect Model

When using a random effect model, it is presumed that variation amongst entities will be random and unrelated to any predictors or independent variables included in the model. The random effect suggests that the error term of the entity is not related to the independent variables that let time-invariant variables to function as explanatory factors. If the intercept is an unanticipated outcome variable, a random effect model will manage ignorance or error (Greene, 2008). To avoid complicating the covariance matrix, this model takes no heteroscedasticity or auto-relation in the panels.

3.12.3 Random Effect (RE) model Vs Fixed Effect (FE) model

- ▶ The effects of variables whose values do not vary over time cannot be estimated using a fixed effects model. Random effects models are unable to control omitted factors, but they can estimate the effects of time-invariant variables.
- ▶ Random effects are estimated with partial pooling but fixed effects are not.
- ▶ Random effect model assist in controlling for unobserved heterogeneity when the heterogeneity is constant over time and not correlated with independent variables.

- ▶ Fixed-effects (FE) model is used when any study analyzing the impact of variables that vary over time. FE explores the relationship between predictor and outcome variables within an entity.
- ▶ Hausman Test is important to select fixed effect or random effect model. It basically null hypothesis (Ho) Random Effect Model is consistent. If p-value is not significant, the null hypothesis is accepted. If p-value is significant than null hypothesis is rejected.

3.12.4 Dynamic Panel Models

Regression models that take time lags into account are dynamic or lagged regression models. The inclusion of lag dependent variable as a regression provides dynamic adjustment in an econometric model. Both panels can have a particular auto-correlation. An auto-rectification of the residual lag might indicate the requirement for dynamic panel analysis and the existence or absence of auto-correlation (Wooldridge, 2002). In the case of a multi-linearity problem, ordinary lower squares are not sufficient, meaning that successive lagged regression values are correlated.

The econometric models 1.1, 1.2, 2.1, 2.2, and 3.1, 3.2 were used to estimate this study in both the long run and the short run. In the long run, random effect model and fixed effect model were calculated, while in the short-run the GMM estimator was used (Verbeek, 2004). A statistical method called the Generalized Moments Method (GMM) combines actual economic data with information of population moment conditions to identify the unknown economic model parameters.

The short run estimation was preceded by estimating the ordinary least squares regression model (OLS) and fixed effect regression models to define the boundary needed for lagging bank performance coefficients, as shown by Roodman, 2006. The tolerable multicollinearity in the models was examined in this work using correlation analysis and the VIF test. When at least two explanatory variables in a multiple regression model have a strong linear relationship, there would have multicollinearity problem.

Hausman test is required select the fixed and random effect models and to interpret the outcome of F statistic, interclass correlation (ρ) and R-square. The Hansen J statistic and the Arrelano and Bond autocorrelation tests have to be interpreted for the short-run GMM specification.

3.12.5 Why to use GMM Model

- ▶ GMM is a generic method for estimating parameters in statistical models.
- ▶ GMM is a dynamic panel data estimator.
- ▶ Small T, large N panels
- ▶ When there is correlation between the explanatory and the error term in the model, GMM adjusts for endogeneity of the lag dependent variable.
- ▶ GMM controls omitted variables bias.

- ▶ GMM controls unobserved panel heterogeneity.
- ▶ GMM controls for measurement errors in panel data.
- ▶ GMM controls autocorrelation within panels or groups

3.12.6 Why to choose System GMM

- ▶ System GMM was proposed by Arellano & Bover (1995) and Blundell & Bond (1998)
- ▶ Correct endogeneity:
 - ❖ Introducing more instruments to dramatically improve efficiency.
 - ❖ Transform the instruments to make it uncorrelated (exogenous) with the fixed effects.
- ▶ Builds a system of two equations: the original equation and the transformed equation.
- ▶ Uses orthogonal deviations – instead of subtracting the previous observation from the contemporaneous one (difference GMM), it subtracts the average of all future observations of variable. No matter how many gaps, it is computable for all observations except the last for each individual, so it minimizing data loss.
- ▶ A two step system GMM estimator is used to take advantage of a weighting matrix by utilizing the residuals from the first step when heteroskedasticity and serial correlation are present.

3.12.7 System GMM Specification

- ▶ Initially, the dynamic model estimates the pooled OLS model and Fixed Effect (FE) model.
- ▶ The output of the fixed effect estimate is considered as the lower-bound estimate, while the output of the pooled OLS estimate is considered as the upper bound estimate.
- ▶ System GMM augments Difference GMM by estimating simultaneously in differences and levels, the two equations being distinctly instrumented.
- ▶ System GMM is used where variables shows random walk (persistent) - a random walk is defined as a process where the current value of a variable is composed of the past value plus an error term.

3.12.8 Correlation Analysis

In this research, correlation analysis is used as a diagnostic test for multicollinearity and to establish a connection between the dependent and independent variables. The strength of the association between two variables is determined using correlation analysis. The correlation coefficient "r" value is between -1 and +1.

When the correlation coefficients are significant and nearly perfect (positive), multicollinearity influenced by the data regression estimates. Gujarati (2003) notes that the problem of multicollinearity is less than 0.8 and usually neglected by pair-specific correlation coefficients less than 0.8. But, usually correlation coefficients of more than 0.5 suggest that the regressor has a high degree of multi-linearity and warranted for correlation.

3.12.9 Variance Inflation Factor (VIF)

VIF test measures the degree of correlation between one predictor to the other predictors in a model. It is used to detect multicollinearity among the variables in a model. High values indicate that, it is not easy to assess accurately the role of predictors to a model. Generally, VIF value less than 5 is at acceptable level, greater than 5 is a cause for concern and VIF value more than 10 indicates a serious multicollinearity problem.

3.12.10 Hausman Test

Hausman's test helped to distinguish among the fixed and random effect measurement of the long run model. The regressor and individual heterogeneity are exogenous, which is the null hypothesis of the Hausman test. The null hypothesis requires the accuracy of fixed effects measurement over random effects and vice versa, based on the assumption of the random effect and fixed effect models on the distribution and the calculation of individual special effects (heterogeneity).

3.12.11 The F test and Wald Test

The F test and Wald tests are post-evaluation analytical procedures used to assess whether the coefficients of independent variables are jointly significant in explaining fluctuations in the dependent variables in both fixed effect and random effect models. The null hypothesis for these investigations is that all coefficients are equal to zero when taken as a whole. Alternatively, one of the coefficients could not be equal to zero. The rejection of the null hypothesis demonstrates that changes in the dependent variable may be explained by a combination of the independent variables.

3.11.12 Within and Between R-Square

The panel data's ability to explain changes in one variable over time as well as changes in two other variables is one of its key characteristics. The between R square shows how changes in the dependent variables are caused by changes in the independent variables. The within R square displays the variations in the dependent variable that may be accounted for by changes in the independent variable over time. Because of these variances inside individual banks over time and those resulting from differences between the banks, this analysis showed how bank performance has changed.

3.11.13 Hansen J statistic

The statistical test from Hansen J indicates whether or not the over-identifying restrictions on GMM instruments are accurate or not. The validity of the over identifying restrictions for the instruments is tested using a null hypothesis. When, the null hypothesis is not rejected means, the model's instruments are appropriate and produced reliable estimates (Roodman, 2006).

3.11.14 Arrelano - Bond Autocorrelation Test

The Arrelano-Bond autocorrelation analysis checks for autocorrelation in the error terms to evaluate the instrument. The Arrelano-Bond test presumes that, the data set is stationary. The

autocorrelation tests of the first and second orders are represented by the measures AR(1) and AR(2), respectively. The test's null hypothesis in both situations is the absence of any serial correlation. If the null hypothesis is rejected, it means that the specified serial correlation order is present, and if it is not rejected, there is no serial order correlation. Differences are created depending on the selection of appropriate instruments from the second and first lag (Roodman 2006).

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.0 Introduction

This part of the study covered the statistic, graphical and econometric analytical analysis of the study panel data set to analyze each research question.

4.1 Statistical Analysis

The population of the study consisted of 43 nos. of local commercial banks licensed by Bangladesh Bank having continues operation from 2014 to 2019. All the secondary data has been collected from the published annual report of the Banks. Padma Bank Limited has been excluded from the database due to its reform from Farmer Bank Ltd or Govt. hostile takeover due to its bankruptcy condition in the year 2017. Some newly licensed banks including Community Bank Ltd, Shimanto Bank Ltd, Bangal Commercial Bank Ltd and Citizen Bank Ltd has been excluded from the dataset due to incomplete dataset. All the foreign banks operating in Bangladesh has been excluded due to their separate global internal risk management and operating system and all the specialized Govt. Banks has also been excluded due to their different mode of operation.

A panel data set of 43 cross sections observations for the period from 2014 to 2019, i.e. 06 years period has been use for this study. So, the study data has a small period, i.e. T and large cross section, i.e. N panel data set, which has been applicable for long run and short run specifications models. This study used total 08 nos. of Bank specific variables, Herfindahl-Hirschman Index (HHI) as within banking industry concentration, GDP growth and Inflation as macro-economic control variables for 06 years of period for analysis of the secondary data set. Therefore, this study used total $(8 \times 6 \times 43) = 2,064$ nos. of bank specific, within banking industry concentration and macro-economic observations.

Since this study has been used robust balanced panel data set, it did not influence the methodology of this study. This study panel data set has been analyzed by using STATA software edition 12. The summery of the secondary panel data set are shown in Table -1 below:

Table – 1: Summary of Secondary Data

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	258	.7027519	1.155541	-7.49	3.81
ROE	258	-4.521667	203.0701	-3245.26	22.16
BankSize	258	258475.3	239843.2	11240	1473484
NPLR	258	10.53043	15.55977	0	84
LDR	258	84.61888	13.91287	37.28	137.23
NIM	258	2.947868	1.953385	-8.4	6.94
FexGL	258	715.9881	709.1645	-214	4212.48
CIR	258	118.9049	1061.826	-2039.35	16784.06
GDPGrowth	258	7.168333	.7165454	6.06	8.15
Inflation	258	5.92	.5313766	5.51	6.99
HHI	258	372.5	9.829777	362	391

The above table shows that, the number of observations remain same for all variables in the balanced data set which is used for this study. Here, the overall mean return on asset (ROA) and return on equity (ROE) is 0.70% and -4.52% respectively. During the period from 2014 to 2019, the commercial banks operating in Bangladesh were positively profitable in terms of ROA but very low mean return, i.e. 0.70% but showed negative result in terms of ROE, i.e. -4.52% due to loss/ poor performance of some banks during the period. The Standard Deviation of ROA is 1.15 indicates that their profit generating capacity is not much different from each others in terms of ROA but highly differ from each other in terms of ROE due to higher Standard Deviation of 203.07. The asset quality or NPLR are varied from 0 to 84% range with mean value and Standard Deviation of 10.53% and 15.55 respectively means that some banks were doing good for managing low NPL ratio and some others were responded very badly during the period. The mean value of NPL ratio were quite high, i.e. 10.53% during the period having Standard Deviation of 15.55 means that, the NPL ratio managing capability or assets quality among the banks are varied largely from each others.

Bank's liquidity risk has been measured commonly by using loan to deposit ratio (LDR). It also shows how efficiently a bank managed its depositor's money through loans/ investment activities which may be related to credit/ investment default risk. Mean value of LDR of commercial banks operating in Bangladesh is 84.62% having standard deviation of 13.91 during the study period. The minimum and maximum values of LDR is 37.28% and 137.23% respectively, indicating that banks largely focus on landing depositor's money which is relatively higher than other option to invest money. Higher concentration of lending business involves higher credit default risk, which need to manage through implementation of effective credit risk management process.

NIM has been used to represent the interest rate risk in to this study (a major component of market risk) which is defined as the net interest income (interest income – interest expenses) as a percentage of total earning assets or total loans and advances. NIM defined as the profitability earned by banks from their interest income against loans and advances which has been determined by money market condition. From Table - 1, the mean value of NIM was 2.95% during the period, this implies the difference between the interest income and interest expenses were adequate for commercial banks and most of them are expected to be profitable during the period. The standard deviation of 1.95 indicates that there was risk of unexpected change in interest rate on banks during the period and this risk was almost same for all the commercial banks operating in Bangladesh.

Log of Foreign Exchange Gain/ Loss (FexGL) have been used as a proxy of Foreign Exchange Risk in to this study (other component of market risk) which is defined as the gain or losses by a bank due to foreign exchange dealings by a bank on yearly basis which has been determined by foreign currency money market condition. The data has been collected from the income statement of the banks. From Table - 1, the mean value of FexGL was 715.99 during the period,

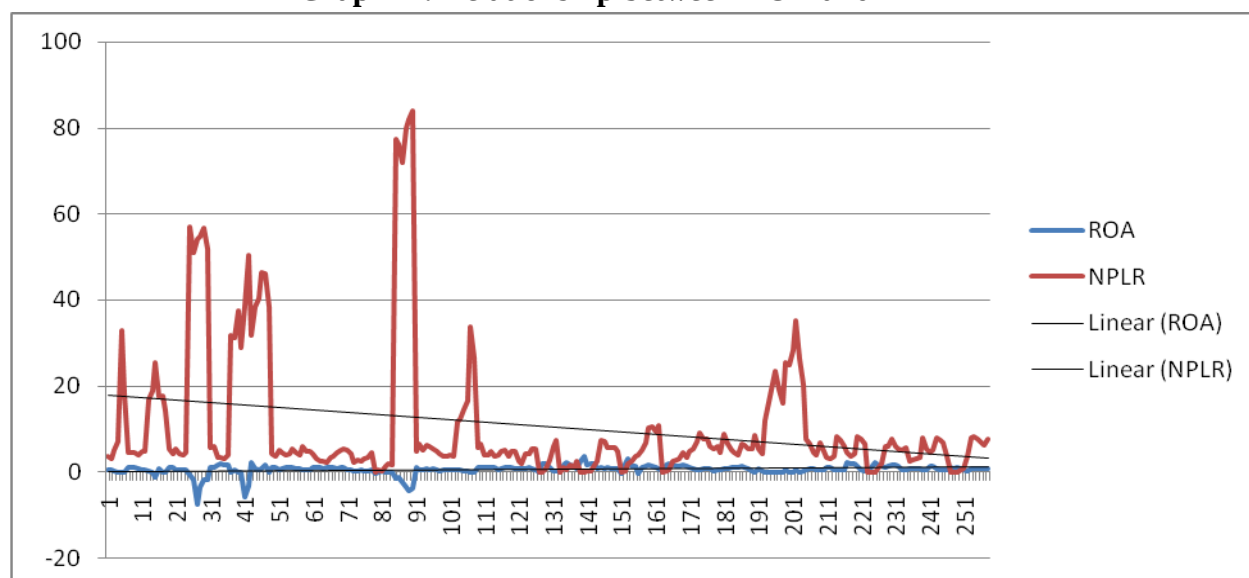
this implies that bank's earnings from foreign currency exchange were quite high and most of them are expected to be profitable during the period. The higher standard deviation indicates that this foreign exchange risk was varied very largely from bank to bank depending on efficient dealings with foreign exchange money market conditions.

This study used the cost income ratio (CIR) or efficiency ratio to represent operational risk which is defined as the operating expenses as a percentage of operating income. CIR reflects the bank ability to cover its operating expenses by operating income. The mean value of cost income ratio (CIR) or efficiency ratio was 118.90 means that, banks were capable to cover their operating expenses by their operating income to minimize operational risk. The higher standard deviation indicates that, the operational risk managing ability was varied largely among banks. The minimum and maximum value of CIR was abnormally high or abnormally low, which indicate that some bank were doing abnormally very good and some banks performance were abnormally very poor for managing CIR.

4.2 Graphical Analysis

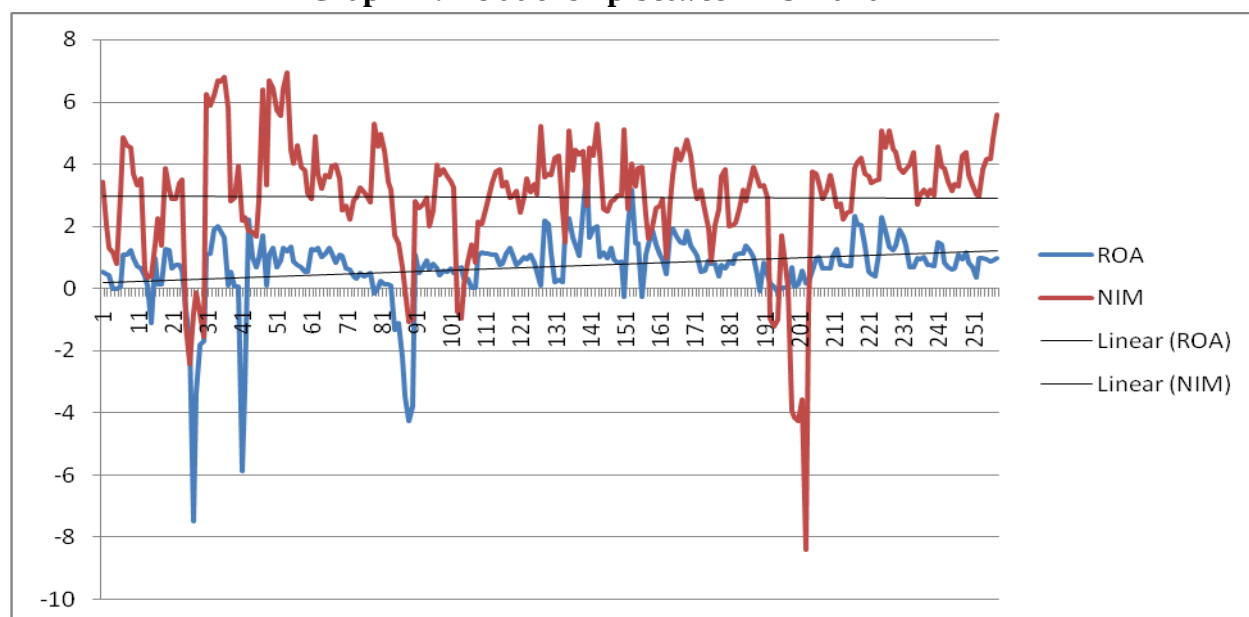
To observe the relationship between the dependent variable ROA (the proxy of Profitability of Banks) and independent variable NPLR (the proxy of Credit Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -1. From the Graph -1, it has been clearly observed that dependent variable ROA and independent variable NPLR has negatively co-related i.e. when NPLR increases the dependent variable ROA decreases and when NPLR decreases the dependent variable ROA or profitability of the Bank increases. This means Banks has to manage their NPLR or Credit Risk efficiently to make the profitability at maximum level of expectation.

Graph -1: Relationship between ROA and NPLR



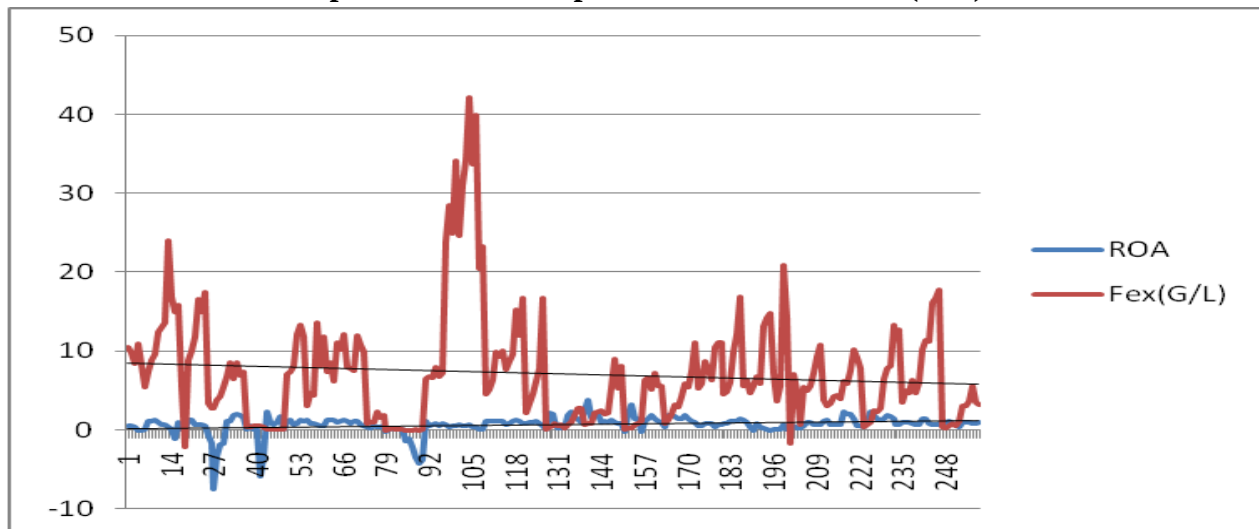
To observe the relationship between the dependent variable ROA (the proxy of Profitability of Banks) and independent variable NIM (the proxy of Market Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -2. From the Graph -2, it has been clearly observed that dependent variable ROA and independent variable NIM are positively co-related i.e. when NIM increases the dependent variable ROA also increases and when NIM decreases the dependent variable ROA or profitability of the Bank also decreases. This means Banks should try to manage their Market Risk efficiently to make the profitability at maximum level of expectation.

