Ph.D. Thesis on

Analysis of Credit Risk Management in the Listed Commercial Banks of Bangladesh

Submitted to

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Supervisor's Certificate

I am pleased to certify that Md. Kutub Uddin, a Ph.D. candidate from the Department of Finance at the University of Dhaka, has completed the research work presented in this dissertation, titled "Analysis of Credit Risk Management in the Listed Commercial Banks of Bangladesh," with utmost sincerity. I provided direct supervision and guidance to him throughout the research activities required to complete this Ph.D. thesis. I certify that this Ph.D. thesis has not been submitted or presented elsewhere for any degree or diploma by this Ph.D. candidate. Additionally, I hereby confirm that the research conducted and presented in this dissertation, as well as the Ph.D. thesis, are original and appropriate for submission for the Ph.D. degree under the Department of Finance at the University of Dhaka. I recommend that this Ph.D. thesis be accepted as a partial fulfillment of the requirements for earning the degree of Doctor of Philosophy in Finance.

Supervisor

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Declaration Letter

I at this moment declare that this Ph.D. thesis on "**Analysis of Credit Risk Management in the Listed Commercial Banks of Bangladesh**" represents my own work which was done after registration for the degree under the Department of Finance at the University of Dhaka and this thesis paper or any other part of this thesis paper has not been previously included in a thesis or dissertation submitted to this University or any other institution for a degree, diploma or other qualifications. I have gone through the University of Dhaka's current research ethics guidelines, and accept responsibility for the conduct of the procedures in accordance with the University's direction on the preparation of the Ph.D. thesis paper. I have attempted to identify all the risks related to this research that may arise in conducting this research, obtained the relevant ethical and safety approval from the stakeholders, and acknowledged my obligations and the rights of the participants. I with confidence and trust want to declare that this thesis paper is my own work and that whatever has been stated above is true to the best of my knowledge, and correct and nothing material has been concealed here from the guidelines of the University of Dhaka.

Signature: Kutubuddin

Date: 22.10.2023

Md. Kutub Uddin

List of Abbreviations

1. NIM = Net Interest Margin
2. NII = Non-Interest Income
3. OPEX = Expense to Income Ratio
4. CAP = Equity to Asset Ratio
5. CAR = Capital Adequacy Ratio
6. SS = Sub-Standard
7. LIA = Loan to Asset Ratio
8. BS = Log Asset Size of Banks
9. LDA = Loan to Deposit Ratio
10. ROA = Return on Asset
11. ROE = Return on Equity
12. BB = Bangladesh Bank
13. ARDL = Autoregressive Distributed Lag
14. GMM = Generalized Method of Moments
15. FE = Fixed Effect
16. RE = Random Effect
17. NPL = Non-Performing Loan
18. SMA = Special Mention Account
19. Log Z = Financial Stability

List of Keywords

1. Credit Risk
2. Bank Size
3. Loan to Asset Ratio
4. Loan to Deposit Ratio
5. % of woman participation in Board of Directors
6. Tobin's Q Ratio
7. Net Interest Margin
8. Non-interest Income
9. Return on Equity
10. Return on Assets
11. Regulatory Index
12. Loan Concentration
13. Financial Stability
14. GDP Growth Rate
15. Infection Ratio
16. Capital Adequacy Ratio
17. Expense Ratio
18. Generalized Method of Moments
19. Autoregressive Distributed Lag (ARDL)
20. Management Efficiency
21. Non-Performing Loan

Abstract

Credit risk management is one of the significant risk management techniques in the financial market as well as in the economy. By reducing the probability of default on loans, financial institutions, most importantly, listed commercial banks of the economy can increase the financial viability and stability of the banks. In spite of taking many promising credit risk management techniques, the banking sector of Bangladesh is experiencing an untenable defaulted loan scenario that over time has been creating financial losses and vulnerability in the market. Moreover, finding a gap and reaching for a solution might be the reason to conduct an analysis on credit risk management such as concentration risk, and downgrade risk of the listed commercial banks in the economy. In our analysis, only DSE-listed commercial banks except Islamic banks have been selected to conduct the research. The selected commercial banks are from different generations

and it has been done to reflect the true impact on banking institutions of multiple phases in the economy. Non-performing loans, Concentration ratio, Herfindal index, Interest rate volatility, Tobin's Q-based replacement cost of asset, Credit Rating Score Analysis, Stress Testing based Credit Risk Analysis are factors that have been analyzed to find the pros and cons of the credit risk condition overwhelmingly extending in the market.