Graph -2: Relationship between ROA and NIM



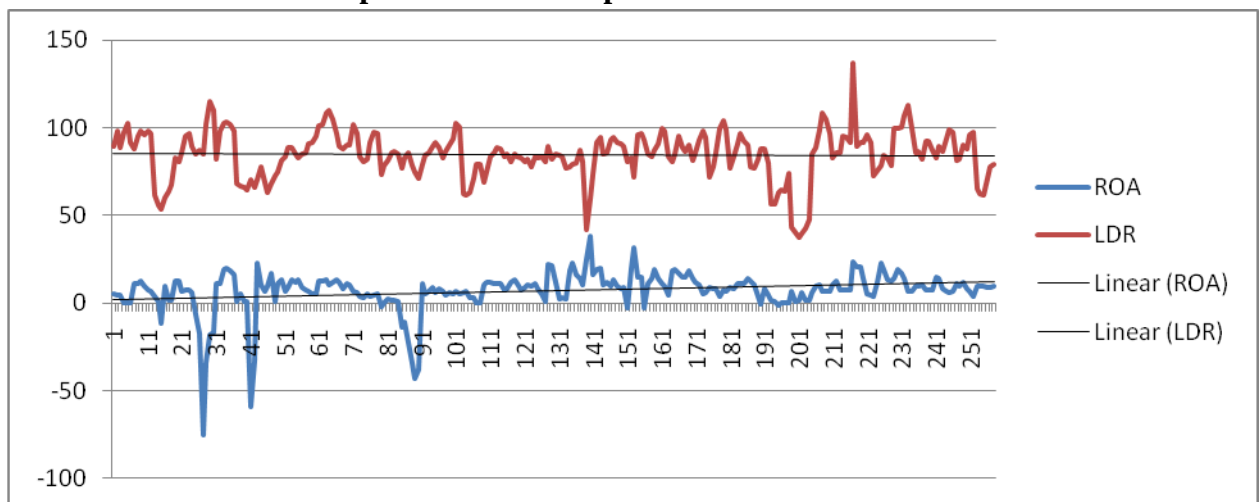
To observe the relationship between the dependent variable ROA (the proxy of Profitability of Banks) and independent variable Fex(G/L) (the proxy of Market Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -3. From the Graph -3, it has been clearly observed that dependent variable ROA and independent variable Fex(G/L) has negatively co-related i.e. when Fex(G/L) increases the dependent variable ROA decreases and when Fex(G/L) decreases the dependent variable ROA or profitability of the Bank increases. However, the study transformed this independent variable by taking log value of Fex(G/L), i.e. LnFex(G/L) to make the variable more scientific. So, the graphical interpretation of this study may be different while using LnFex(G/L) as independent variable instead of Fex(G/L). However, Banks has to manage their foreign exchange risk or market risk efficiently to make the profitability at maximum level of expectation.

Graph -3: Relationship between ROA and Fex(G/L)



To observe the relationship between the dependent variable ROA (the proxy of Profitability of Banks) and independent variable LDR (the proxy of Liquidity Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -4. From the Graph -4, it has been clearly observed that dependent variable ROA and independent variable LDR are negatively co-related i.e. when LDR increases the dependent variable ROA decreases and when LDR decreases the dependent variable ROA or profitability of the Bank increases. This means Banks should try to manage their Liquidity Risk efficiently to make the profitability at maximum level of expectation.

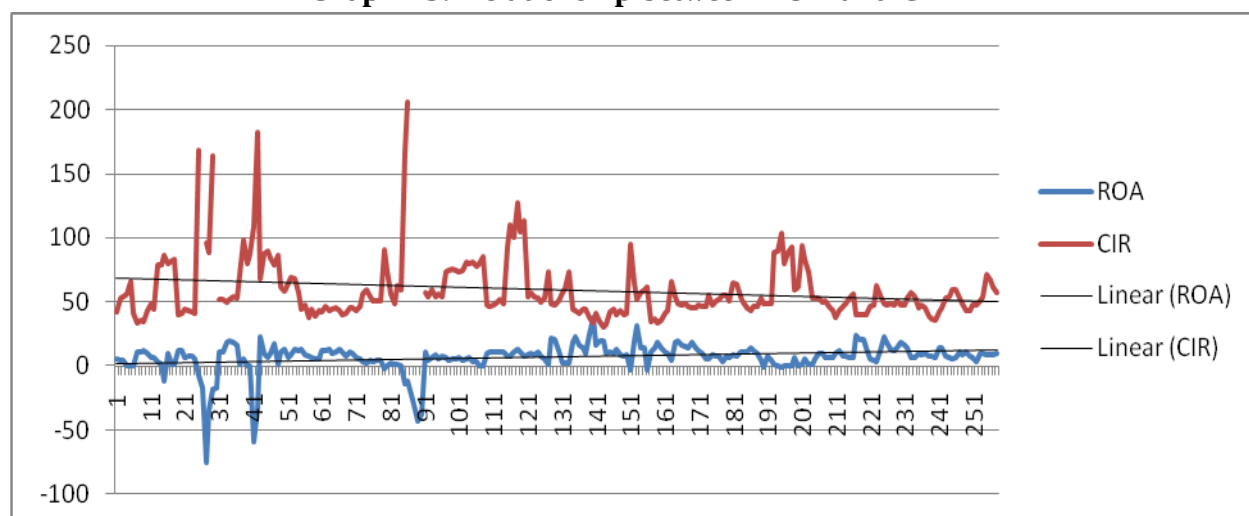
Graph -4: Relationship between ROA and LDR



To observe the relationship between the dependent variable ROA (the proxy of Profitability of Banks) and independent variable CIR (the proxy of Operation Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -5. From the Graph -5, it has been clearly observed that dependent

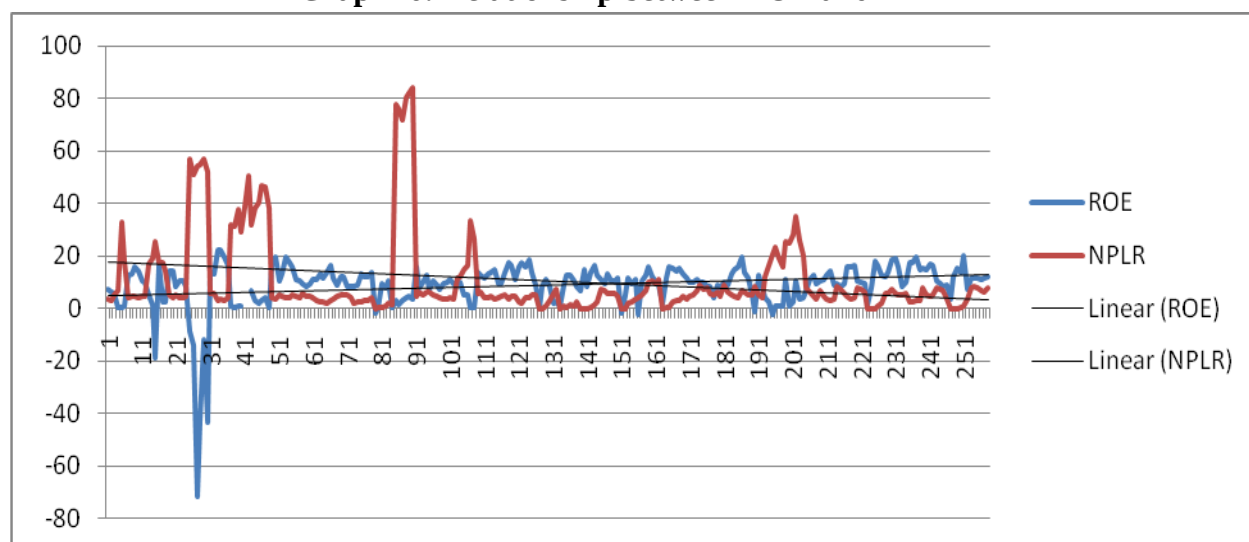
variable ROA and independent variable CIR negatively co-related i.e. when CIR increases the dependent variable ROA decreases and when CIR decreases the dependent variable ROA or profitability of the Bank increases. This means Banks has to manage their CIR or Operation Risk efficiently to make the profitability at maximum level of expectation.

Graph - 5: Relationship between ROA and CIR



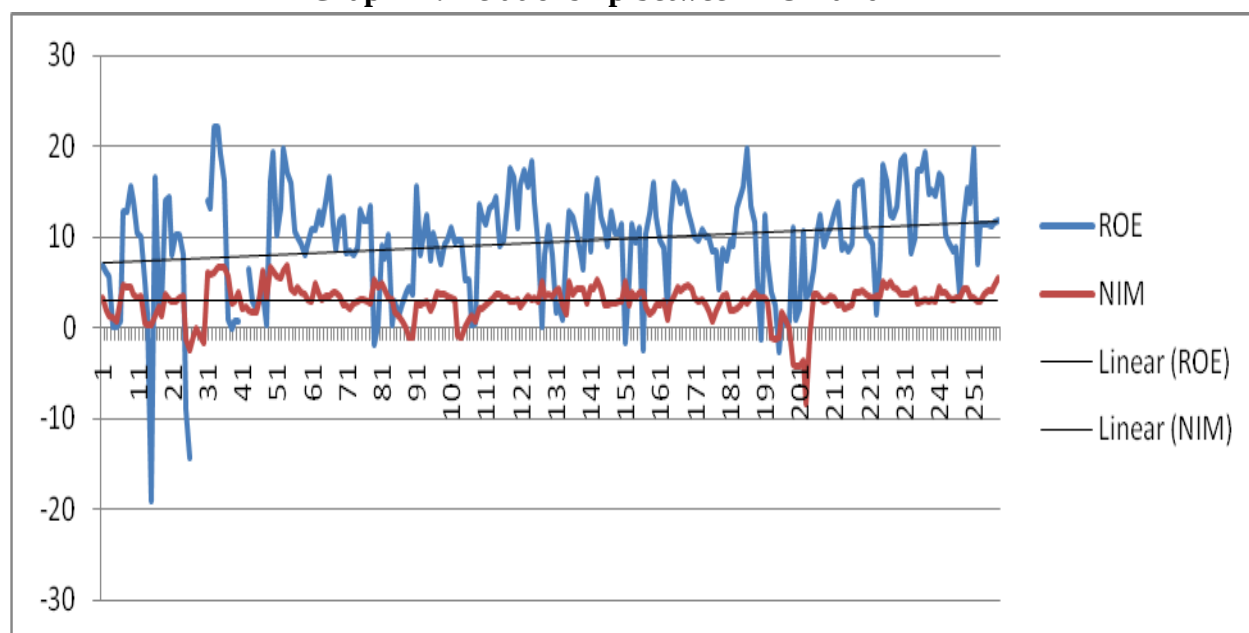
To observe the relationship between the dependent variable ROE (the proxy of Profitability of Banks) and independent variable NPLR (the proxy of Credit Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -6. From the Graph -6, it has been clearly observed that dependent variable ROE and independent variable NPLR are negatively co-related i.e. when NPLR increases the dependent variable ROE decreases and when NPLR decreases the dependent variable ROE or profitability of the Bank increases. This means Banks has to manage their NPLR or Credit Risk efficiently to make the profitability at maximum level of expectation.

Graph -6: Relationship between ROE and NPLR



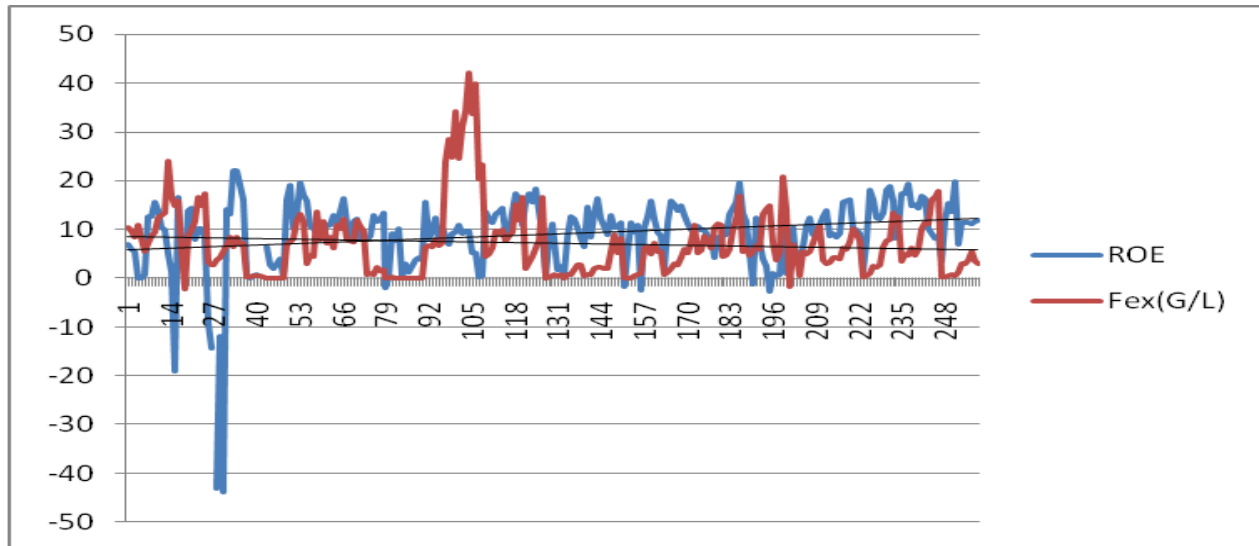
To observe the relationship between the dependent variable ROE (the proxy of Profitability of Banks) and independent variable NIM (the proxy of Market Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -7. From the Graph -7, it has been clearly observed that dependent variable ROE and independent variable NIM are positively co-related i.e. when NIM increases the dependent variable ROE also increases and when NIM decreases the dependent variable ROE or profitability of the Bank also decreases. This means Banks should try to manage their Market Risk efficiently to make the profitability at maximum level of expectation.

Graph -7: Relationship between ROE and NIM



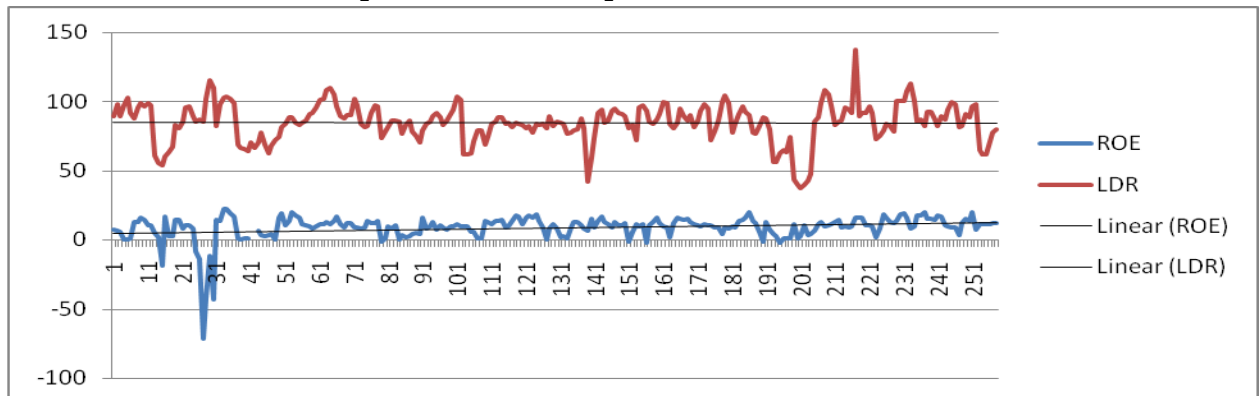
To observe the relationship between the dependent variable ROE (the proxy of Profitability of Banks) and independent variable Fex(G/L) (the proxy of Market Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -8. From the Graph -8, it has been clearly observed that dependent variable ROE and independent variable Fex(G/L) are negatively co-related i.e. when Fex(G/L) increases the dependent variable ROE decreases and when Fex(G/L) decreases the dependent variable ROE or profitability of the Bank increases. However, the study transformed this independent variable by taking log value of Fex(G/L), i.e. LnFex(G/L) to make the variable more scientific. So, the graphical interpretation of this study may be different while using LnFex(G/L) as independent variable instead of Fex(G/L). However, Banks has to manage their foreign exchange risk or market risk efficiently to make the profitability at maximum level of expectation.

Graph -8: Relationship between ROE and Fex(G/L)



To observe the relationship between the dependent variable ROE (the proxy of Profitability of Banks) and independent variable LDR (the proxy of Liquidity Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -9. From the Graph -9, it has been clearly observed that dependent variable ROE and independent variable LDR are negatively co-related i.e. when LDR increases the dependent variable ROE decreases and when LDR decreases the dependent variable ROE or profitability of the Bank increases. This means Banks should try to manage their Liquidity Risk efficiently to make the profitability at maximum level of expectation.

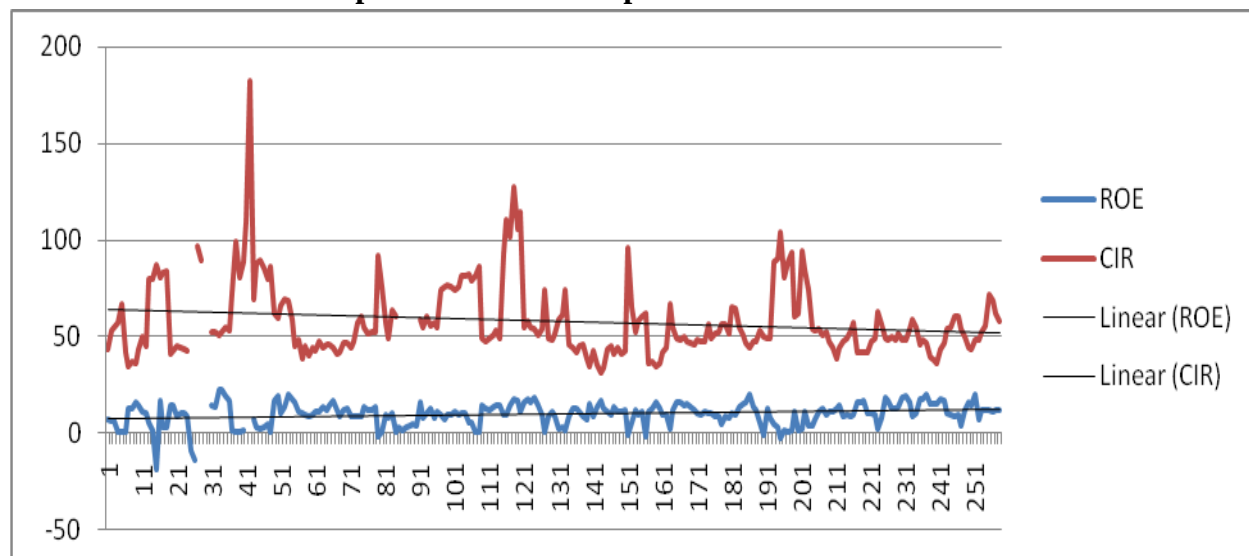
Graph -9: Relationship between ROE and LDR



To observe the relationship between the dependent variable ROE (the proxy of Profitability of Banks) and independent variable CIR (the proxy of Operation Risk measurement of Banks), this study plots all the observations of the said two variables into line graph by using MS Excel software shown in Graph -10. From the Graph -10, it has been clearly observed that dependent variable ROE and independent variable CIR negatively co-related i.e. when CIR increases the

dependent variable ROE decreases and when CIR decreases the dependent variable ROE or profitability of the Bank increases. This means Banks has to manage their CIR or Operation Risk efficiently to make the profitability at maximum level of expectation.

Graph - 10: Relationship between ROE and CIR



From the graphical analysis it has been observed that, credit risk and profitability of the banks are negatively correlated, interest rate risk (the proxy of Market Risk measurement of Banks) and profitability of the banks are positively correlated, foreign currency management risk and profitability of the banks are negatively correlated, liquidity risk and profitability of the banks are negatively correlated and operational risk and profitability of the banks are also negatively correlated.

4.3 Panel Data Specification Test

Panel data models give details on the behavior of individual observations, both within and across observations over time. There are cross-sectional and time-series variables presence in the data and models. If all individual observations are observed throughout all time periods, panel data is said to be balanced; if not, it is said to be unbalanced. Panel data, sometimes referred as cross-sectional time series data, which are created by combining typically a large number of cross-sectional units with a small number of observations made over time. Panel data is a term used in the fields of econometrics and statistics to describe multi-dimensional data that often includes measurements taken over a period of time. As a result, panel data are observations made by the researchers for varieties of data that were gathered throughout a number of time periods for the same set of units or entities.

The balanced panel data set used in this study has been validated by dropping some out layer observations or modified to make the dataset multicollinearity problem free which makes the output robust. Both short run and long run effect of dependent variable on the independent variables among the panel data set has been examined. To examine long run effect, this study

used random effect GLS regression model and fixed effect (within) regression model. Moreover, to examine the short run effect, this study used OLS regression model and fixed effect (within) regression model by using first lag value of the dependent variable as an independent variable to make the model dynamic. And finally, this study used dynamic panel data estimator, Two step system GMM model to examine short run effect of the dependent variable among the independent variables of the panel data set.

4.3.1 Risk Factors and its impact on Financial Performance of Commercial Banks

To establish whether all the risk factors including credit risk, market risk, liquidity risk and operational risk affect the financial performance of commercial banks operating in Bangladesh, this study used return on assets (ROA) and return on equity (ROE) as dependent variables whereas non-performing loan ratio (NPLR) or assets quality as proxy of credit risk, net interest margin (NIM) and Foreign Exchange Gain /Loss (FexGL) as proxy of market risk, loan to deposit ratio (LDR) as proxy of liquidity risk and cost income ratio (CIR) as proxy of operation risk were considered as independent variables. To reduce the correlation among the variables and multicollinearity problem this study modified some independent variables by obtaining log transformed form of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of Foreign Exchange Gain /Loss (LnFexGL) and log of cost income ratio (LnCIR) [in case of ROA only]. After panel data set validation, this study used Stata 12 version to test long run and short run effect of dependent variables on the independent variables to check the effect of risk factors on the financial performance of local commercial banks operating in Bangladesh during the study period.

4.3.2 Co-relation among the variables

The term "correlation" refers to the statistical relation between two variables. A correlation, which may be either positive or negative, shows that when the value of one variable changes, the value of the other variable also changes. The correlation between Banks' risks parameters themselves and return on assets is shown in Table -2.

Table - 2: Correlation between risk factors and return on assets (ROA)

	ROA	LnNPLR	LnNIM	LnFexGL	LDR	LnCIR
ROA	1.0000					
LnNPLR	-0.3984	1.0000				
LnNIM	0.3164	-0.3481	1.0000			
LnFexGL	0.1020	0.1219	-0.1024	1.0000		
LDR	0.2371	-0.2412	0.3180	0.3139	1.0000	
LnCIR	-0.4999	0.4165	-0.3204	-0.2316	-0.4486	1.0000

The result indicates that, log of non-performing loan ratio (LnNPLR) or asset quality has negative correlation with ROA having correlation coefficient of -0.3984. Negative correlation coefficient between LnNPLR and ROA was expected since loan constitutes the largest share of total assets of a Bank that generate income. Therefore, a decrease in NPL may direct to an improved financial performance of banks. The increasing trend of NPL is a signal of high credit risk which results to low expected return on asset (ROA).

There is a positive 0.3164 correlation between ROA and log of net interest margin (LnNIM), which serves as a proxy for interest rate risk as well as market risk. As a result, banks increase their lending rates in response to increasing market interest rates, which increases ROA. Low interest rates may have an impact on bank risk through changing the banks' value, cash flows, and sources of revenue. The cost of loan default is also transferred on to other customers of the banks in the form of higher loan interest rates. Customers are unable to acquire loans because commercial banks demand higher interest margins owing to poor credit risk management procedures. A circumstance like this hinders corporate growth and has an impact on the return the bank's expects over the long run. Moreover, the correlation coefficient between ROA and log of Foreign Exchange Gain/ Loss (LnFexGL) proxy of foreign exchange risk/ market risk has been found to be positive 0.1020. Therefore, increase in market Foreign Exchange risk leads higher return on assets (ROA).

LDR which is a proxy of liquidity risk has positive correlation with ROA with correlation coefficient of 0.2371. Positive correlation coefficient between LDR and ROA was expected since maximum utilization of depositor's fund into higher earning assets, i.e., loans and advances will maximize the total earning on assets (ROA). The low utilization of depositor's fund in the form of loans and advances will lead lower return on assets. But it also leads to higher liquidity risk for the Bank. So, Bank must manage an ideal ratio to minimize their liquidity risk but to maximize their return of assets.

The result also indicates that, log of cost to income ratio (LnCIR) which is a proxy of operational risk has negative correlation with ROA having correlation coefficient of -0.4999. Negative correlation coefficient between LnCIR and ROA was expected since cost of operation has direct negative impact on Bank's overall profitability and finally returns on assets. As a result, a downward trend in the cost-to-income ratio may result in better financial results for Bangladeshi commercial banks operating during the time of the research.

The correlation coefficient of log of non-performing loan ratio (LnNPLR) or credit risk factor and log of net interest margin (LnNIM) which is a proxy of interest rate risk/ market risk has been found to be negative – 0.3481. Negative correlation coefficient between LnNPLR and LnNIM is expected since when non performing loan of a Bank decrease means more utilization of earning assets leads to increase of net interest earning of the Bank and vice versa. LnNPLR and log of Foreign Exchange Gain/ Loss (LnFexGL) has positive correlation coefficient of

0.1219 since when foreign exchange risk of a bank increases its possibility of nonperforming loan also increases. LnNPLR and Total loan to total deposit ratio (LDR) has negative correlation coefficient of -0.2412 since when nonperforming loan of a Bank decrease means more utilization of earning assets or loans and advances leads to increase of total loan to total deposit ratio (LDR) of the Bank and vice versa. However, LnNPLR and log of cost to income ratio (LnCIR) has positive correlation coefficient of 0.4165 since when nonperforming loan of a Bank increases means less utilization of earning assets or loans and advances leads to increase of cost to income ratio of the Bank and vice versa.

The correlation coefficient of log of net interest margin (LnNIM) and log of Foreign Exchange Gain / Loss (LnFexGL) has been found negative -0.1024, means interest rate risk and foreign exchange risk are negatively correlated as part of market risk. The correlation coefficient of log of net interest margin (LnNIM) and total loan to total deposit ratio (LDR) has been found to be positive 0.3180 since when total loan to total deposit (LDR) increase, the total interest income increases leads to net interest margin increase. However, the log of net interest margin (LnNIM) and log of cost to income ratio (LnCIR) has negative correlation coefficient of -0.3204 means interest rate risk and operational risk of banks are negatively correlated. The correlation coefficient of log of Foreign Exchange Gain / Loss (LnFexGL) and total loan to total deposit ratio (LDR) has been found to be positive 0.3139 means foreign exchange risk and liquidity risk of banks are positively correlated. The correlation coefficient of log of Foreign Exchange Gain / Loss (LnFexGL) and log of cost to income ratio (LnCIR) has negative correlation coefficient of -0.2316 means foreign exchange risk and operational risk of banks are negatively correlated. And the correlation coefficient of total loan to total deposit ratio (LDR) and log of cost to income ratio (LnCIR) has been found to be negative -0.4486 means liquidity risk and operational risk of banks are negatively correlated.

Table - 3: Correlation between risk component and return on equity (ROE)

	ROE	LnNPLR	LnNIM	LnFexGL	LDR	CIR
ROE	1.0000					
LnNPLR	-0.1633	1.0000				
LnNIM	0.0444	-0.3481	1.0000			
LnFexGL	0.1262	0.1219	-0.1024	1.0000		
LDR	0.1353	-0.2412	0.3180	0.3139	1.0000	
CIR	-0.4212	0.4237	-0.3038	-0.2739	-0.4112	1.0000

The result indicates that, log of non-performing loan ratio (LnNPLR) or asset quality has negative correlation with ROE having correlation coefficient of -0.1633. Negative correlation coefficient between LnNPLR and ROE is expected since loan constitutes the largest share of

total assets of a Bank that generate income. Therefore, a decrease in NPL may direct to an improved financial performance of banks. The increasing trend of NPL is a signal of high credit risk which results to low expected return on equity (ROE).

It was shown that there is a positive 0.0444 correlation between ROE and log of net interest margin (LnNIM), which serves as a proxy for interest rate risk as well as market risk. As a result, banks increase their lending rates in response to increasing market interest rates, which increases ROE. Low interest rates may have an impact on bank risk through changing the banks' value, cash flows, and sources of revenue. The cost of loan default is also transferred on to other customers of the banks in the form of higher loan interest rates. Customers are unable to acquire loans because commercial banks demand higher interest margins owing to poor credit risk management procedures. A circumstance like this hinders corporate growth and has an impact on the return the bank's expects over the long run. Moreover, the correlation coefficient between ROE and log of Foreign Exchange Gain/ Loss (LnFexGL) proxy of foreign exchange risk/ market risk has been found to be positive 0.1262. Therefore, increase in market Foreign Exchange risk leads higher return on equity (ROE).

LDR which is a proxy of liquidity risk has positive correlation with ROE with correlation coefficient of 0.1353. Positive correlation coefficient between LDR and ROE has been expected since maximum utilization of depositor's fund into higher earning assets, i.e., loans and advances will maximize the total earning on equity (ROE). The low utilization of depositor's fund in the form of loans and advances leads lower return on equity. But it also leads to higher liquidity risk for the Bank. So, Bank must manage an ideal ratio to minimize their liquidity risk but to maximize their return of equity.

The result also indicates that, cost to income ratio (CIR) which is a proxy of operational risk has negative correlation with ROE having correlation coefficient of -0.4212. Negative correlation coefficient between CIR and ROE has been expected since cost of operation has direct negative impact on Bank's overall profitability and finally returns on equity.

The correlation coefficient of log of non-performing loan ratio (LnNPLR) or credit risk factor and log of net interest margin (LnNIM) which is a proxy of interest rate risk/ market risk has been found to be negative – 0.3481. Negative correlation coefficient between LnNPLR and LnNIM has been expected since when non performing loan of a Bank decrease means more utilization of earning assets leads to increase of net interest earning of the Bank and vice versa. LnNPLR and log of Foreign Exchange Gain/ Loss (LnFexGL) has positive correlation coefficient of 0.1219 since when foreign exchange risk of a bank increases its possibility of nonperforming loan also increases. LnNPLR and Total loan to total deposit ratio (LDR) has negative correlation coefficient of -0.2412 since when nonperforming loan of a Bank decrease means more utilization of earning assets or loans and advances leads to increase of total loan to total deposit ratio (LDR) of the Bank and vice versa. However, LnNPLR and cost to income ratio

(CIR) has positive correlation coefficient of 0.4237 since when nonperforming loan of a Bank increases means less utilization of earning assets or loans and advances leads to increase of cost to income ratio of the Bank and vice versa.

The correlation coefficient of log of net interest margin (LnNIM) and log of Foreign Exchange Gain / Loss (LnFexGL) has been found to negative -0.1024 means interest rate risk and foreign exchange risk are negatively correlated as part of market risk. The correlation coefficient of log of net interest margin (LnNIM) and total loan to total deposit ratio (LDR) has been found to be positive 0.3180 since when total loan to total deposit (LDR) increase, the total interest income increases leads to net interest margin increase. However, the log of net interest margin (LnNIM) and cost to income ratio (CIR) has negative correlation coefficient of -0.3038 means interest rate risk and operational risk of banks are negatively correlated. The correlation coefficient of log of Foreign Exchange Gain / Loss (LnFexGL) and total loan to total deposit ratio (LDR) has been found to be positive 0.3139 means foreign exchange risk and liquidity risk of banks are positively correlated. The correlation coefficient of log of Foreign Exchange Gain / Loss (LnFexGL) and cost to income ratio (CIR) has negative correlation coefficient of -0.2739 means foreign exchange risk and operational risk of banks are negatively correlated. And the correlation coefficient of total loan to total deposit ratio (LDR) and cost to income ratio (CIR) has been found to be negative -0.4112 means liquidity risk and operational risk of banks are negatively correlated.

4.3.3 Output of VIF Test for Multicollinearity Check among the variables

In a multivariate regression equation, multicollinearity occurs when one or more independent variables have a significant correlation with one another. The statistical significance of an independent variable is affected by multicollinearity, which is a concern. The variance inflation factor (VIF), which measures how much the variance of an estimated regression coefficient increases if the predictors are linked, is one approach to quantify multicollinearity. A high VIF implies a high degree of multicollinearity between the related independent variable and the other variables in the model. By using the variance inflation factors (VIF) as a general guide: 1 implies no correlation. Moderate correlation is defined from 1 to 5. More than 5 indicate a strong correlation.

Table – 4: Output of VIF Test for Multicollinearity Check where ROA is considered as dependent variable:

Variable	VIF	1/VIF
LnCIR	1.53	0.653071
LDR	1.44	0.694640
LnNPLR	1.36	0.736016
LnNIM	1.29	0.776350
LnFexGL	1.26	0.791738
Mean VIF	1.38	

The result indicates that, all the variance inflation factor (VIF) of Table -4 are less than 5, i.e. all the Bank specific variables of the study are moderately correlated means no multicollinearity problem among the variables.

Table – 5: Output of VIF Test for Multicollinearity Check where ROE is considered as dependent variable:

Variable	VIF	1/VIF
CIR	1.54	0.649660
LDR	1.39	0.717244
LnNPLR	1.39	0.718142
LnFexGL	1.31	0.761889
LnNIM	1.29	0.776149
Mean VIF	1.39	

The result indicates that, all the variance inflation factor (VIF) of Table - 5 are less than 5, i.e. all the Bank specific variables of the study are moderately correlated means no multicollinearity problem among the variables.

4.3.4 Panel regression results

This part of this paper presented the outcome of the econometric model analysis on the basis of the research questions of this study. To examine the long run effect between dependent variables and independent variables, this study run both random effect GLS regression and fixed effect regression for econometric model 1.1, 1.2, 2.1, 2.2, 3.1 and 3.2. After analyzing the outputs of both the regression test, this study run Hausman Specification test to established the findings of the panel regression output for long run effect. This study also used dynamic panel data estimator two step system GMM model to analyze the short run effect between dependent variables and independent variables. Finally, a comparison of all the models, both short- and long-term, is included in the paper.

4.3.4.1 Effect of Risk Management Factors on Financial Performance of Commercial Banks in Bangladesh considering “Bank Size” as Bank specific control variable:

Initially, the long run and the short run version of model 1.1 has been estimated, where ROA is considered as dependent variable as proxy of financial performance while log of non-performing loan ratio (LnNPLR) is proxy of credit risk, log of net interest margin (LnNIM) and log of foreign exchange gain/ loss (LnFexGL) as proxy of market risk, loan to deposit ratio (LDR) as proxy of liquidity risk and log of cost income ratio (LnCIR) as proxy of operational risk, dummy variable “IslamiConv” represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of

Total Asset (LnBS). At first long run specification of model 1.1a has been examined by analyzing the output of the random effects GLS regression model, the fixed effect regression model and then the output has been finalized through the output of Hausman Test. After analyzing the long run effect this study analyzed the short run effect of model 1.1b through two step system GMM model, whose findings are shown in table – 6:

Table – 6: Output of Econometric Model 1.1a and 1.1b, where dependent variable is ROA:

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
L_ROA	--	--	0.456*** (0.064)	0.059 (0.075)	LnL_ROA: 0.391*** (0.079)
LnNPLR	- 0.145*** (0.054)	- 0.129* (0.069)	-0.018*** (0.046)	-0.019 (0.078)	LnNPLR: -0.226** (0.106)
LnNIM	0.084 (0.087)	0.034 (0.097)	0.094 (0.081)	0.043 (0.105)	LnNIM: 0.150 (0.192)
LnFexGL	0.060 (0.079)	-0.106 (0.119)	0.041 (0.060)	-0.125 (0.135)	0.166 (0.186)
LDR	-0.003 (0.005)	0.005 (0.004)	-0.002 (0.005)	-0.004 (0.008)	LnLDR: 0.329 (0.887)
LnCIR	-1.0407*** (0.235)	-2.536*** (0.359)	-0.422** (0.197)	-2.507*** (0.492)	LnCIR: -0.395 (0.384)
IslamiConv (Dummy)	0.266 (0.182)	Omitted	0.189 (0.118)	Omitted	Omitted
LnBS	-0.207 (0.131)	-0.533*** (0.192)	-0.006 (0.100)	-0.493* (0.251)	-0.360 (0.256)
Constant	8.810*** (1.619)	17.844*** (2.377)	2.067 (1.376)	18.032*** (3.453)	3.512 (4.582)
	R-Sq:- Within: 0.2934 Between:0.5744 Overall:0.3317 Wald Chi2 (7): 92.48*** rho: 0.3558 Obser: 224, Group: 41	R-Sq:- Within: 0.3271 Between:0.3477 Overall:0.2287 F(6,177): 14.34 *** rho: 0.7433 Obser: 224 Group: 41	R-Sq: 0.5068 Adj R-Sq: 0.4854 F(8,185): 23.76*** Root MSE: 0.5808 Obser: 194	R-Sq:- Within: 0.3140 Between:0.3360 Overall:0.2337 F(7,146): 9.55*** rho: 0.7267 Obser: 194 Group: 41	Wild Chi2(6): 145.60*** Sargar test, Chi2(5)=51.05*** Hansen test, Chi2(5)= 7.32 AR(1), z= -1.81* AR(2), z= -1.51 Obser: 139, Group: 31 Instruments: 13
	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *
Hausman Test	Random Effect		0.059 ≤ λ ≤ 0.456, here λ = 0.391		

Initially, the output of random effect GLS model has been analyzed to examine long run effect of model 1.1a. The analysis showed that, the P-value of Wald Chi Squire is less than 0.01, so the

model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The interclass correlation (rho) is 35.58% implying that 35.58% of the deviations in return in assets (ROA) are due to variation across the banks. The within R-square 28.34% means the difference in ROA are because of variation within individual banks and between R-square 57.44% means the difference are because of variation between the banks. The overall R-square shows that 33.17% changes in ROA because of the variables considered in the model account, while about 66.83% change in ROA may be due to other variables which have not been addressed in this model.

Then, the other specification of econometric model 1.1a is the fixed effects regression model. As per findings of fixed effects regression model showed in Table – 6 above, the P-value of F is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The interclass correlation (rho) is 74.33% implying that 74.33% of the variations in return in assets (ROA) are because of differences across the banks. The within R-square means 32.71% difference in ROA are because of variation within individual banks and between R-square means 34.77% of the difference are because of variation between the banks. The overall R-square shows that 22.87% changes in ROA because of the variables considered in the model account, while about 77.13% change in ROA may be due to other variables which have not been addressed in this model.

The Hausman Test, commonly referred to as the Hausman specification test, is used to identify endogenous regressors (predictor variables) in this case. The values of endogenous variables are influenced by other variables in the system. The Hausman test will do this. The specification tests are performed by constructing a test of the hypothesis $H_0: a = 0$. In contrast to fixed effects, random effects may be estimated via partial pooling. When using partial pooling, the effect estimates for a group will be partially dependent on the more abundant data from other groups if the group has few data points.

Table – 7: Output of Hausman specification test for econometric Model 1.1a, where dependent variable is ROA

	Coefficients		(b-B) Difference	sqrt (diag (V_b-V_B)) S.E.
	(b) random	(B) fixed		
LnNPLR	-.1456507	-.1299877	-.015663	.
LnNIM	.0844516	.0341152	.0503365	.
LnFexGL	.0603486	-.1059576	.1663062	.
LDR	-.0028023	.0048485	-.0076508	.
LnCIR	-1.407774	-2.536317	1.128543	.
LnBS	-.2068946	-.5336168	.3267222	.

```

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:   Ho:   difference in coefficients not systematic

      chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
              =  -33.89      chi2<0 ==> model fitted on these
                                data fails to meet the asymptotic
                                assumptions of the Hausman test;
                                see suest for a generalized test

```

The test statistics have a chi statistic of -33.89 with six degrees of freedom, as shown in Table 7. So, the model fitted on these data fails to meet the asymptotic assumption of the Hausman test. So, here Random Effect GLS model has been selected over Fixed Effects Regression Model for interpretation of the long run specification while only Bank specific control variable “Bank Size” is considered as control variable into the model. The output of random effect GLS model shows in table – 6 above are as follows:

Table – 6 above shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.145 in the long run which is significant at 1% level. So, the hypothesis of LnNPLR has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected at 1% level of significance. However, the negative coefficient indicates that when NPLR of banks increases the financial performance of commercial banks in Bangladesh or ROA decreases.

In table - 6 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk, is 0.084 with a p value more than 10%. So, the hypothesis of LnNIM has positive impact on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, the financial performance of commercial banks in Bangladesh or ROA also increases. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.060 with p value of more than 10%. So, the hypothesis of LnFexGL has positive impact on ROA is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROA also increases.

The coefficient of loan to deposit ratio (LDR) used as proxy of liquidity risk showed in table-6 above is -0.003 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR has a negative impact on the profitability of commercial banks operating in Bangladesh is rejected. However, the negative coefficient indicates that when LDR of banks increases the financial performance of commercial banks in Bangladesh or ROA decreases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-6 above is -1.041 in the long run which is significant at 1% level. So, the hypothesis of LnCIR has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected at 1% level of significance. However, the negative coefficient indicates that when cost income ratio (CIR) increases, the financial performance of commercial banks in Bangladesh or ROA decreases.