The main purpose of the study is to find the influence of credit risk on the profitability, financial stability, and financial health of the listed commercial banks in the market. Different tools have been used as the measurement of the factors in the analysis such as Operating Expense as a percentage of Net Profit, Total Capital, Capital Adequacy Ratio, Non-interest Income, Net Interest Margin, Return on Asset, Return on Equity, Loan to Asset, Gross Domestic Product Growth Rate, Interest Rate Spread, Dummy Variable and these variables represents as a proxy of Management Quality, Cyclical Credit Policy, Financial Strength, Profitability, Economic Growth, Market Policy, Financial Act, Skimming Problem, Diversification.

After considering all the defined variables as part of the diagnostic test some statistical tests on the data set have been conducted mentioning unit root test, Cross-Sectional Dependence test, Kao Residual Integration test, Descriptive Statistics, Correlation Test, Endogeneity Test for the designed period from 2009 to 2020. Diagnostic tests signify the quality of the data as well as variables. After the diagnostic test, the main model for the data set has been run. Fixed Effect, Random Effect, Hausman Test, Generalized Method of Moments, Autoregressive Distributed Lag, Log Z-based GMM. A two-step GMM model has been used here to overcome the impact

of asymmetric variance on the model. The generalized Method of Moment (GMM) model has been used to see the impact of moments on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces a smaller number of standard errors than that of the least square method. Independent moment conditions can give the real outcome that happened in the market. Under the one-step GMM model, asymmetric variance is too high to capture the impact of the moment in the study. However, the two-step GMM model reduces this burden largely and shows the impact of NPL on the banking sector's stability.

Fixed Effect and Random Effect expose unobserved factors' impact on the credit risk management policy of the commercial banks in Bangladesh. Developing hypothesis for the credit risk measurement and movement of the banking sector with volatile credit position and extreme defaulters. In the last couple of years, the rate of NPL is extending in the banking industry of Bangladesh. Besides, different factors and policy changes directly impact the market including economic, political, and specific factors. Bank Size, Inflation rate, Expense Ratio, GDP growth rate, and Income Ratio all these factors significantly influence the credit risk management of the banking industry. However, governance and management efficiency directly control the performance and the amount of bad debt in the credit market.

Presuming regular activities of the banks it is found that equity to asset ratio, loan to asset, non-interest income, expense ratio, ROA, ROE, and financial policy implementation are significant on the stationary values dependent least square results. When the equity to asset ratio rises, banks' strength increases and increases the confidence of the depositors thus reducing the NPL rate or credit risk level in the banking industry. The loan-to-asset ratio is found inversely related to the NPL rate and does not comply with the expected results. As part of the credit management, higher lending amount with strong asset level increases the credit risk through higher NPL rate. The reason behind the extensive LTA with lower NPL is that strong asset fundamentals of the commercial banks improve the earnings capability so that financially disturbed banks can make write-offs with bigger earnings surprises from high LTA.

In this analysis diversification hypothesis assumes that listed commercial banks with non-interest generation ability make the banks strong enough to reduce NPL as earnings other than interest income diversify the credit risk of the banks and NII has been found negatively related to the NPL. The hypothesis of bad management that implies the higher operating expense ratio with higher income gradually increases the credit risk by simultaneously increasing the rate of NPL in the industry. The market is competitive but the number of banks is increasing on a regular basis. This puts intense pressure to earn interest to meet the operating expense that ultimately bound the banks to provide more credit and the rate of defaulters becomes increased under the adverse selection process. This is found statistically significant in the analysis of Bangladesh's banking industry. Return on Assets tends to increase with the tendency of rising in NPL level. With good asset quality motivates the banks to extend the credit disbursement level in the market. However, industry instability and the extensive amount of bad loan increases the return for the short run with differed interest income, in the long run, NPL increases at a higher rate and write-offs have been made that is dissimilar with the hypothesis of lower NPL with higher ROA. However, this is satisfactory that ROE is inversely related to the NPL and statistically significant. Banks provide credit from most of the part of the deposit and a small percentage of the equity. As

As a result, the return on equity reduces the NPL which is evident and the same to the hypothesis of good management. Financial acts increase the credit risk level after initiation which does not match the moral hazard hypothesis. In spite of introducing different policies related to the financial credit market through the banking sector, the NPL amount is extending gradually. However, the introduction of regulatory policy should decrease the NPL rate and increase market discipline and the depositor's confidence. In the fixed effect analysis, the same relationship or influence of the bank-specific factors and economic factors for CAP, NII, Expense Ratio, and ROE on NPL has been found statistically significant. Consideration of the fixed effect of qualitative values such as loan quality, borrowers' tendency, market behavior, age, regulatory guidelines, the confidence of the depositors, guarantors quality, social value of the loan receivers have exposed that loan to asset ratio, ROA and Financial policy adoption even though the impact on the NPL rate is same direction

as before but statistically these factors are not sound to explain the right direction as these qualitative factors are assumed to influence the NPL at a constant level which is less likely to take

place in the real market of the banking industry. In Bangladesh, multiple qualitative factors are considered for loan approval that are associated with bank-specific and economic factors at different rates.