The coefficient of dummy variable “IslamiConv” used as proxy of different types of banking operations in Bangladesh (both Islamic Banking and Conventional Banking system) showed in

table-6 above is 0.266 having p value of more than 10%. So, the hypothesis of dummy variable “IslamiConv” or banks type has positive impact on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.207 having p value more than 10%. So at 10% level of significance, the hypothesis that the control variable “LnBS” or bank size has negative impact on the profitability of commercial banks operating in Bangladesh is rejected.

To test the short run effect on first econometric model, the short run version of model 1.1b has been estimated. Here, 1st lag value of the dependent variable i.e. 1st lag value of ROA has been used as independent variable to make the model dynamic among others including log of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of foreign exchange gain/ loss (LnFexGL), loan to deposit ratio (LDR) and log of cost income ratio (LnCIR) and dummy variable “IslamiConv” represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS).

The short run specification of model 1.1b has been examined initially through the pooled OLS regression model and then fixed effect regression model whose findings are shown in table – 6. Here, the coefficient of lagged return on asset (L.ROA) of pooled OLS regression analysis is 0.456. So, the higher boundary of the coefficient of lagged value of return on asset (L.ROA) for the GMM model would be 0.456. The coefficient of lagged return on asset (L.ROA) of the fixed effect estimates is 0.059. Therefore, 0.59 would be the lower threshold of the lagged return on asset (L.ROA) in the GMM specification. To be more precise, the estimate should be placed in the range of $0.059 \leq \lambda \leq 0.456$. Here, the two-step system GMM estimates for the model's short-run specification show that the lagged return on assets (ROA) coefficient is 0.391. The coefficient is within the allowed range of 0.059 to 0.456 that was set by the short run model 1.1b's pooled OLS regression effect and fixed effects estimations. This is the points to consistency of estimates.

The output of two step system GMM estimates shows that, the P-value of Wild Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The number of instruments used in this study is less than the number of groups, and at a 1% level of significance, the log value of the dependent variable ROA's first lagged value, or LnL.ROA, differs considerably from zero. According to the analysis, the Hansen test statistic is 7.32, and the related p-value is higher than 0.10. As a result, at the ten percent level of significance, the null hypothesis of the validity of the over identifying restrictions for the instruments is not rejected. As a result, the model's instruments are suitable and produce accurate, consistent estimations. Table-6 also displays the autocorrelation test in the error terms. With a matching p-value of less than 10%, the test statistic for first order autocorrelation, or AR(1), is -1.81. Therefore, at a ten percent level of significance, the null hypothesis that the disturbance term (error term) has no first order serial correlation is

rejected. The test statistic for second order serial correlation AR(2) in the error term has a p-value that is more than 0.10 and equals -1.51. Because of this, the null hypothesis that there is no second order serial correlation in the disturbance term is accepted, and the use of instruments from the second lag and differences is permitted at a ten percent level of significance. This strengthens the case for adopting the two step system GMM estimates to specify model 1.1b correctly in the short term.

Table – 6 above also shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.226 in the short run which is significant at 5% level. So, the hypothesis of credit risk has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected at 5% level of significance. In addition, the negative coefficient indicates that when NPLR of banks increases the financial performance of commercial banks in Bangladesh or ROA decreases in the short run.

In table - 6 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk, is 0.150 with a p value more than 10%. So at 10% level of significance, the hypothesis that interest rate risk has positive impact in the short run on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROA also increases in the short run. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.166 with p value of more than 10%. So, the hypothesis of foreign exchange risk has positive impact in the short run on ROA is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROA also increases in the short run.

The coefficient of log of loan to deposit ratio (LnLDR) used as proxy of liquidity risk showed in table-6 above is 0.329 having p value of more than 10%. So at 10% level of significance, the hypothesis that LDR has positive impact on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when LDR of banks increases the financial performance of commercial banks in Bangladesh or ROA increases in the short run.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-6 above is -0.395 in the short run which is not significant at 10% level. So, the hypothesis of operational risk has negative impact on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance. However, the negative coefficient indicates that when cost income ratio (CIR) increases, the financial performance of commercial banks in Bangladesh or ROA decreases in the short run. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.360 having p value more than 10%. So at 10% level of

significance, the hypothesis that control variable “LnBS” or bank size has negative impact in the short run on the profitability of commercial banks operating in Bangladesh is rejected.

The summery output of econometric model 1.1 both in the short run and long run where only bank specific control variable Bank Size, i.e. log of Total Asset (LnBS) has been considered into the model is that credit risk of the bank is negatively correlated with financial performance both in the long run and short run while interest rate risk and foreign exchange risk, both are considered as part of market risk is positively correlated with financial performance both in the short run and long run. However, the liquidity risk of the bank is negatively correlated with financial performance in the long run but showed positive correlation in the short run means inconsistency with the statistical assumption of this study. The operational risk of the banks is also having negative correlation with financial performance both in the short run and long run. Though, some of these study variables’ coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

Table – 8: Output of Econometric Model 1.2a and 1.2b, where dependent variable is ROE:

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
L_ROE	--	--	0.315*** (0.069)	-0.028 (0.077)	LnL_ROE: 0.239* (0.123)
LnNPLR	- 1.297*** (0.384)	- 0.841* (0.486)	-1.398*** (0.375)	-0.843 (0.562)	-0.326*** (0.110)
LnNIM	1.856*** (0.571)	0.533 (0.686)	2.013*** (0.590)	0.895 (0.813)	0.170 (0.149)
LnFexGL	0.903 (0.642)	0.216 (0.960)	0.598 (0.575)	0.363 (1.148)	0.287 (0.187)
LDR	-0.004 (0.032)	0.033 (0.041)	-0.008 (0.036)	0.018 (0.060)	LnLDR: -0.506 (0.564)
CIR	-0.155*** (0.032)	-0.292*** (0.058)	-0.078** (0.032)	-0.331*** (0.073)	LnCIR: -1.309** (0.542)
IslamiConv (Dummy)	0.713 (1.059)	Omitted	0.470 (0.809)	Omitted	Omitted
LnBS	0.281 (0.870)	-1.175 (1.469)	0.557 (0.756)	-0.698 (1.998)	-0.050 (0.197)
Constant	9.506 (8.450)	36.888*** (14.540)	0.987 (7.430)	33.280 (20.384)	8.188* (4.651)

	R-Sq:- Within: 0.1404 Between:0.6418 Overall:0.4100 Wald Chi2 (7): 91.21*** rho: 0.2495 Obser: 204 Group: 39	R-Sq:- Within: 0.1908 Between:0.4337 Overall:0.2970 F(6,159): 6.25 *** rho: 0.5987 Obser: 204 Group: 39	R-Sq: 0.4834 Adj R-Sq: 0.4581 F(8,163): 19.07*** Root MSE: 3.870 Obser: 172	R-Sq:- Within: 0.1890 Between:0.4910 Overall:0.3046 F(7,128): 4.26*** rho: 0.5842 Obser: 172 Group: 37	Wild Chi2(6): 196.68*** Sargar test, Chi2(5)= 23.93*** Hansen test, Chi2(5)= 8.02 AR(1), z= -1.61 ; AR(2), z= -1.01 ; Obser: 127, Group: 29 Instruments: 13
	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *
Hausman Test Result	Random Effect		-0.028 ≤ λ ≤ 0.315, here λ = 0.239		

Initially, the output of random effect GLS model has been analyzed to examine long run effect of model 1.2a. The analysis showed that, the P-value of Wald Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The interclass correlation (rho) is 24.95% implying that 24.95% of the deviations in return on equity (ROE) are due to variation across the banks. The within R-square means 14.04% difference in ROE are because of variation within individual banks and between R-square means 64.18% of the difference are because of variation between the banks. The overall R-square shows that 41.00% changes in ROE because of the variables considered in the model account, while about 59.00% change in ROE may be due to other variables which have not been addressed in this model.

Then, the other specification of econometric model 1.2a is the fixed effects regression model. As per findings of fixed effects regression model showed in Table – 8 above, the P-value of F is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The interclass correlation (rho) is 59.87% implying that 59.87% of the variations in return on equity (ROE) are because of differences across the banks. The within R-square means 19.08% difference in ROE are because of variation within individual banks and between R-square means 43.37% of the difference are because of variation between the banks. The overall R-square shows that 29.70% changes in ROE because of the variables considered in the model account, while about 69.30% change in ROE may be due to other variables which have not been addressed in this model.

The Hausman Test, commonly referred to as the Hausman specification test, is used to identify endogenous regressors (predictor variables) in this case. The values of endogenous variables are influenced by other variables in the system. The Hausman test will do this. The specification tests are performed by constructing a test of the hypothesis $H_0: a = 0$. In contrast to fixed effects, random effects may be estimated via partial pooling. When using partial pooling, the effect estimates for a group will be partially dependent on the more abundant data from other groups if the group has few data points.

Table – 9: Output of Hausman specification test for Econometric Model 1.2a, where dependent variable is ROE

---- Coefficients ----				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	random	fixed	Difference	S.E.
LnNPLR	-1.297129	-.841122	-.4560068	.
LnNIM	1.856381	.5326248	1.323756	.
LnFexGL	.9028112	.2162851	.6865261	.
LDR	-.0042208	.0334606	-.0376814	.
CIR	-.1549236	-.2919891	.1370655	.
LnBS	.2806355	-1.175107	1.455742	.

b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)				
= -19.73 chi2<0 ==> model fitted on these				
data fails to meet the asymptotic				
assumptions of the Hausman test;				
see suest for a generalized test				

The test statistics have a chi statistic of -19.73 with six degrees of freedom, as shown in Table - 9. Therefore, the model fitted to these data does not satisfy the Hausman test's asymptotic assumption. So, here Random Effect GLS model has been selected over Fixed Effects Regression Model for interpretation of the long run specification while only Bank specific control variable “Bank Size” is considered as control variable into the model. The output of random effect GLS model shows in table – 8 above are as follows:

Table – 8 above shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -1.297 in the long run which is significant at 1% level. So at 1% level of significance, the hypothesis that LnNPLR has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected. The negative coefficient, however, shows that as NPLR of banks increases, Bangladeshi commercial banks' long-term financial performance or ROE decreases.

The coefficient of log of net interest margin (LnNIM) used as proxy of interest rate risk which is also a part of market risk showed in table-8 above is 1.856 in the long run which is significant at 1% level. So at 1% level of significance, the hypothesis of LnNIM has positive impact on the profitability of commercial banks operating in Bangladesh is not rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROE also increases. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.903 with p value of more than 10%. So, the hypothesis of LnFexGL has positive impact on ROE is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROE also increases.

The coefficient of loan to deposit ratio (LDR) used as proxy of liquidity risk showed in table-8 above is -0.004 having p value of more than 10%. So at 10% level of significance the hypothesis that, LDR has negative impact on the profitability of commercial banks operating in Bangladesh is rejected. However, the negative coefficient indicates that when LDR of banks increases the financial performance of commercial banks in Bangladesh or ROE decreases.

The coefficient of cost income ratio (CIR) used as proxy of operational risk showed in table-8 above is -0.155 in the long run which is significant at 1% level. So, the hypothesis of CIR has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected at 1% level of significance. However, the negative coefficient indicates that when cost income ratio (CIR) increases, the financial performance of commercial banks in Bangladesh or ROE decreases. The coefficient's value of -0.155 indicates that, over the long term, leaving other variables constant, a 1% increase in CIR decreases ROE by 15.50 percentage points.

The coefficient of dummy variable “IslamiConv” used as proxy of different types of banking operations in Bangladesh (both Islamic Banking and Conventional Banking system) showed in table-8 above is 0.713 having p value of more than 10%. So, at 10% level of significance, the hypothesis of dummy variable “IslamiConv” or banks type has positive impact on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is 0.281 having p value more than 10%. So, the hypothesis of control variable “LnBS” or bank size has positive impact on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance.

To test the short run effect on first econometric model, the short run version of model 1.2b has been estimated. Here, 1st lag value of the dependent variable i.e. 1st lag value of ROE has been used as independent variable to make the model dynamic among others including log of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of foreign exchange gain/ loss (LnFexGL), loan to deposit ratio (LDR) and cost income ratio (CIR) and dummy variable “IslamiConv” represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS).

The short run specification of model 1.2b has been examined initially through the pooled OLS regression model and then fixed effect regression model whose findings are shown in table – 8. Here, the coefficient of lagged return on equity (L.ROE) of pooled OLS regression analysis is 0.315. For the GMM model, this means that 0.315 would be the upper boundary of the coefficient of lagged value of return on equity (L.ROE). The coefficient of lagged return on equity (L.ROE) of the fixed effect estimates is -0.028. As a result, the lagged return on equity (L.ROE) in the GMM specification would have a lower bound of -0.028. Specifically, if the estimate is λ , it should be laid in the interval of $-0.028 \leq \lambda \leq 0.315$. The coefficient of the lag return on equity (ROE) in this case is 0.239, which is also significant at the 10% level according

to the two step system GMM estimates for the short run specification of the model. So, the coefficient is within the acceptable range of $-0.028 \leq \lambda \leq 0.315$ established by the pooled OLS regression effect and fixed effects estimates of the short run model 1.2b. This is the points to consistency of estimates.

The output of two step system GMM estimates shows that, the P-value of Wild Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The number of instruments used in this study is less than the number of groups, and at a 1% level of significance, the log value of the dependent variable ROE's first lagged value, or LnL.ROE, differs considerably from zero. According to the analysis, the Hansen test statistic is 8.02, and the related p-value is higher than 0.10. As a result, at the ten percent level of significance, the null hypothesis of the validity of the over identifying restrictions for the instruments is not rejected. As a result, the model's instruments are suitable and produce accurate, consistent estimations. Table-8 also displays the autocorrelation test in the error terms. With a matching p-value of less than 10%, the test statistic for first order autocorrelation, or AR(1), is -1.61. Therefore, at a ten percent level of significance, the null hypothesis that the disturbance term (error term) has no first order serial correlation is rejected. The test statistic AR(2) for second order serial correlation in the error term has a p-value that is more than 0.10 and equals -1.01. As a consequence, the null hypothesis that there is no second order serial correlation in the error terms is accepted and the use of instruments from the second lag and differences is permitted at a ten percent level of significance. This strengthens the case for adopting the two step system GMM estimates to specify model 1.2b correctly, in the short term.

Table – 8 above also shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.326 in the short run which is significant at 1% level. Therefore, at the 1% level of significance, the hypothesis that credit risk has a negative impact on the profitability of commercial banks operating in Bangladesh is not rejected. In addition, the negative coefficient indicates that when NPLR of banks increases ROE decreases in the short run.

As shown in table-8 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk is 0.170 with a p value more than 10%. So, at 10% level of significance, the hypothesis of interest rate risk has positive impact in the short run on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROE also increases in the short run. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.287 with p value of more than 10%. So, the hypothesis of foreign exchange risk has positive impact in the short run on ROE is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk

increases the financial performance of commercial banks in Bangladesh or ROE also increases in the short run.

The coefficient of log of loan to deposit ratio (LnLDR) used as proxy of liquidity risk showed in table-8 above is -0.506 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR has a negative impact on the profitability of commercial banks operating in Bangladesh is rejected. However, the negative coefficient shows that as LDR of banks increases, Bangladeshi commercial banks' short-term financial performance or ROE decreases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-8 above is -1.309 in the short run which is also significant at 5% level. So, the hypothesis of operational risk has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected at 5% level of significance. However, the negative coefficient indicates that when cost income ratio (CIR) increases, Bangladeshi commercial banks' short-term financial performance or ROE decreases. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.050 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a short-term negative influence on the profitability of commercial banks operating in Bangladesh is rejected.

The summery output of econometric model 1.2 both in the long run and short run where only bank specific control variable Bank Size, i.e. log of Total Asset (LnBS) has been considered into the model is that credit risk of the bank is negatively correlated with financial performance both in the long run and short run while interest rate risk and foreign exchange risk, both are considered as part of market risk is positively correlated with financial performance both in the long run and short run. However, the liquidity risk of the bank is negatively correlated with financial performance of the bank both in the long run and short run means inconsistency with the statistical assumption of this study. The operational risk of the banks is also having negative correlation with financial performance both in the short run and long run. Though, some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

4.3.4.2. Effect of Risk Factors on Financial Performance of Commercial Banks in Bangladesh considering “Bank Size” as Bank specific and “HHI” as banking industry concentration control variables:

The long run and the short run version of model 2.1 has been estimated, where ROA is considered as dependent variable as proxy of financial performance while log of non-performing loan ratio (LnNPLR) is proxy of credit risk, log of net interest margin (LnNIM) and log of foreign exchange gain/ loss (LnFexGL) as proxy of market risk, loan to deposit ratio (LDR) as proxy of liquidity risk and log of cost income ratio (LnCIR) as proxy of operational risk, dummy variable “IslamiConv” represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of

Total Asset (LnBS) and within banking industry concentration control variable has been represented by Herfindahl-Hirschman Index (HHI). At first long run specification of model 2.1a has been examined by analyzing the output of the random effects GLS regression model, the fixed effect regression model and then the analysis has been finalized through the output of Hausman Test. After analyzing the long run effect this study analyzed the short run effect of model 2.1b through two step system GMM model, the findings of which are shown in table – 10:

Table – 10: Output of Econometric Model 2.1a and 2.1b, where dependent variable is ROA:

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
L_ROA	--	--	0.452*** (0.063)	0.061 (0.075)	LnL_ROA: 0.385*** (0.084)
LnNPLR	- 0.147*** (0.054)	- 0.124* (0.071)	-0.150*** (0.046)	-0.122 (0.079)	-0.220** (0.107)
LnNIM	0.106 (0.086)	0.028 (0.099)	0.112 (0.080)	0.053 (0.108)	0.164 (0.205)
LnFexGL	0.012 (0.080)	-0.104 (0.119)	0.019 (0.060)	-0.129 (0.135)	0.130 (0.183)
LDR	0.003 (0.005)	0.004 (0.006)	0.002 (0.005)	-0.003 (0.009)	LnLDR: 0.771 (0.952)
LnCIR	-1.296*** (0.236)	-2.585*** (0.382)	-0.416** (0.193)	-2.477*** (0.499)	-0.321 (0.359)
IslamiConv (Dummy)	0.363** (0.184)	Omitted	0.235** (0.118)	Omitted	Omitted
LnBS	-0.078 (0.137)	-0.608** (0.275)	0.039 (0.100)	-0.402 (0.344)	-0.299 (0.250)
HHI	0.012*** (0.004)	-0.003 (0.007)	0.022*** (0.008)	0.005 (0.012)	LnHHI: 6.719** (2.737)
Constant	1.902 (2.963)	19.915*** (5.963)	-6.719* (3.434)	14.971* (8.662)	-39.015** (19.064)
	R-Sq:- Within: 0.2835 Between:0.5958 Overall:0.3621 Wald Chi2 (8): 102.98*** rho: 0.3599 Obser: 224 Group: 41	R-Sq:- Within: 0.3276 Between:0.3247 Overall:0.2158 F(7,176): 12.25 *** rho: 0.7621 Obser: 224 Group: 41	R-Sq: 0.5267 Adj R-Sq: 0.5035 F(9,184): 22.75*** Root MSE: 0.5706 Obser: 194	R-Sq:- Within: 0.3147 Between:0.3686 Overall:0.2531 F(8,145): 8.32*** rho: 0.7005 Obser: 194 Group: 41	Wild Chi2(7): 199.14*** Sargar test, Chi2(5)= 49.04*** Hansen test, Chi2(5)= 7.65 AR(1), z= -1.83* AR(2), z= -1.52 Obser: 139, Group: 31 Instruments: 14
	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *
Hausman Test Result	Random Effect		$0.061 \leq \lambda \leq 0.452$, here $\lambda = 0.385$		

Initially, the output of random effect GLS model has been analyzed to examine long run effect of model 2.1a. The analysis showed that, the P-value of Wald Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive

effects on the dependent variable ROA. The interclass correlation (rho) of 35.99% indicates that variations among banks explain for 35.99% of differences in return on assets (ROA). The within R-square means 28.35% difference in ROA are because of variation within individual banks and between R-square means 59.58% of the difference are because of variation between the banks. The total R-square shows that 36.21% of variations in ROA are due to factors taken into account by the model, whereas about 63.79% of changes in ROA may be caused by other variables that are not taken into consideration by this model.

Then, the other specification of econometric model 2.1a is the fixed effects regression model. As per findings of fixed effects regression model showed in Table – 10 above, the P-value of F is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The interclass correlation (rho) is 76.21%, suggesting that variances between banks explain for 76.21% of variations in return on assets (ROA). The within R-square means 32.76% difference in ROA are because of variation within individual banks and between R-square means 32.47% of the difference are because of variation between the banks. The overall R-square reveals that the factors taken into account by the model account for 21.58% variations in ROA, whereas up to 78.42% of the change in ROA may be due to other variables that are not taken into account by this model.

The Hausman Test, commonly referred to as the Hausman specification test, is used to identify endogenous regressor (predictor variables) in this case. The values of endogenous variables are influenced by other variables in the system. The Hausman test will do this. The specification tests are performed by constructing a test of the hypothesis $H_0: a = 0$. In contrast to fixed effects, random effects may be estimated via partial pooling. When using partial pooling, the effect estimates for a group will be partially dependent on the more abundant data from other groups if the group has few data points.

Table – 11: Output of Hausman specification test for Econometric Model 2.1a, where dependent variable is ROA

---- Coefficients ----				
	(b)	(B)	(b-B)	$\sqrt{\text{diag}(V_b - V_B)}$
	random	fixed	Difference	S.E.
LnNPLR	-.1471356	-.1243987	-.0227368	.
LnNIM	.1064518	.0276969	.078755	.
LnFexGL	.0123053	-.104841	.1171463	.
LDR	.0028555	.0041516	-.0012962	.
LnCIR	-1.296203	-2.584957	1.288753	.
LnBS	-.0778644	-.6075567	.5296924	.
HHI	.0124	-.0025009	.0149008	.

b = consistent under H_0 and H_a ; obtained from xtreg				
B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg				
Test: H_0 : difference in coefficients not systematic				
$\chi^2(7) = (b-B)'[(V_b - V_B)^{-1}](b-B)$ $= -21.27 \quad \chi^2 < 0 \implies \text{model fitted on these data fails to meet the asymptotic assumptions of the Hausman test; see suest for a generalized test}$				

According to Table - 11, the test statistics have a chi statistic of -21.27 with seven degrees of freedom. Therefore, the model fitted to these data does not satisfy the Hausman test's asymptotic assumption. So, here Random Effect GLS model has been selected over Fixed Effects Regression Model for interpretation of the long run specification while Bank specific control variable “Bank Size” and within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) are considered as control variables into the model. The output of random effect GLS model shows in table – 10 above are as follows:

Table – 10 above shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.147 in the long run which is significant at 1% level. So, at 1% level of significance, the hypothesis of LnNPLR has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected. The negative coefficient, however, shows that ROA or financial performance of Bangladesh's commercial banks decreases when NPLR of banks increases.

In table - 6 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk is 0.106 with a p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that LnNIM having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROA also increases. The log value of foreign exchange gain/loss (LnFexGL), a proxy for the other component of market risk, known as foreign exchange risk, has a coefficient of 0.012 and a p value greater than 10%. So, the hypothesis of LnFexGL has positive impact on ROA is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROA also increases.

The coefficient of loan to deposit ratio (LDR) used as proxy of liquidity risk showed in table-10 above is 0.003 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive correlation shows that when bank LDR increases, Bangladeshi commercial banks' financial performance, or ROA, increases as well.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-10 above is -1.296 in the long run which is significant at 1% level. So, the hypothesis that LnCIR has negative impact on the profitability of commercial banks operating in Bangladesh is not rejected at 1% level of significance. However, the negative coefficient indicates that when the cost income ratio (CIR) increases, ROA decreases.

The coefficient of dummy variable “IslamiConv” used as proxy of different types of banking operations in Bangladesh (both Islamic Banking and Conventional Banking system) showed in

table-10 above is 0.363 having p value of more than 10%. So, at 10% level of significance, the hypothesis of dummy variable “IslamiConv” or banks type has positive impact on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.078 having p value more than 10%. So, at 10% level of significance, the hypothesis of control variable “LnBS” or bank size has negative impact on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) is 0.012 in the long run which is significant at 1% level. So, at 1% level of significance, the hypothesis of control variable “HHI” has positive impact on the profitability of commercial banks operating in Bangladesh is not rejected.

To test the short run effect on first econometric model, the short run version of model 2.1b has been estimated. Here, 1st lag value of the dependent variable i.e. 1st lag value of ROA has been used as independent variable to make the model dynamic among others including log of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of foreign exchange gain/ loss (LnFexGL), loan to deposit ratio (LDR) and log of cost income ratio (LnCIR) and dummy variable “IslamiConv” represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS) and within banking industry concentration control variable proxy by Herfindahl-Hirschman Index (HHI).

The short run specification of model 2.1b has been examined initially through the pooled OLS regression model and then fixed effect regression model whose findings are shown in table – 10. Here, the coefficient of lagged return on asset (L.ROA) of pooled OLS regression analysis is 0.452. So, the higher boundary of the coefficient of lagged value of return on asset (L.ROA) for the GMM model would be 0.452. The coefficient of lagged return on asset (L.ROA) of the fixed effect estimates is 0.061. As a result, the lagged return on asset (L.ROA) in the GMM specification would have a lower bound of 0.061. Specifically, if the estimate is λ , it should be laid in the interval of $0.062 \leq \lambda \leq 0.452$. Here, the two-step system GMM estimates for the model's short-run specification show that the lagged return on assets (ROA) coefficient is 0.385. The coefficient is therefore within the permissible range of $0.062 \leq \lambda \leq 0.452$ set by the pooled OLS regression effect and fixed effects estimates of the short run model 2.1b. This is the points to consistency of estimates.

The output of two step system GMM estimates shows that, the P-value of Wild Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The number of instruments used in this study is less than the number of groups, and at a 1% level of significance, the log value of the dependent variable ROA's first lagged value, or LnL.ROA, differs considerably from zero. According to the analysis, the Hansen test statistic is 7.65, and the related p-value is higher than 0.10. As a result, at the ten percent level of significance, the null hypothesis of the validity of the

over identifying restrictions for the instruments is not rejected. As a result, the model's instruments are suitable and produce accurate, consistent estimations. Table - 10 also displays the autocorrelation test in the error terms. With a matching p-value of less than 10%, the test statistic for first order autocorrelation, or AR(1), is -1.83. Therefore, at a ten percent level of significance, the null hypothesis that the disturbance term (error term) has no first order serial correlation is rejected. The test statistic for second order serial correlation AR(2) in the error term has a p-value of -1.52, which is more than 0.10. Therefore, the null hypothesis that there is no second order serial correlation in the error terms may be accepted at a ten percent level of significance by permitting the use of instruments from the second lag and differences. This strengthens the case for adopting the two step system GMM estimates to specify model 2.1b correctly, in the short term.

Table – 10 above also shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.220 in the short run which is significant at 5% level. The hypothesis that credit risk has a negative effect on the profitability of commercial banks operating in Bangladesh is not rejected at 5% level of significance. Additionally, the negative coefficient shows that as bank NPLR increases, Bangladeshi commercial banks' short-term financial performance or ROA decreases.

In Table - 10 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk, is 0.164 with a p value more than 10%. So, the hypothesis of interest rate risk has positive impact in the short run on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROA also increases in the short run. In Table 10 above, the coefficient of log net interest margin (LnNIM), which is a measure of market risk and a stand-in for interest rate risk is 0.164 with a p value more than 10%. So, the hypothesis of foreign exchange risk has positive impact in the short run on ROA is rejected at 10% level of significance. Additionally, the positive coefficient shows that as Foreign Exchange Risk increases, Bangladeshi commercial banks' short-term financial performance, or ROA, also increases.

The coefficient of the log of loan to deposit ratio (LnLDR), which is used as a proxy for liquidity risk and is shown in table-10 above, is 0.771 and has a p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive correlation shows that as bank LDR increases, either Bangladeshi commercial bank's short-term financial performance, or ROA, increases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-10 above is -0.321 in the short run which is not significant at 10% level. The assumption

that operational risk has a negative effect on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance. However, the negative coefficient shows that when the cost income ratio (CIR) increases, Bangladeshi commercial banks' short-term financial performance or ROA decreases. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.299 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a short-term negative influence on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable log of Herfindahl-Hirschman Index (LnHHI) is 6.719 in the long run which is significant at 5% level. Therefore, at the 5% level of significance, the hypothesis that the control variable "LnHHI" having a positive influence on the profitability of commercial banks operating in Bangladesh is not rejected.

The summery output of econometric model 2.1 both in the long run and short run where bank specific control variable Bank Size, i.e. log of Total Asset (LnBS) and within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) has been considered into the model is that credit risk of the bank is negatively correlated with financial performance both in the long run and short run while interest rate risk and foreign exchange risk, both are considered as part of market risk is positively correlated with financial performance both in the long run and short run. The liquidity risk of the bank is also positively correlated with financial performance in the long run and short run which is in line with the statistical assumption of this study. The operational risk of the banks is also having negative correlation with financial performance both in the long run and short run. Though, some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

Table – 12: Output of Econometric Model 2.2a and 2.2b, where dependent variable is ROE:

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
L_ROE	--	--	0.313*** (0.069)	-0.030 (0.078)	LnL_ROE: 0.277*** (0.087)
LnNPLR	- 1.289*** (0.382)	- 0.882* (0.499)	-1.365*** (0.378)	-0.885 (0.568)	-0.265*** (0.103)
LnNIM	1.877*** (0.567)	0.569 (0.694)	2.043*** (0.590)	0.992 (0.832)	0.107 (0.136)
LnFexGL	0.644 (0.651)	0.194 (0.964)	0.503 (0.580)	0.291 (1.158)	0.237 (0.150)
LDR	0.025 (0.035)	0.040 (0.044)	0.006 (0.038)	0.040 (0.071)	LnLDR: 0.597 (0.888)
CIR	-0.147*** (0.032)	-0.285*** (0.061)	-0.075** (0.032)	-0.325*** (0.073)	LnCIR: -0.971** (0.397)

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
IslamiConv (Dummy)	1.109 (1.077)	Omitted	0.602 (0.817)	Omitted	Omitted
LnBS	0.794 (0.902)	-0.591 (2.128)	0.673 (0.762)	0.422 (2.764)	-0.063 (0.176)
HHI	0.062** (0.030)	0.019 (0.049)	0.065 (0.057)	0.055 (0.094)	LnHHI: 5.010* (2.655)
Constant	-21.419 (17.104)	22.074 (41.619)	-25.335 (24.337)	-2.583 (64.327)	-27.297 (19.296)
	R-Sq:- Within: 0.1555 Between:0.6652 Overall:0.4220 Wald Chi2 (8): 96.09*** rho: 0.2567 Obser: 204 Group: 39	R-Sq:- Within: 0.1915 Between:0.4666 Overall:0.3160 F(7,158): 5.35 *** rho: 0.5644 Obser: 204 Group: 39	R-Sq: 0.4875 Adj R-Sq: 0.4590 F(9,162): 17.12*** Root MSE: 3.867 Obser: 172	R-Sq:- Within: 0.1912 Between:0.5284 Overall:0.3261 F(8,127): 3.75*** rho: 0.5555 Obser: 172 Group: 37	Wild Chi2(7): 168.87*** Sargar test, Chi2(5)= 22.42*** Hansen test, Chi2(5)= 4.89 AR(1), z= -1.72* AR(2), z= -1.06 Obser: 127, Group: 29 Instruments: 14
	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *
Hausman Test Result	Random Effect		$-0.030 \leq \lambda \leq 0.313$, here $\lambda = 0.277$		

Initially, the output of random effect GLS model has been analyzed to examine long run effect of model 2.2a. The analysis showed that, the P-value of Wald Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The interclass correlation (rho) is 25.67%, which indicates that variance across the banks is responsible for 25.67% of the variations in return on equity (ROE). The within R-square means 15.55% difference in ROE are because of variation within individual banks and between R-square means 66.52% of the difference are because of variation between the banks. The overall R-square reveals that the factors taken into account in the model account for 42.20% of changes in ROE, whereas additional variables that have not been taken into account in this model may be responsible for 57.80% of those changes.

Then, the other specification of econometric model 2.2a is the fixed effects regression model. As per findings of fixed effects regression model showed in Table – 12 above, the P-value of F is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The interclass correlation (rho) is 56.44%, suggesting that variances between banks explain for 56.44% of variations in return on equity (ROE). The within R-square means 19.15% difference in ROE are because of variation

within individual banks and between R-square means 46.66% of the difference are because of variation between the banks. The total R-square shows that 31.60% of changes in ROE are due to factors taken into account by the model, while about 68.40% of changes in ROE may be due to additional variables that have not been taken into account in this model.

The Hausman Test, commonly referred to as the Hausman specification test, is used to identify endogenous regressor (predictor variables) in this case. The values of endogenous variables are influenced by other variables in the system. The Hausman test will do this. The specification tests are performed by constructing a test of the hypothesis $H_0: a = 0$. In contrast to fixed effects, random effects may be estimated via partial pooling. When using partial pooling, the effect estimates for a group will be partially dependent on the more abundant data from other groups if the group has few data points.

Table – 13: Output of Hausman specification test for Econometric Model 2.2a, where dependent variable is ROE

---- Coefficients ----				
	(b) random	(B) fixed	(b-B) Difference	$\sqrt{\text{diag}(V_b - V_B)}$ S.E.
LnNPLR	-1.289127	-.8821154	-.4070113	.
LnNIM	1.876729	.568973	1.307756	.
LnFexGL	.6435345	.1935167	.4500177	.
LDR	.0251877	.0396566	-.0144689	.
CIR	-.1473393	-.2848731	.1375338	.
LnBS	.794072	-.5911001	1.385172	.
HHI	.0618357	.0186355	.0432002	.

b = consistent under H_0 and H_a ; obtained from xtreg
B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg

Test: H_0 : difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= -14.25 chi2<0 ==> model fitted on these
data fails to meet the asymptotic
assumptions of the Hausman test;
see suest for a generalized test

According to Table - 13, the test statistics have a chi statistic of -14.25 with six degrees of freedom. Therefore, the model fitted to these data does not satisfy the Hausman test's asymptotic assumption. So, here Random Effect GLS model has been selected over Fixed Effects Regression Model for interpretation of the long run specification while Bank specific control variable “Bank Size” and within banking industry concentration control variable “Herfindahl-Hirschman Index (HHI)” are considered as control variables into the model. The output of random effect GLS model shows in table – 12 above are as follows:

Table – 12 above shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -1.289 in the long run which is significant at 1% level. So, the hypothesis of LnNPLR has negative impact on the profitability of commercial banks operating in

Bangladesh is not rejected at 1% level of significance. The negative coefficient, however, shows that over time, Bangladeshi commercial banks' ROE or financial performance decreases as NPLR of banks increases.

The coefficient of log of net interest margin (LnNIM) used as proxy of interest rate risk, which is also a part of market risk showed in table-12 above is 1.877 in the long run, which is significant at 1% level. Therefore, at the 1% level of significance, the hypothesis that LnNIM has a positive influence on the profitability of commercial banks operating in Bangladesh is not rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROE also increases. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.644 with p value of more than 10%. So, the hypothesis of LnFexGL has positive impact on ROE is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROE also increases.

The loan to deposit ratio (LDR), which is used as a proxy for liquidity risk and is shown in table-12 above, has a coefficient of 0.025 and a p value of greater than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive correlation shows that when bank LDR increases, Bangladeshi commercial banks' financial performance, or ROE, increases as well.

The coefficient of cost income ratio (CIR) used as proxy of operational risk showed in table-12 above is -0.147 in the long run which is significant at 1% level. Therefore, at the 1% level of significance, the hypothesis that CIR has a negative impact on the profitability of commercial banks operating in Bangladesh is not rejected. However, the negative coefficient shows that as the cost income ratio (CIR) increases, Bangladeshi commercial banks' financial performance or ROE decrease. The coefficient is -0.147, which means that over the long run, holding other variables constant, a 1% increase in CIR reduces ROE by 14.70 percentage points.

The coefficient of dummy variable "IslamiConv" used as proxy of different types of banking operations in Bangladesh (both Islamic Banking and Conventional Banking system) showed in table- 12 above is 1.109 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that the dummy variable "IslamiConv" or banks type has a favorable influence on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is 0.794 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a positive effect on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) is 0.062 in the long run which is significant at 5% level.

Therefore, at the 5% level of significance, the hypothesis that the control variable "HHI" having a positive influence on the profitability of commercial banks operating in Bangladesh is not rejected.

To test the short run effect on first econometric model, the short run version of model 2.2b has been estimated. Here, 1st lag value of the dependent variable i.e. 1st lag value of ROE has been used as independent variable to make the model dynamic among others including log of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of foreign exchange gain/ loss (LnFexGL), loan to deposit ratio (LDR) and cost income ratio (CIR) and dummy variable "IslamiConv" represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS) and within banking industry concentration control variable proxy by "Herfindahl-Hirschman Index (HHI)".

The short run specification of model 2.2b has been examined initially through the pooled OLS regression model and then fixed effect regression model whose findings are shown in table – 12. Here, the coefficient of lagged return on equity (L.ROE) of pooled OLS regression analysis is 0.313. The coefficient of lagged value of return on equity (L.ROE) for the GMM model would thus have an upper bound of 0.313. The coefficient of lagged return on equity (L.ROE) of the fixed effect estimates is -0.030. Therefore, -0.030 would be the lower bound for the lagged return on equity (L.ROE) in the GMM specification. Specifically, if the estimate is λ , it should be laid in the interval of $-0.030 \leq \lambda \leq 0.313$. Here, the two step system GMM estimates for the short run model specification reveal that the coefficient of the lag return on equity (ROE) is 0.277, which is also significant at 10% level. The coefficient therefore falls within the permissible range of $-0.030 \leq \lambda \leq 0.313$ set by the pooled OLS regression effect and fixed effects estimates of the short run model 2.2b. This is the points to consistency of estimates.

The output of two step system GMM estimates shows that, the P-value of Wild Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The number of instruments used in this study is less than the number of groups, and at a 1% level of significance, the log value of the dependent variable ROE's first lagged value, or LnL.ROE, differs considerably from zero. According to the analysis, the Hansen test statistic is 8.89, and the related p-value is higher than 0.10. As a result, at the ten percent level of significance, the null hypothesis of the validity of the over identifying restrictions for the instruments is not rejected. As a result, the model's instruments are suitable and produce accurate, consistent estimations. Table - 12 also displays the autocorrelation test in the error terms. With a matching p-value of less than 10%, the test statistic for first order autocorrelation, or AR(1), is -1.72. Therefore, at a ten percent level of significance, the null hypothesis that the disturbance term (error term) has no first order serial correlation is rejected. The test statistic for second order serial correlation AR(2) in the error term has a p-value that is more than 0.10 and equals -1.06. As a consequence, the null hypothesis

that there is no second order serial correlation in the error terms is accepted and the use of instruments from the second lag and differences is permitted at a ten percent level of significance. This strengthens the case for adopting the two step system GMM estimates to specify model 2.2b correctly, in the short term.

Table – 12 above also shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.265 in the short run which is significant at 1% level. The hypothesis that credit risk has a negative effect on the profitability of commercial banks operating in Bangladesh is thus not rejected at 1% level of significance. Additionally, the negative coefficient shows that the short-term financial performance of Bangladesh's commercial banks or ROE decreases as NPLR of banks increases.

As shown in table-12 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk is 0.107 with a p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that interest rate risk has a positive short-term impact on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROE also increases in the short run. The log value of foreign exchange gain/loss (LnFexGL), a proxy for foreign currency risk, with a coefficient of 0.237 and a p value more than 10%. So, the hypothesis of foreign exchange risk has positive impact in the short run on ROE is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROE also increases in the short run.

According to table-12 above, the log of loan-to-deposit ratio (LnLDR) coefficient, which is employed as a proxy for liquidity risk, is 0.597 with a p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive correlation shows that as LDR of banks increases, Bangladeshi commercial banks' short-term financial performance, or ROE, also increases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-12 above is -0.971 in the short run which is also significant at 5% level. The hypothesis that operational risk has a negative effect on the profitability of commercial banks operating in Bangladesh is not rejected at the 5% level of significance. However, the negative coefficient shows that as the cost income ratio (CIR) increases, Bangladeshi commercial banks' short-term financial performance or ROE decrease. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.063 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a short-term negative influence on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable log of Herfindahl-

Hirschman Index (LnHHI) is 5.010 in the long run which is significant at 10% level. Therefore, at the 10% level of significance, the hypothesis that the control variable "LnHHI" having a positive influence on the profitability of commercial banks operating in Bangladesh is not rejected.

The summery output of econometric model 2.2 both in the long run and short run where bank specific control variable Bank Size, i.e. log of Total Asset (LnBS) and within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) has been considered into the model is that credit risk of the bank is negatively correlated with financial performance both in the long run and short run while interest rate risk and foreign exchange risk, both are considered as part of market risk is positively correlated with financial performance both in the long run and short run. The liquidity risk of the bank is also positively correlated with financial performance in the long run and short run which is in line with the statistical assumption of this study. The operational risk of the banks is also negatively correlated with financial performance both in the long run and short run. Though, some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

4.3.4.3 Effect of Risk Factors on Financial Performance of Commercial Banks in Bangladesh considering “Bank Size” as Bank specific and “HHI” as banking industry concentration control variable and “GDP Growth” & “Inflation Rate” as macro-economic control variables:

The long run and the short run version of model 3.1 has been estimated, where ROA is considered as dependent variable as proxy of financial performance while log of non-performing loan ratio (LnNPLR) is proxy of credit risk, log of net interest margin (LnNIM) and log of foreign exchange gain/ loss (LnFexGL) as proxy of market risk, loan to deposit ratio (LDR) as proxy of liquidity risk and log of cost income ratio (LnCIR) as proxy of operational risk, dummy variable “IslamiConv” represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS), within banking industry concentration control variable is represented by Herfindahl-Hirschman Index (HHI) and Inflation Rate & GDP Growth Rate has been used as macroeconomic control variables. At first long run specification of model 3.1a has been examined by analyzing the output of the random effects GLS regression model, the fixed effect regression model and then the output has been finalized through the output of Hausman Test. After analyzing the long run effect this study analyzed the short run effect of model 3.1b through two step system GMM model, output of this has been shown in table – 14:

Table – 14: Output of Econometric Model 3.1a and 3.1b, where dependent variable is ROA:

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
L_ROA	--	--	0.440*** (0.064)	0.033 (0.077)	LnL_ROA: 0.384*** (0.087)
LnNPLR	- 0.111** (0.054)	- 0.116* (0.071)	-0.147*** (0.046)	-0.136* (0.079)	-0.202* (0.107)
LnNIM	0.136 (0.085)	0.077 (0.101)	0.115 (0.080)	0.077 (0.110)	0.167 (0.202)
LnFexGL	-0.027 (0.080)	-0.126 (0.119)	0.016 (0.060)	-0.149 (0.136)	0.145 (0.180)
LDR	0.006 (0.005)	0.009 (0.007)	0.003 (0.005)	-0.001 (0.010)	LnLDR: 0.892 (0.931)
LnCIR	-1.306*** (0.233)	-2.359*** (0.393)	-0.415** (0.195)	-2.359*** (0.505)	-0.300 (0.351)
IslamiConv (Dummy)	0.422** (0.184)	Omitted	0.244** (0.118)	Omitted	Omitted
LnBS	0.019 (0.139)	-0.155 (0.346)	0.043 (0.100)	0.004 (0.429)	-0.331 (0.265)
HHI	0.015 (0.022)	0.012 (0.023)	0.025 (0.026)	0.003 (0.026)	LnHHI: 14.427 (9.174)
Inflation	-0.435 (0.280)	-0.390 (0.290)	-0.302 (0.355)	-0.260 (0.344)	LnInfa: -1.921 (1.628)
GDP Growth	-0.319** (0.159)	-0.239 (0.181)	-0.093 (0.190)	-0.275 (0.211)	LnGDPG : 0.600 (1.352)
Constant	4.404 (8.296)	11.934 (9.716)	-5.731 (9.594)	13.768 (11.340)	-82.793 (54.698)
	R-Sq:- Within: 0.3243 Between:0.5907 Overall:0.3839 Wald Chi2 (10): 119.24*** rho: 0.3720 Obser: 224 Group: 41	R-Sq:- Within: 0.3466 Between:0.4441 Overall:0.2914 F(9,174): 10.25 *** rho: 0.6477 Obser: 224 Group: 41	R-Sq: 0.5300 Adj R-Sq: 0.5016 F(11,182): 18.66*** Root MSE: 0.5717 Obser: 194	R-Sq:- Within: 0.3269 Between:0.4680 Overall:0.3117 F(10,143): 6.95*** rho: 0.6039 Obser: 194 Group: 41	Wild Chi2(9): 238.08*** Sargar test, Chi2(5)= 49.66*** Hansen test, Chi2(5)= 7.50 AR(1), z= -1.84* AR(2), z= -1.55 Obser: 139, Group: 31 Instruments: 16
	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *
Hausman Test	Random Effect		0.033 ≤ λ ≤ 0.440, here λ = 0.384		

Initially, the output of random effect GLS model has been analyzed to examine long run effect of model 3.1a. The analysis showed that, the P-value of Wald Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The interclass correlation (rho) is 37.20% implying that 37.20% of the deviations in return in assets (ROA) are due to variation across the banks. The within R-square means 32.43% difference in ROA are because of variation within individual banks and between R-square means 59.07% of the difference are because of variation between the banks. The total R-square reveals that the factors taken into account in the model account for

38.39% of changes in ROA, whereas other variables that have not been taken into account in this model may be responsible for another 61.61% of these changes.

The fixed effects regression model is the alternate specification of econometric model 3.1a. As per findings of fixed effects regression model showed in Table – 14 above, the P-value of F is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROA. The interclass correlation (rho) is 64.77 %, which suggests that 64.77 % of the changes in return on assets (ROA) result from variances among banks. The within R-square means 34.66% difference in ROA are because of variation within individual banks and between R-square means 44.41% of the difference are because of variation between the banks. The overall R-square reveals that the factors taken into account in the model account for 29.14% of changes in ROA, whereas other variables that have not been taken into account in this model may be responsible for 70.86% of those changes.

The Hausman Test, commonly referred to as the Hausman specification test, is used to identify endogenous regressor (predictor variables) in this case. The values of endogenous variables are influenced by other variables in the system. The Hausman test will do this. The specification tests are performed by constructing a test of the hypothesis $H_0: a = 0$. In contrast to fixed effects, random effects may be estimated via partial pooling. When using partial pooling, the effect estimates for a group will be partially dependent on the more abundant data from other groups if the group has few data points.

Table – 15: Output of Hausman specification test for econometric model 3.1a, where dependent variable is ROA

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	random	fixed	Difference	S.E.
LnNPLR	-.1113519	-.1164104	.0050585	.
LnNIM	.1358988	.0771575	.0587413	.
LnFexGL	-.0265396	-.126148	.0996083	.
LDR	.0064996	.0085965	-.0020969	.
LnCIR	-1.306301	-2.358585	1.052284	.
LnBS	.0187855	-.1548973	.1736828	.
HHI	.0151274	.0117343	.0033932	.
Inflation	-.4348139	-.3903956	-.0444183	.
GDPGrowth	-.3190366	-.2390686	-.079968	.

b = consistent under H_0 and H_a ; obtained from xtreg				
B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg				
Test: H_0 : difference in coefficients not systematic				
chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)				
= -13.32 chi2<0 ==> model fitted on these				
data fails to meet the asymptotic				
assumptions of the Hausman test;				
see suest for a generalized test				

According to Table - 15, the test statistics have a chi statistic of -13.32 with nine degrees of freedom. Therefore, the model fitted to these data does not satisfy the Hausman test's asymptotic

assumption. So, here Random Effect GLS model has been selected over Fixed Effects Regression model for interpretation of the long run specification while Bank specific control variable “Bank Size”, banking industry concentration control variable Herfindahl-Hirschman Index (HHI) and Inflation Rate & GDP Growth Rate has been used as macroeconomic control variables are considered as control variables into the model. The output of random effect GLS model shows in table – 14 above are as follows:

Table – 14 above shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.111 in the long run which is significant at 5% level. Therefore, at the 5% level of significance, the hypothesis that LnNPLR having a negative influence on the profitability of commercial banks operating in Bangladesh is not rejected. However, the negative coefficient indicates that when NPLR of banks increases, ROA decreases.

As shown in table - 14 above, the coefficient of log net interest margin (LnNIM) which is used as a proxy for interest rate risk and is also a component of market risk is 0.136 with a p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that LnNIM having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, the financial performance of commercial banks in Bangladesh or ROA also increases. The log value of foreign exchange gain/loss (LnFexGL) a proxy for the other market risk factor known as foreign exchange risk having a coefficient of -0.027 and a p value greater than 10%. So, the hypothesis of LnFexGL has negative impact on ROA is rejected at 10% level of significance. And also, the negative coefficient indicates that when Foreign Exchange Risk increases ROA decreases.

The coefficient of loan to deposit ratio (LDR) used as proxy of liquidity risk showed in table-14 above is 0.006 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when LDR of banks increases, ROA also increases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-14 above is -1.306 in the long run which is significant at 1% level. Therefore, at the 1% level of significance, the hypothesis that LnCIR having a negative influence on the profitability of commercial banks operating in Bangladesh is not rejected. However, the negative coefficient indicates that when cost income ratio (CIR) increases, ROA decreases.

The coefficient of dummy variable “IslamiConv” used as proxy of different types of banking operations in Bangladesh (both Islamic Banking and Conventional Banking system) showed in table-14 above is 0.422 in the long run which is significant at 5% level. Therefore, at the 5% level of significance, the hypothesis that the dummy variable "IslamiConv" or banks type having a positive influence on the profitability of commercial banks operating in Bangladesh is not

rejected. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is 0.019 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a positive effect on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) is 0.015 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "HHI" has a positive influence on the profitability of Bangladeshi commercial banks is rejected.

Coefficient of macro-economic control variables "Inflation Rate" is -0.435 with p value of more than 10%. So, at 10% level of significance, the hypothesis that control variable "Inflation Rate" has negative impact on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of other macro-economic control variables "GDP Growth Rate" is -0.319 in the long run which is significant at 5% level. Therefore, at the 5% level of significance, the hypothesis that the control variable "GDP Growth Rate" has a negative influence on the profitability of commercial banks operating in Bangladesh is not rejected.

To test the short run effect on first econometric model, the short run version of model 3.1b has been estimated. Here, 1st lag value of the dependent variable i.e. 1st lag value of ROA has been used as independent variable to make the model dynamic among others including log of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of foreign exchange gain/ loss (LnFexGL), loan to deposit ratio (LDR) and log of cost income ratio (LnCIR) and dummy variable "IslamiConv" represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS), within banking industry concentration control variable proxy by Herfindahl-Hirschman Index (HHI) and Inflation Rate & GDP Growth Rate has been used as macroeconomic control variables.

The short run specification of model 3.1b has been examined initially through the pooled OLS regression model and then fixed effect regression model whose findings are shown in table – 14. Here, the coefficient of lagged return on asset (L.ROA) of pooled OLS regression analysis is 0.440. So, the higher boundary of the coefficient of lagged value of return on asset (L.ROA) for the GMM model would be 0.440. The coefficient of lagged return on asset (L.ROA) of the fixed effect estimates is 0.033. As a result, the lagged return on asset (L.ROA) in the GMM specification would have a lower bound of 0.033. Specifically, if the estimate is λ , it should be laid in the interval of $0.033 \leq \lambda \leq 0.440$. Here, the two step system GMM estimates for the short run specification of model shows that the coefficient of the lagged return on assets (ROA) is 0.384. So, the coefficient is within the acceptable range of $0.033 \leq \lambda \leq 0.440$ established by the pooled OLS regression effect and fixed effects estimates of the short run model 3.1b. This is the points to consistency of estimates.

The output of two step system GMM estimates shows that, the P-value of Wild Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative

or positive effects on the dependent variable ROA. The number of instruments used in this study is less than the number of groups, and at a 1% level of significance, the log value of the dependent variable ROA's first lagged value, or LnL.ROA, differs considerably from zero. According to the analysis, the Hansen test statistic is 7.50, and the related p-value is higher than 0.10. As a result, at the ten percent level of significance, the null hypothesis of the validity of the over identifying restrictions for the instruments is not rejected. As a result, the model's instruments are suitable and produce accurate, consistent estimations. Table - 14 also displays the autocorrelation test in the error terms. With a matching p-value of less than 10%, the test statistic for first order autocorrelation, or AR(1), is -1.84. Therefore, at a ten percent level of significance, the null hypothesis that the disturbance term (error term) has no first order serial correlation is rejected. The test statistic for second order serial correlation AR(2) in the error term has a p-value that is more than 0.10 and equals -1.55. As a consequence, the null hypothesis that there is no second order serial correlation in the error terms is accepted and the use of instruments from the second lag and differences is permitted at a ten percent level of significance. This strengthens the case for adopting the two step system GMM estimates to specify model 3.1b correctly, in the short term.

Table – 14 above also shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.202 in the short run which is significant at 10% level. The hypothesis that credit risk has a negative effect on the profitability of commercial banks operating in Bangladesh is not rejected at a 10% level of significance. Additionally, the negative coefficient shows that as bank NPLR increases, Bangladeshi commercial banks' short-term financial performance or ROA decreases.

As shown in table-14 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk is 0.167 with a p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that interest rate risk has a positive short-term impact on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROA also increases in the short run. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.145 with p value of more than 10%. So, the hypothesis of foreign exchange risk has positive impact in the short run on ROA is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROA also increases in the short run.

The coefficient of log of loan to deposit ratio (LnLDR) used as proxy of liquidity risk showed in table-14 above is 0.892 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. The positive correlation suggests that as

LDR of banks increases, Bangladeshi commercial banks' short-term financial performance or ROA also increases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-14 above is -0.300 in the short run which is not significant at 10% level. The assumption that operational risk has a negative effect on the profitability of commercial banks operating in Bangladesh is therefore rejected at 10% level of significance. However, the negative coefficient indicates that when cost income ratio (CIR) increases, the financial performance of commercial banks in Bangladesh or ROA decreases in the short run. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is -0.331 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a short-term negative influence on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable log of Herfindahl-Hirschman Index (LnHHI) is 14.427 in the long run which are not significant at 10% level. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnHHI" has a positive influence on the profitability of commercial banks operating in Bangladesh is rejected.

Coefficient of macro-economic control variables "Inflation Rate" is -1.921 with p value of more than 10%. The hypothesis that the control variable "Inflation Rate" has a negative impact on the profitability of commercial banks operating in Bangladesh is therefore rejected at a 10% level of significance. The coefficient of other macro-economic control variables log of GDP Growth Rate, i.e. "LnGDPG" is 0.600 in the short run which is not significant at 10% level. Therefore, at a 10% level of significance, the hypothesis that the control variable "GDP Growth Rate" has a positive influence on the profitability of commercial banks operating in Bangladesh is rejected.

The summery output of econometric model 3.1 both in the long run and short run where bank specific control variable Bank Size, i.e. log of Total Asset (LnBS), within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) and macroeconomic control variables "Inflation Rate" & "GDP Growth Rate" has been considered into the model is that credit risk of the bank is negatively correlated with financial performance both in the long run and short run while interest rate risk is considered as part of market risk is positively correlated with financial performance both in the short run and long run. The other component of market risk, i.e. Foreign Exchange Risk is positively correlated with financial performance in the short run but have negative correlation with the profitability of the commercial banks operating in Bangladesh in the long run. The liquidity risk of the bank is also positively correlated with financial performance in the long run and short run which is in line with the statistical assumption of this study. The operational risk of the banks is also having negative correlation with financial performance both in the long run and short run. Though, some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

Table – 16: Output of Econometric Model 3.2a and 3.2b, where dependent variable is ROE:

Independent Variables	Long Run		Short Run		
	Random Effect	Fixed Effect	OLS Regression	Fixed Effect	Two Step GMM Model
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
L_ROE	--	--	0.310*** (0.069)	-0.076 (0.079)	LnL_ROE: 0.191* (0.099)
LnNPLR	- 1.196*** (0.391)	- 0.899* (0.499)	-1.322*** (0.380)	-1.021* (0.561)	-0.255** (0.093)
LnNIM	1.857*** (0.571)	0.633 (0.708)	2.042*** (0.592)	1.099 (0.830)	0.154 (0.255)
LnFexGL	0.505 (0.661)	-0.118 (0.974)	0.457 (0.583)	-0.364 (1.168)	0.336** (0.151)
LDR	0.028 (0.036)	0.050 (0.047)	0.004 (0.039)	0.049 (0.075)	LnLDR: 0.438 (1.118)
CIR	-0.154*** (0.033)	-0.272*** (0.062)	-0.079** (0.033)	-0.310*** (0.073)	LnCIR: -1.364*** (0.411)
IslamiConv (Dummy)	1.210 (1.101)	Omitted	0.627 (0.820)	Omitted	Omitted
LnBS	1.057 (0.926)	2.431 (2.756)	0.766 (0.769)	6.547* (3.684)	-0.089 (0.187)
HHI	-0.096 (0.159)	-0.131 (0.165)	-0.096 (0.185)	-0.139 (0.186)	LnHHI: 7.535 (7.709)
Inflation	0.728 (1.978)	0.728 (2.061)	0.718 (2.542)	-0.056 (2.410)	LnInfa: -2.050 (1.310)
GDP Growth	-1.800 (1.126)	-2.484* (1.323)	-1.506 (1.352)	-3.923** (1.558)	LnGDPG : -0.595 (1.325)
Constant	43.554 (57.503)	54.663 (68.141)	40.551 (68.327)	25.392 (81.895)	-35.395 (48.888)
	R-Sq:- Within: 0.1749 Between:0.6552 Overall:0.4235 Wald Chi2 (10): 96.88*** rho: 0.2731 Obser: 204 Group: 39	R-Sq:- Within: 0.2096 Between:0.4899 Overall:0.3252 F(9,156): 4.60*** rho: 0.5263 Obser: 204 Group: 39	R-Sq: 0.4915 Adj R-Sq: 0.4565 F(11,160): 14.06*** Root MSE: 3.876 Obser: 172	R-Sq:- Within: 0.2308 Between:0.3120 Overall:0.1777 F(10,125): 3.75*** rho: 0.7154 Obser: 172 Group: 37	Wild Chi2(9): 210.97*** Sargar test, Chi2(5)= 25.17*** Hansen test, Chi2(5)= 4.40 AR(1), z= -1.39 AR(2), z= -1.02 Obser: 127, Group: 29 Instruments: 16
	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *	p-value<.01 *** p-value<.05 ** p-value<.10 *
Hausman Test Result	Random Effect		-0.076 ≤ λ ≤ 0.310, here λ = 0.191		

Initially, the output of random effect GLS model has been analyzed to examine long run effect of model 3.2a. The analysis showed that, the P-value of Wald Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The interclass correlation (rho) is 27.31%, which suggests that variance among the banks explains for 27.31% of the variations in return on equity (ROE). The within R-square means 17.49% difference in ROE are because of variation within

individual banks and between R-square means 65.52% of the difference are because of variation between the banks. The total R-square shows that the factors taken into account in the model account for 42.35% of changes in ROE, whereas about 57.65% of variations in ROE may be due to additional variables that have not been taken into account in this model.

The fixed effects regression model is the alternate specification of econometric model 3.2a. As per findings of fixed effects regression model showed in Table – 16 above, the P-value of F is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The interclass correlation (rho) is 52.63%, suggesting that variances between banks explain for 52.63% of variations in return on equity (ROE). The within R-square means 20.96% difference in ROE are because of variation within individual banks and between R-square means 48.99% of the difference are because of variation between the banks. The total R-square reveals that the factors taken into account in the model account for 32.52% of changes in ROE, while up to 67.48% of variations in ROE may be attributable to other variables that have not been taken into account in this model.

The Hausman Test, commonly referred to as the Hausman specification test, is used to identify endogenous regressor (predictor variables) in this case. The values of endogenous variables are influenced by other variables in the system. The Hausman test will do this. The specification tests are performed by constructing a test of the hypothesis $H_0: a = 0$. In contrast to fixed effects, random effects may be estimated via partial pooling. When using partial pooling, the effect estimates for a group will be partially dependent on the more abundant data from other groups if the group has few data points.

Table – 17: Output of Hausman specification test for Econometric Model 3.2a, where dependent variable is ROE

---- Coefficients ----				
	(b) random	(B) fixed	(b-B) Difference	$\sqrt{\text{diag}(V_b - V_B)}$ S.E.
LnNPLR	-1.195593	-.8986437	-.2969488	.
LnNIM	1.856732	.6328367	1.223895	.
LnFexGL	.50503	-.1179756	.6230056	.
LDR	.0277924	.0503146	-.0225222	.
CIR	-.1540442	-.272031	.1179868	.
LnBS	1.056901	2.431248	-1.374347	.
HHI	-.0959754	-.1307943	.0348189	.
Inflation	.7278754	.7276603	.0002151	.
GDPGrowth	-1.799718	-2.484444	.684726	.

b = consistent under H_0 and H_a ; obtained from xtreg				
B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg				
Test: H_0 : difference in coefficients not systematic				
$\chi^2(9) = (b-B)'[(V_b - V_B)^{-1}](b-B)$				
$= -13.93$				
$\chi^2 < 0 \implies \text{model fitted on these data fails to meet the asymptotic assumptions of the Hausman test; see suest for a generalized test}$				

According to Table - 17, the test statistics have a chi statistic of -13.93 with nine degrees of freedom. Therefore, the model fitted to these data does not satisfy the Hausman test's asymptotic

assumption. So, here Random Effect GLS model has been selected over Fixed Effects Regression Model for interpretation of the long run specification while Bank specific control variable “Bank Size”, within banking industry concentration control variable “Herfindahl-Hirschman Index (HHI)” and Inflation Rate & GDP Growth Rate has been used as macroeconomic control variables are considered as control variables into the model. The output of random effect GLS model shows in table – 16 above are as follows:

Table – 16 above shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -1.196 in the long run which is significant at 1% level. Therefore, at the 1% level of significance, the hypothesis that LnNPLR having a negative influence on the profitability of commercial banks operating in Bangladesh is not rejected. However, the negative coefficient indicates that when NPLR or credit risk of banks increases the financial performance of commercial banks in Bangladesh or ROE decreases in the long run.

In table -16 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk, is 1.857 in the long run, which is significant at the 1% level. Therefore, at the 1% level of significance, the hypothesis that LnNIM has a positive influence on the profitability of commercial banks operating in Bangladesh is not rejected. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROE also increases. The log value of foreign exchange gain/loss (LnFexGL) a proxy for the other market risk factor known as foreign exchange risk having coefficient of 0.505 and a p value greater than 10%. So, the hypothesis of LnFexGL has positive impact on ROE is rejected at 10% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROE also increases.

The coefficient of loan to deposit ratio (LDR) used as proxy of liquidity risk showed in table-16 above is 0.028 having p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that LDR having a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive correlation shows that when bank LDR increases, Bangladeshi commercial banks' financial performance or ROE, increases as well.

The coefficient of cost income ratio (CIR) used as proxy of operational risk showed in table-16 above is -0.154 in the long run which is significant at 1% level. Therefore, at the 1% level of significance, the hypothesis that CIR has a detrimental impact on the profitability of commercial banks operating in Bangladesh is not rejected. However, the negative coefficient indicates that when cost income ratio (CIR) increases, ROE decreases. The coefficient's value of -0.154 indicates that, over the long term, keeping other variables constant, a 1% increase in CIR decreases ROE by 15.40 percentage points.

The coefficient of dummy variable “IslamiConv” used as proxy of different types of banking operations in Bangladesh (both Islamic Banking and Conventional Banking system) showed in

table- 16 above is 1.210 having p value of more than 10%. Therefore, the 10% level of significance rejects the hypothesis that the dummy variable "IslamiConv" or banks type has a positive influence on the profitability of commercial banks operating in Bangladesh. The coefficient of control variable log of Bank Size (total asset), i.e. LnBS is 1.057 having p value more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "LnBS," or bank size, has a positive effect on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) is -0.096 in the long run which is rejected at 10% level of significance. The hypothesis that the control variable "HHI" has a negative effect on the profitability of commercial banks operating in Bangladesh is therefore rejected at a 10% level of significance.

Coefficient of macro-economic control variables "Inflation Rate" is 0.782 with p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "Inflation Rate" has a positive influence on the profitability of commercial banks operating in Bangladesh is rejected. The coefficient of other macro-economic control variables "GDP Growth Rate" is -1.80 with p value of more than 10%. So, The hypothesis that the control variable "GDP Growth Rate" has a negative effect on the profitability of commercial banks operating in Bangladesh is therefore rejected at a 10% level of significance.

To test the short run effect on first econometric model, the short run version of model 3.2b has been estimated. Here, 1st lag value of the dependent variable i.e. 1st lag value of ROE has been used as independent variable to make the model dynamic among others including log of non-performing loan ratio (LnNPLR), log of net interest margin (LnNIM), log of foreign exchange gain/ loss (LnFexGL), loan to deposit ratio (LDR) and cost income ratio (CIR) and dummy variable "IslamiConv" represent two types of banking system Islamic Banking and Conventional Banking system operating in Bangladesh and control variable Bank Size is represented by log of Total Asset (LnBS), within banking industry concentration control variable "Herfindahl-Hirschman Index (HHI)" and Inflation Rate & GDP Growth Rate has been used as macroeconomic control variables.

The short run specification of model 3.2b has been examined initially through the pooled OLS regression model and then fixed effect regression model whose findings are shown in table – 16. Here, the coefficient of lagged return on equity (L.ROE) of pooled OLS regression analysis is 0.310. So, the higher boundary of the coefficient of lagged value of return on equity (L.ROE) for the GMM model would be 0.310. The fixed effect estimates' coefficient of lagged return on equity (L.ROE) is -0.076. As a result, the GMM specification's lower bound for lagged return on equity (L.ROE) would be -0.076. Specifically, if the estimate is λ , it should be laid in the interval of $-0.076 \leq \lambda \leq 0.310$. The coefficient of the lag return on equity (ROE) in this case is 0.191, which is also significant at the 10% level according to the two step system GMM estimates for the short run specification of the model. In light of this, the coefficient falls within the

permissible range of $-0.076 \leq \lambda \leq 0.310$ set by the fixed effects estimates and pooled OLS regression impact of the short run model 3.2b. This is the points to consistency of estimates.

The output of two step system GMM estimates shows that, the P-value of Wild Chi Squire is less than 0.01, so the model is significant at 1% level and all the independent variables have negative or positive effects on the dependent variable ROE. The number of instruments used in this study is less than the number of groups, and at a 1% level of significance, the log value of the dependent variable ROE's first lagged value, or LnL.ROE, differs considerably from zero. According to the analysis, the Hansen test statistic is 4.40, and the related p-value is higher than 0.10. As a result, at the ten percent level of significance, the null hypothesis of the validity of the over identifying restrictions for the instruments is not rejected. As a result, the model's instruments are suitable and produce accurate, consistent estimations. Table - 16 also displays the autocorrelation test in the error terms. With a matching p-value of more than 10%, the test statistic for first order autocorrelation, or AR(1), is -1.39. Therefore, at a ten percent level of significance, the null hypothesis that the disturbance term (error term) has no first order serial correlation is not rejected. The test statistic AR(2) for second order serial correlation in the error term equal to -1.02 with p-value that is more than 0.10. As a consequence, the null hypothesis that there is no second order serial correlation in the error terms is accepted and the use of instruments from the second lag and differences is permitted at a ten percent level of significance. This strengthens the case for adopting the two step system GMM estimates to specify model 3.2b correctly, in the short term.

Table – 16 above also shows that the coefficient of log of nonperforming loan ratio (LnNPLR) used as proxy of credit risk is -0.255 in the short run which is significant at 1% level. The hypothesis that credit risk has a negative effect on the profitability of commercial banks operating in Bangladesh is not rejected at 1% level of significance. In addition, the negative coefficient indicates that when NPLR or credit risk of banks increases, ROE decreases in the short run.

As shown in table-16 above, the coefficient of log net interest margin (LnNIM), which is used as a proxy for interest rate risk and is also a component of market risk is 0.154 with a p value more than 10%. The assumption that interest rate risk has a positive short-term impact on the profitability of commercial banks operating in Bangladesh is rejected at a 10% level of significance. However, the positive coefficient indicates that when net interest margin (NIM) or interest rate risk increases, ROE also increases in the short run. The other component of market risk, i.e. foreign exchange risk which is proxy by log value of foreign exchange gain/ loss (LnFexGL) has coefficient of 0.336 in the short run which is significant at 1% level. So, the hypothesis of foreign exchange risk has positive impact in the short run on ROE is not rejected at 1% level of significance. And also, the positive coefficient indicates that when Foreign Exchange Risk increases the financial performance of commercial banks in Bangladesh or ROE also increases in the short run.

The coefficient of log of loan to deposit ratio (LnLDR) used as proxy of liquidity risk showed in table-16 above is 0.438 having p value of more than 10%. Therefore, at 10% level of significance the hypothesis that LDR having a favorable influence on the profitability of commercial banks operating in Bangladesh is rejected. However, the positive correlation shows that as LDR of banks increases, Bangladeshi commercial banks' short-term financial performance or ROE also increases.

The coefficient of log of cost income ratio (LnCIR) used as proxy of operational risk showed in table-16 above is -1.364 in the short run which is also significant at 1% level. The hypothesis that operational risk has a negative effect on the profitability of commercial banks operating in Bangladesh is not rejected at 1% level of significance. However, the negative coefficient indicates that when cost income ratio (CIR) increases, ROE decreases in the short run. The control variable log of Bank Size (total asset) or LnBS has a coefficient of -0.089 and a p value greater than 10%. So, the hypothesis of control variable "LnBS" or bank size has negative impact in the short run on the profitability of commercial banks operating in Bangladesh is rejected at 10% level of significance. The coefficient of within banking industry concentration control variable log of Herfindahl-Hirschman Index (LnHHI) is 7.535 in the long run which is significant at 10% level. Therefore, at the 10% level of significance, the hypothesis that the control variable "LnHHI" having a positive influence on the profitability of commercial banks operating in Bangladesh is not rejected.

Coefficient of macro-economic control variables log of Inflation Rate, i.e. "LnInfa" is -2.050 with p value of more than 10%. So, the hypothesis of control variable "Inflation Rate" has negative impact on the profitability of commercial banks operating in Bangladesh in the short run is rejected at 10% level of significance. The coefficient of other macro-economic control variables log of GDP Growth Rate, i.e. "LnGDPG" is -0.595 with p value of more than 10%. Therefore, at a 10% level of significance, the hypothesis that the control variable "GDP Growth Rate" has a negative influence on the profitability of commercial banks operating in Bangladesh is rejected.

The summery output of econometric model 3.2 both in the long run and short run where bank specific control variable Bank Size, i.e. log of Total Asset (LnBS), within banking industry concentration control variable Herfindahl-Hirschman Index (HHI) and macroeconomic control variables "Inflation Rate" & "GDP Growth Rate" has been considered into the model is that credit risk of the bank is negatively correlated with financial performance both in the long run and short run while interest rate risk and foreign exchange risk both are considered as part of market risk is positively correlated with financial performance both in the long run and short run. The liquidity risk of the bank is also positively correlated with financial performance in the long run and short run which is in line with the statistical assumption of this study. The operational risk of the banks is also having negative correlation with financial performance both in the long

run and short run. Though, some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

4.3.4.4 Summary of findings of panel regression results

Initially, the empirical result of the first econometric model – 1.1 has been analyzed, where bank specific risk factors including credit risk, market risk, liquidity risk and operational risk has a positive or negative impact on the profitability of Commercial Banks operating in Bangladesh during the study period considering “Bank Size” as bank specific control variable. Here, the output of “Hausman Test” qualifies Random effect GLS model for analyzing the long run effect of dependent variable ROA as proxy of financial performance of commercial banks operating in Bangladesh on the independent variables, i.e. LnNPLR as proxy of credit risk, LnNIM as proxy of interest rate risk and LnFexGL as proxy of foreign exchange risk (both are representing the market risk of the banks), LDR as proxy of liquidity risk, LnCIR as proxy of operational risk, dummy variable representing banks types “IslamiConv” and log of Bank Size (total asset), i.e. LnBS as bank specific control variable. After that, this study examine the output of short run effect of econometric model – 1.1 through examine the output of two step system GMM model on the panel dataset.

In the long run, the independent variable LnNPLR has a negative impact on commercial banks' ROA, while LnNIM and LnFexGL have positive effects, LDR has a negative effect, and LnCIR has a negative effect on ROA, or the financial performance of commercial banks operating in Bangladesh at the time of the study. However, the independent variable LnNPLR has negative impact on ROA, while LnNIM and LnFexGL have a positive correlation with ROA, LDR has a positive impact, and LnCIR has a negative impact on the financial performance or ROA of commercial banks operating in Bangladesh in the short-term during the study period. Some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

In second part of the study, the empirical result of the second econometric model – 1.2 has been analyzed. The output of “Hausman Test” again qualifies Random effect GLS model for analyzing the long run effect of dependent variable ROE as proxy of financial performance of commercial banks operating in Bangladesh on the independent variables, i.e. LnNPLR as proxy of credit risk, LnNIM as proxy of interest rate risk and LnFexGL as proxy of foreign exchange risk (both are representing the market risk of the banks), LDR as proxy of liquidity risk, CIR as proxy of operational risk, dummy variable representing banks types “IslamiConv” and log of Bank Size (total asset), i.e. LnBS as bank specific control variable. After that, this study examine the output of short run effect of econometric model – 1.2 through examine the output of two step system GMM model on the panel dataset.

The study's empirical findings demonstrate that, in the long run the independent variable LnNPLR has a negative impact on commercial banks' ROE, while LnNIM and LnFexGL have

positive effects, LDR has a negative effect and CIR also has had a negative effect on ROE or the financial performance of commercial banks operating in Bangladesh during the study period. LnNIM and LnFexGL have a positive association with ROE, whereas LnNPLR has a negative influence on ROE in the short term. LDR and CIR also have a negative impact on the financial performance or ROE of commercial banks operating in Bangladesh in the short run throughout the research period. Some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

The summary of empirical output of the econometric model 1.1 & 1.2 where “Bank Size or log of total asset, i.e. LnBS” has been used as bank specific control variable into the model is that, the bank specific risk factors credit risk has negative impact of both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run which is also in line with the statistical assumption of this study. So, when the credit risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases. Both the dependent variables, i.e., the financial performance of Bangladesh's commercial banks during the study periods, were positively impacted by interest rate risk and foreign exchange risk (both are components of the bank's market risk), which is also consistent with the study's statistical assumption. So, when the market risk of Bangladesh's commercial banks increases, the financial performance of the banks also increases. The liquidity risk has negative impact of both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods in the long run but showed different sign in the short run means inconsistency with the statistical assumption of this study where only bank specific control “Bank Size or log of total asset, i.e. LnBS” has been used into the model. Last but not least, operational risk has a negative impact on both the dependent variables, i.e., the financial performance of commercial banks operating in Bangladesh during the study periods, both in the long run and short run, which is also consistent with the statistical hypothesis of this study. So, when the operational risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases.

When this study add within banking industry concentration control proxy variable “HHI” along with bank specific control variable “log of Bank Size (total asset), i.e. LnBS” into the econometric model – 2.1, the empirical result shows in this study that, the “Hausman Test” qualifies Random effect GLS model for analyzing the long run effect on dependent variable ROA as proxy of financial performance of commercial banks operating in Bangladesh of the independent variables, i.e. LnNPLR as proxy of credit risk, LnNIM as proxy of interest rate risk and LnFexGL as proxy of foreign exchange risk (both are representing the market risk of the banks), LDR as proxy of liquidity risk, LnCIR as proxy of operational risk where dummy variable representing banks types “IslamiConv” and log of Bank Size (total asset), i.e. LnBS as bank specific control variable and within banking industry concentration control variable “HHI” has been included into the model. After that, this study examine the output of short run effect of

econometric model – 2.2 through examine the output of two step system GMM model on the panel dataset.

The empirical results of the study demonstrate that the independent variable LnNPLR has a long-term negative impact on ROA of commercial banks, while LnNIM and LnFexGL have a positive effect, LDR has a positive effect, and LnCIR has a negative impact on ROA, i.e., the financial performance of commercial banks operating in Bangladesh in the long run at the time of the study. However, the independent variable LnNPLR has a short-term negative impact on ROA, while LnNIM and LnFexGL have a positive correlation with ROA, LDR has a positive impact, and LnCIR has a negative impact on the financial performance or ROA of commercial banks operating in Bangladesh in the short run during the study period. Some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

In second part of the study, the empirical result of the second econometric model – 2.2 has been analyzed. The output of “Hausman Test” again qualifies Random effect GLS model for analyzing the long run effect on dependent variable ROE as proxy of financial performance of commercial banks operating in Bangladesh of the independent variables, i.e. LnNPLR as proxy of credit risk, LnNIM as proxy of interest rate risk and LnFexGL as proxy of foreign exchange risk (both are representing the market risk of the banks), LDR as proxy of liquidity risk, CIR as proxy of operational risk where dummy variable representing banks types “IslamiConv” and log of Bank Size (total asset), i.e. LnBS as bank specific control variable and within banking industry concentration control variable “HHI” has been used into the model. After that, this study examine the output of short run effect of econometric model – 2.2 through examine the output of two step system GMM model on the panel dataset.

The research's empirical findings demonstrate that, over the long term the independent variable LnNPLR has a negative impact on the return on equity (ROE) of commercial banks, while LnNIM and LnFexGL have positive effects, LDR has a positive effect, and LnCIR has a negative effect on ROE, i.e., the financial performance of commercial banks operating in Bangladesh in the long run at the time of the study. The independent variable LnNPLR has a short-term negative impact on ROE, while LnNIM and LnFexGL have a positive correlation with ROE, LDR has a positive impact, and CIR has a negative impact on the financial performance or ROE of commercial banks operating in Bangladesh in the short run during the study period. Some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

The summery of empirical output of the econometric model 2.1 & 2.2 where bank specific control variable “Bank Size or log of total asset, i.e. LnBS” and within banking industry concentration variables “HHI” has been included into the model is that, the bank specific risk factors credit risk has negative impact of both the dependent variables, i.e. financial performance

of commercial banks operating in Bangladesh during the study periods both in the long run and short run which is also in line with the statistical assumption of this study. So, when the credit risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases. Both the dependent variables i.e., the financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run are positively impacted by interest rate risk and foreign exchange risk (both are components of market risk of the bank), which is also consistent with the statistical assumption of this study. So, when the market risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. Both the long-term and short-term financial performance of commercial banks operating in Bangladesh during the research periods were positively impacted by the liquidity risk, which is also consistent with the study's statistical assumption. So, when the liquidity risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. Last but not least, operational risk has a negative impact on both the dependent variables i.e., the financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run, which is also consistent with the statistical hypothesis of this study. So, when the operational risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases.

In the last part, this study add macro-economic control variables “GDP Growth Rate” and “Inflation Rate” into the model along with banking industry concentration control variable “HHI” and bank specific control variable “log of Bank Size (total asset), i.e. LnBS” into the econometric model – 3.1. The empirical result shows in this study that, the “Hausman Test” qualifies Random effect GLS model for analyzing the long run effect of dependent variable ROA as proxy of financial performance of commercial banks operating in Bangladesh of the independent variables, i.e. LnNPLR as proxy of credit risk, LnNIM as proxy of interest rate risk and LnFexGL as proxy of foreign exchange risk (both are representing the market risk of the banks), LDR as proxy of liquidity risk, LnCIR as proxy of operational risk where dummy variable representing banks types “IslamiConv” and log of Bank Size (total asset), i.e. LnBS as bank specific control variable, within banking industry concentration control variable “HHI”, macro-economic control variable “Inflation” & “GDP Growth” during the study period has been included into the model. After that, this study examine the output of short run effect of econometric model – 3.2 through examine the output of two step system GMM model on the panel dataset.

The empirical results of the study show that, in the long run the independent variable LnNPLR has a negative impact on ROA of commercial banks, while LnNIM has a positive effect, LnFexGL has a negative impact on ROA, LDR has a positive impact, and LnCIR has a negative impact on ROA, i.e., the financial performance of commercial banks operating in Bangladesh at the time of the study. However, the independent variable LnNPLR has a short-term negative impact on ROA, while LnNIM and LnFexGL have a positive correlation with ROA, LDR has a

positive impact and LnCIR has a negative impact on the financial performance or ROA of commercial banks operating in Bangladesh during the study period. Some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

In final part of the study, the empirical result of the third econometric model – 3.2 has been analyzed. The output of “Hausman Test” again qualifies Random effect GLS model for analyzing the long run effect on dependent variable ROE as proxy of financial performance of commercial banks operating in Bangladesh of the independent variables, i.e. LnNPLR as proxy of credit risk, LnNIM as proxy of interest rate risk and LnFexGL as proxy of foreign exchange risk (both are representing the market risk of the banks), LDR as proxy of liquidity risk, CIR as proxy of operational risk where dummy variable representing banks types “IslamiConv” and log of Bank Size (total asset), i.e. LnBS as bank specific control variable, within banking industry concentration control variable “HHI”, macro-economic control variable “Inflation” & “GDP Growth” during the study period has been included into the model. After that, this study examine the output of short run effect of econometric model – 3.2 through examine the output of two step system GMM model on the panel dataset.

The research's empirical findings demonstrate that, over the long term the independent variable LnNPLR has a negative impact on the return on equity (ROE) of commercial banks, while LnNIM and LnFexGL have positive effects, LDR has a positive effect and LnCIR has a negative effect on ROE, i.e., the financial performance of commercial banks operating in Bangladesh at the time of the study. The independent variable LnNPLR has a short-term negative impact on ROE, while LnNIM and LnFexGL have a positive correlation with ROE, LDR has a positive impact and CIR has a negative impact on the financial performance or ROE of commercial banks operating in Bangladesh during the study period. Some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

The summary of empirical output of the econometric model 3.1 & 3.2 where bank specific control variable “Bank Size or log of total asset, i.e. LnBS”, within banking industry concentration variables “HHI”, macro-economic control variable “Inflation” & “GDP Growth” during the study period included into the model is that, the bank specific risk factors credit risk has negative impact of both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run which is also in line with the statistical assumption of this study. So, when the credit risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases. Both the long-term and short-term financial performance of commercial banks operating in Bangladesh during the research periods were positively impacted by the interest rate risk, which is also consistent with the study's statistical assumption. The other market risk factor or foreign exchange risk showed a negative correlation with ROA but a positive correlation with ROE in the long run, while a positive correlation with both the dependent

variables and the financial performance of commercial banks operating in Bangladesh in the short run during the study periods indicates inconsistency with the study's statistical hypothesis. The study concluded that foreign exchange risk has a negative correlation with ROA but positive correlation with ROE, i.e. the financial performance of commercial banks operating in Bangladesh over the long term while having a positive correlation with their financial performance over the short term considering all the bank specific internal and all the external control variables into the econometric model. Both the long-term and short-term financial performance of commercial banks operating in Bangladesh during the research periods were positively impacted by the liquidity risk, which is also consistent with the study's statistical assumption. So, when the liquidity risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. Last but not least, operational risk has a negative effect on both the dependent variables i.e., the financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run, which is also consistent with the statistical hypothesis of this study. So, when the operational risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases.

CHAPTER FIVE

CONCLUSION, RECOMMENDATION & SCOPE OF FURTHER RESEARCH

5.0 Introduction

This part of the research paper covered the conclusion of the findings of this study and made some recommendation for the stake holders of the banking industry of Bangladesh. Finally, this part of this study found some further scope of research on the banking industries operating in Bangladesh.

5.1 Conclusion

Risk-taking is an essential element of banking and financial intermediation. Failure to effectively evaluate and manage risks may lead to losses that threaten the health of each financial institution and the stability of the entire financial system. The relation between effective risk management system and sound risk management practices is strong and has an impact on overall performance of banks, which is also significant. The different roles of a banking institution cannot operate together without proper risk management to achieve the bank's goals to optimize its capital. There is no other choice but to ensure acceptable risk management practices for competitive survival. The banks should therefore give more emphasis to quality improvement in risk management and set their performance targets following strategic planning/goals. The extent of the risk management function and the structure maintained depend on the size and complexity of the banks. Risk management is most effective when the financial institution or banks applies basic principles and components of risk management consistently.

The main objective of this study is to evaluate the financial performance of commercial banking operating in Bangladesh as a result of risk management considering both internal and external determinants. The conceptual focus of this research is on how risk variables affect the financial performance of commercial banks. All local commercial banks in Bangladesh that were registered and in operation from the beginning of 2014 to the end of 2019 made up the research population. Secondary data has been collected from annual reports of the commercial banks operating in Bangladesh during the period from 2014 to 2019.

After reviewing theoretical frameworks, Bangladesh Bank risk management related guidelines and empirical literature of the previous researchers; this study established a conceptual framework where credit risk, liquidity risk, market risk and operational risk has been identified as the major risk factors. The literature review of this study identified some study variables from the previous studies where return on asset (ROA) and return on equity (ROE) has been used as dependent variables as proxy of financial performance of commercial banks operating in Bangladesh and the independent variables has been identified as non-performing loan ratio (NPLR) as proxy of credit risk, net interest margin (NIM) representing interest rate risk and log of foreign exchange gain / loss (LnFexGL) representing foreign exchange risk (both are used as proxy of market risk), loan to deposit ratio (LDR) as proxy of liquidity risk and cost to income ratio (CIR) as proxy of operational risk. This study also used log of Bank Size (total asset) as bank specific control variable, Herfindahl–Hirschman Index (HHI) as proxy of within banking industry concentration control variable and GDP Growth rate & Inflation rate has been used as

proxy of macro-economic control variables to determine the effect of risk management factors on the financial performance of Commercial Banks operating in Bangladesh during the study period.

With the graphical analysis of dataset it has been observed that, both the dependent variables, i.e. ROA and ROE as proxy of financial performance of commercial banks in Bangladesh has negative correlation with independent variables non-performing loan ratio (NPLR) and cost to income ratio (CIR). While other two independent variables, i.e. loan to deposit ratio (LDR) and net interest margin (NIM) has positive effect on both the dependent variables ROA and ROE. The other independent variable log of foreign exchange gain/ losses (LnFexGL) is not presentable graphically due to log transformation.

The statistical software STATA – 12 has been used to analyze panel dataset of this study for evaluating the empirical output. Initially, this study analyze the output of correlation test among all the variables and found both dependent variables, i.e. ROA and ROE as proxy of financial performance of commercial banks in Bangladesh has negative effect on independent variables non-performing loan ratio (NPLR) and cost to income ratio (CIR). While other three independent variables, i.e. net interest margin (NIM), log of foreign exchange gain/ losses (LnFexGL) both representing the market risk and loan to deposit ratio (LDR) and has positive effect on both the dependent variables ROA and ROE. To reduce the correlation among the variables at accepted level, this study transform some independent variables including NPLR to log of NPLR (LnNPLR), NIM to log of NIM (LnNIM) and CIR to log of CIR (LnCIR) while other two remain unchanged for dependent variable return on asset (ROA). But in case of return on equity (ROE), this study transformed independent variables NPLR to log of NPLR (LnNPLR) and NIM to log of NIM (LnNIM) while other three independent variables remain unchanged. The output of “VIF test” shows that, there is no multicollinearity problem among the independent variables for both the dependent variables.

Panel data models provide information on individual observations behavior, both across individual observations and over time. The data and models have both cross-sectional and time-series dimensions. Panel data, sometimes referred to as cross-sectional time series data are created by combining typically a large number of cross-sectional units with a small number of observations made over time. Panel data in the fields of econometrics and statistics refers to multi-dimensional data that often includes measurements over a certain period of time. Panel data is therefore a collection of observations made by researchers of a variety of events for a certain set of units or entities throughout a range of time periods.

Both short run and long run effect of dependent variables on the independent variables among the panel data set has been examined. To examine long run effect, this study used random effect GLS regression model and fixed effect (within) regression model. Moreover, to examine the short run effect, this study used OLS regression model and fixed effect (within) regression model

by using first lag value of the dependent variable as an independent variable to make the model dynamic. And finally, this study used dynamic panel data estimator, tow step system GMM model to examined short run effect of the dependent variable among the independent variables of the panel data set.

While reviewing the first econometric model – 1.1 & 1.2, this study found expected sign or correlation for four independent variables, i.e. NPLR, NIM, LnFexGL and CIR with both the dependent variables, i.e. ROA and ROE while analyzing both long run and short run effect which is also in line with graphical and statistical analysis. But the other independent variables, i.e. LDR have shown different sign or correlation in different parts of analysis means inconsistency with the expected sign & correlation and also not in line with the graphical and statistical analysis. Though, some of these study variables' coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

The credit risk has a negative impact on both the dependent variables, i.e., the financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run according to the summary of empirical output of the econometric model 1.1 & 1.2, which is also consistent with the statistical assumption of this study. So, when the credit risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases. Both the dependent variables i.e., the financial performance of commercial banks operating in Bangladesh during the study periods has been positively impacted by interest rate risk and foreign exchange risk (both are components of the bank's market risk) which is also consistent with the study's statistical assumption. So, when the market risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. The liquidity risk has negative impact of both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods in the long run but showed different sign in the short run means inconsistency with the statistical assumption of this study where only bank specific control “Bank Size or log of total asset, i.e. LnBS” has been used into the model. Finally, in accordance with the research's statistical assumption, operational risk has a negative effect on both the dependent variables, i.e., the financial performance of Bangladeshi commercial banks operating during the study periods both in the long run and short run. So, when the operational risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases.

When this study add within banking industry concentration control proxy variable “HHI” along with bank specific control variable “log of Bank Size (total asset), i.e. LnBS” into the econometric model – 2.1 & 2.2, this study found expected sign or correlation for all independent variables, i.e. NPLR, NIM, LnFexGL, LDR and CIR with both the dependent variables, i.e. ROA and ROE while analyzing both long run and short run effect which is also in line with graphical and statistical analysis during the study period. Though, some of these study variables'

coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

Credit risk has a negative impact on both the dependent variables, i.e., the financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run, according to the summary of empirical output of the econometric model 2.1 & 2.2, which is also consistent with the statistical assumption of this study. So, when the credit risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases. Both the dependent variables i.e., the financial performance of commercial banks operating in Bangladesh during the study periods has been positively impacted by interest rate risk and foreign exchange risk (both are components of the bank's market risk) which is also consistent with the study's statistical assumption. So, when the market risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. The liquidity risk has a positive influence on both the dependent variables i.e., the financial performance of Bangladeshi commercial banks operating during the study periods both in the long run and short run, which is also in line with the research's statistical hypothesis. So, when the liquidity risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. Last but not least, operational risk has a negative long-term and short-term impact on the financial performance of Bangladeshi commercial banks operating during the research periods, which is also consistent with the statistical assumption of this study. Therefore, the financial performance of the banks decreases as operational risk of a commercial bank operating in Bangladesh increases.

In the last part, this study add macro-economic control variables “GDP Growth Rate” and “Inflation Rate” into the model along with banking industry concentration control variable “HHI” and bank specific control variable “log of Bank Size (total asset), i.e. LnBS” into the econometric model – 3.1 & 3.2, this study found expected sign or correlation for four independent variables, i.e. NPLR, NIM, LDR and CIR with both the dependent variables, i.e. ROA and ROE while analyzing both long run and short run effect which is also in line with graphical and statistical analysis during the study period. But the other independent variable LnFexGL has negative correlation with ROA in the long run and positive correlation in the short run while LnFexGL has positive correlation with ROE both in the long run and short run. Though, some of these study variables’ coefficients are statistically significant and some are not significant at 1%, 5% or 10% confidence level.

The credit risk has a negative impact on both the dependent variables, i.e., the financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run, according to the summary of empirical output of the econometric model 3.1 and 3.2, which is also consistent with the statistical assumption of this study. So, when the credit risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases. Both the long-term and short-term financial performance of commercial

banks operating in Bangladesh during the research periods were positively impacted by the interest rate risk, which is also consistent with the study's statistical assumption. The other factor of market risk, i.e. foreign exchange risk showed negative correlation with ROA but positive correlation with ROE in the long run while positive correlation with both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods in the short run means inconsistency with the statistical assumption of this study. So, we can summarize that, foreign exchange risk has negative correlation with ROA but has positive correlation with ROE in the long run while has positive correlation with both ROA & ROE, i.e. the financial performance of commercial banks operating in Bangladesh in the short run considering all the bank specific control factors, banking industry concentration control factors and macro-economic control factors in to the model. The foreign exchange risk behaves differently in the long run with two dependent variables, i.e. ROA and ROE due to different types of dividend payout policies and capital management policies of the commercial banks operating in Bangladesh, which may have influence on the ROE ratio calculation techniques for the Banks. The liquidity risk has positive impact of both the dependent variables, i.e. financial performance of commercial banks operating in Bangladesh during the study periods both in the long run and short run which is also in line with the statistical assumption of this study considering all the bank specific control factors, banking industry concentration control factors and macro-economic control factors in to the model. So, when the liquidity risk of a commercial bank operating in Bangladesh increases the financial performance of the banks also increases. Last but not least, operational risk has a negative effect on both the dependent variables, i.e., the financial performance of commercial banks operating in Bangladesh during the study periods, both in the long run and short run, which is also consistent with the statistical hypothesis of this study considering all the bank specific control factors, banking industry concentration control factors and macro-economic control factors in to the model. So, when the operational risk of a commercial bank operating in Bangladesh increases the financial performance of the banks decreases.

After reviewing all the outputs of the econometric models, it has been observed that, Banks' can manage their credit risk and operational risk efficiently through implementation of prudent policies, guidelines and ensure proper monitoring, compliances to minimize losses as well as improve their financial performance. But there may have influence of some external factors on the liquidity risk and market risk of the banks. Which has been analyzed and empirically tested through examined econometric models of this study, i.e. bank should analyze other external factors like banking industry concentration and macro-economic variables like GDP Growth and Inflation carefully while managing the liquidity risk and market risk in addition to the bank specific risk factors.

5.2 Recommendation

Based on the research question of this study, the following recommendation has been suggested for the commercial banks operating in Bangladesh, the regulator and the policy makers:

The results of this study showed a negative association between credit risk and the financial performance of Bangladeshi commercial banks, i.e., when credit risk-related metrics, in particular credit quality lowers or NPLR increases, the financial performance of the banks decreases. So, banks must focus on managing its credit risk through implementation of effective credit policies, guidelines and adequate credit risk management practices. Commercial Banks should have clear credit risk assessment process flow, independent and well delegated and diversified approval process and effective credit monitoring and follow-up process. To make the credit risk management process more effective, commercial banks should have separate dedicated team/ department for credit risk management/ assessment/ approval, credit administration/ documentation and credit monitoring and recovery team/ department, which is totally separated from the business team/ relationship team as per guideline of central bank/ Bangladesh Bank. The credit approval delegation should clearly be specified through a well defined delegation of business power (DBP) approved by its Board of Directors. Every credit memo/ issues should be recommended by the Credit Review Committee (CRC) headed by Chief Risk Officer (CRO) and other senior members/ departmental heads of the banks before obtaining approval from the Management/ Executive Committee/ Board of Directors as per DBP. The Early Alert Account Review Committee (EARC) headed by Chief Risk Officer (CRO)/ Chief Business Officer (CBO) and other senior members/ departmental heads of the banks should review all the problem accounts to fix recovery/ account management strategy before classified/ NPL. All commercial banks should have special account management department/ recovery department with a dedicated team to recover classified loan/ NPL / written off loan to minimize NPL and profit maximization.

The Bangladesh Bank/ Central Bank should up to date all the credit related policies, guidelines and circulars time to time in line with the market condition and to meet international standard. Bangladesh Bank should enhance their monitoring activities among the commercial banks operating in Bangladesh through comprehensive and risk based audit to supervise its credit related activities including approval process, documentation and monitoring system. The policy makers/ Govt. Authority should support the commercial banks to recover their bad debts through amendment of different related acts and establishment of more judicial courts for expediting the legal recovery process. The policy makers/ Govt. Authority may think for allowing private/ public bed-debt discounting/ recovery agencies/ companies for buyback and recover commercial banks written off loans portfolio at discount rate within all legal framework support. This may help to reduce overall bed-debts/ NPL of the banking industry of Bangladesh.

The findings of this study established that Liquidity risk is positively correlated with the financial performance of commercial banks operating in Bangladesh, i.e. when Liquidity risk related factors especially loan to deposit ratio (LDR) increases the financial performance of the Banks, i.e. both ROA & ROE increases. But this study also established that, within banking industry concentration factors and macro-economic factors have an influential role on the overall

liquidity management and its impact on the overall profitability of the commercial banks operating in Bangladesh. So, all commercial Banks should have effective liquidity management related policies and guidelines in line with Bangladesh Bank to manage their overall liquidity position. All Banks must maintained required CRR and SLR with the central bank on daily basis as part of efficient liquidity management. When any commercial banks fail to maintain their liquidity position efficiently, they will face difficulties for new loan disbursement and will have negative impact on their overall profitability. So, Banks need to maintain ideal liquidity position to maximize their loan & advance portfolio at optimum level and to maximize their profitability. All commercial Bank should have effective Asset Liability Management Committee (ALCO) headed by Chief Risk Officer (CRO)/ Chief Business Officer (CBO)/ Head of Treasury Department and other senior members/ departmental heads of the banks to review overall liquidity position of the bank, the industry and Bangladesh Bank monitory policy to fix the future strategy to manage liquidity risk. Bangladesh Bank/ the Central Bank should time to time review monitory policy or money supply strategy to maintain ideal liquidity position in the banking industry and overall inflation in the economy.

The findings of this research also showed that Interest Rate Risk (a proxy for Market Risk) has a positive correlation with the financial performance of Bangladeshi commercial banks, i.e., ROA & ROE, when market risk-related factors, particularly Interest Rate Risk or Net Interest Margin (NIM), increase the financial performance of the banks also increases. Though, interest income is the main earning sources for commercial bank operating in Bangladesh, so all banks should have effective policy and guidelines to manage their minimum spread or net interest margin (NIM) to make the bank profitable one.

The outputs of this study also shows that, foreign exchange risk, another component of market risk behave differently with two different dependent variables, i.e. ROA & ROE in the long run (foreign exchange risk has negative correlation with ROA but have positive correlation with ROE in the long run) while have positive correlation with both the dependent variables in the short run. The foreign exchange risk behaves differently in the long run with two dependent variables, i.e. ROA and ROE due to different types of dividend payout policies and capital management policies of the commercial banks operating in Bangladesh, which may have influence on the ROE ratio calculation techniques for the Banks. So, banks should manage their dividend payout policies and capital management policies efficiently while managing their overall profitability to minimizing their long run risk. This study also established that, banking industry concentration control variable and macro-economic factors have an influential role on the overall market risk management strategy and its impact on the overall profitability of the commercial banks operating in Bangladesh. So, banks should have effective policies & guidelines to manage its interest rate risk and foreign exchange risk, both in the long run and short run considering all the internal and external control factors addressed or not addressed in to the econometric models of this study.

Asset Liability Management Committee (ALCO) of the banks should set together at least ones in a month to fix the interest spread/ NIM by managing their lending rate and deposit rate. Currently, the Central Bank/ Bangladesh Bank are imposing control lending rate and deposit rate for all the commercial banks operating in Bangladesh. As a result, the scope of NIM maximization is very much difficult for the banks in line with the market condition. So, Banks should try to diversify their revenue sources from loan/ investment based interest/ profit income to agency fees income through issuance of different derivatives or interest income from bonds, investment into the capital market within policy/ guideline and other fee based income. The Central Bank/ Bangladesh Bank should withdraw their control tools on the banks lending and deposit rate and let it be free on the basis of market condition. This will help the good/ complied banks to maximize their profitability and the good borrowers will get lower interest rate benefit as well. The Treasury Department of the commercial bank operating in Bangladesh, should have well guided internal policy & guideline to fix the foreign currency exchange rate on the daily basis considering demand and supply condition of foreign currency & macro-economic condition of the country.

Operational risk is inversely connected with the financial performance of Bangladeshi commercial banks, i.e., when operational risk-related parameters, particularly the cost to income ratio (CIR) increase, the banks' financial performance decreases. So, banks must focus on managing its operational risk factors through implementation of effective policies, guidelines and adequate risk management practices through comprehensive IT Risk management guideline, AML Risk management guideline and HR policy in line with central bank's guidelines. All commercial banks should focus on system automation through implementation of core banking software (CBS) to minimize operational lapses, fraud and forgeries, which will reduce its overall operational cost. Banks should have independent internal and external audit team to conduct frequent audit to identify different lapses and to minimize losses. This audit team should report directly to the Board Audit Committee as per Bangladesh Bank guideline. The Central Bank/ Bangladesh Bank should guide all the commercial banks (public/ private) for implementation of CBS to make the banking system more transparent and efficient. The Central Bank/ Bangladesh Bank should also conduct periodic audit/ inspection through their professional team to identify any lapses of banking operation and take appropriate measures to prevent such lapses in future. Bangladesh Bank should also have to review their related policies and guidelines time to time depending on the current situation and global practices.

5.3 Scope for further research

This study assesses the financial performance of Bangladeshi commercial banking as a result of risk management that takes into account both internal and external factors. This study covered all the major risk areas of banks including Credit Risk, Liquidity Risk, Market Risk and Operational Risk where bank specific, banking industry concentration and macro-economic control variables were included to make the study more robust.

However, this study did not included foreign/ multinational banks operating in Bangladesh due to their global risk management practices, which is largely different from local commercial banks. It also excluded all the specialized banks operating in Bangladesh due to their different mode of operation and purpose and micro-finance instructions due to different regulatory system.

Therefore, more research is advised based on a comparison of risk management practices between foreign/multinational banks and private commercial banks operating in Bangladesh and their effects on total profitability. Another scope of study would be on the basis of risk management practices considering the whole population including commercial banks, foreign/ multinational banks, specialized banks and micro-finance institutions and its impact on the overall prodigality of the financial institutions.

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ANNEXURE - I

Secondary Data Collection Instrument

Source: Audited Financial Statements of all the Commercial Banks in Bangladesh:

Name of the Bank:

Year of Operation:

Type of Banking Operation: Islamic/ Conventional

Variable	Description	2019	2018	2017	2016	2015	2014
ROA							
ROE							
Bank Size	Total Assets (million)						
Non-Performing Loan Ratio	Non-Performing Loan						
	Total Loans & Advances						
Non-Performing Loan Ratio							
Loan Advance Ratio	Total Loans & Advances						
	Total Deposit						
Loan to Deposit Ratio							
Net Interest Margin	Net Interest Income						
	Total Loans & Advances						
NIM							
Foreign Exchange Gain/ Loss							
Cost Income Ratio	Operating Cost						
	Income						
Cost Income Ratio							
Inflation Rate							
GDP Growth Rate							