When random effect assumption on the stable values of the econometric model being considered, it is observed that Equity to asset, Loan to Asset, Non-interest Income, Expense Ratio and Return on Equity are similarly influencing the NPL or credit risk in the banking sector and these instrumental factors are statistically found significant. Moreover, it considers the random influence of the qualitative values on credit risk management besides the existence of the central banks' credit quality measurement process. Consistently, a similar influence is found both in fixed and random effect models in the credit risk management of listed commercial banks in Bangladesh. Notable that the return on Assets impact is the same but only significant in the random effect model. ROA tends to increase with respect to the increase in the NPL rate but this only happens when policy changes influence the bank-specific factors growth rate, and inflation at different levels. Any random event in the market including political turmoil, Basel requirement changes, exchange rate changes, repo rate changes, and market hype on banks' financial possible distress can impact on return on assets and hence credit risk might be tense at that moment. The baseline model under the Generalized Method of Moments with lag one consideration, operating expense ratio, equity to asset ratio (CAP), capital adequacy ratio, and non-interest income is included as baseline factors as these factors are directly related to the banks' existence in the industry. Bank forms and operates within a frame where financial position and performance can be traced through these baseline factors.

Credit risk measurement in the current market in this analysis finds that NPL increases in the last year tend to rise in the current year under lag 1 estimation. This finding is more relevant in the banking sector as in Bangladesh NPL has become a burden already and it reached almost 1 lac thirty-six thousand crore taka. While the moment condition is applied, the baseline factors results remain stable under lag 1 estimation only a new factor is added to find the changes in the expected outcome. Optimization in the results of the findings of the hypothesis testing with GMM under lag2 estimation the baseline factors remain constant as same as baseline factors with lag 1 estimation through same impact and significant level. GMM with lag 2 estimation reveals that if NPL increases in the last year it will also increase in the current year.

In Bangladesh, this is prevalent and acute in the time being passed. NIM impact on NPL is the same under lag 1 and 2 estimation. It is notable to see that bank size (BS) is found significant in lag 2 GMM estimation which was absent in lag 1 estimation. The big size of the banks supports the hypothesis of diversification and reduces the NPL in the banking market. Big banks have the ability to overcome shock quickly. The influence of financial policy adoption is significant in lag 2 consideration with GMM analysis which is not significant under lag 1 estimation. Interest rate spread is not relevant under lag 2. Loan to deposit ratio is as same as under lag 1 but statistical significance is found in lag 2 estimation in credit risk management. Both ROA and ROE under GMM with lag 2 estimation are found statistical significance. This is related to the existence of the bad management and procyclical credit policy.

Autoregressive Distributed Lag (ARDL) results express the long-run and short-run forecasting for the bank-specific factors and economic movement of the banking sector. In the long run, the expense ratio increases but NPL decreases this is analogous to the hypothesis of skimping but

statistically significant. CAP is found analogous to the tight control hypothesis. Financial stability measurement based on Log Z(ROA), Log Z(CAR), and Log Z (Infection Ratio) as dependent variables finds that participation of women on board reduces the stability and is statistically significant. In Bangladesh, most of the woman members exercise less control on board in decisions on lending credit. Besides, family members of the board minimize the scope of ensuring more governance by holding control of the board as a result stability doesn't improve at a significant level. Finally, management efficiency analysis expresses that if credit risk increases in the last year it also increases in the current year under lag estimation and is statistically significant. Similarly, when the expense ratio increases efficiency is reduced and higher NPL increases the credit risk level in the market.
Moral hazard impact works behind the generation of more interest with more credit allocation. This violates the stability of the banking sector. Tobin's Q as performance measurement ratio positively influences the credit risk management condition. While increases in the ratio, it decreases the NPL, and hence credit risk is reduced. Banks' financial strength and loan recovery success intensify Tobin's Q ratio with the higher rate of the market value of the assets of the banking industry. Nonetheless, good management efficiency reduces the NPL rate and credit risk in the market to compete and exist in the industry in the long run. In this analysis, the Generalized Method of Moment under lag 1&2, ARDL Model, Panel Fixed, and Random Effect Model have been used to analyze credit risk conditions and to predict credit risk mitigation strategies for Bangladesh. It is wise that changes in bank-specific factors and economic factors must be handled with prudence to operate and sustain the banking industry in the long run.

JEL Classification: E51, D81, D82, G210, O4, F43, E43, E31.
Keywords: Credit Risk, Information Asymmetry, Bank Size, Economic Growth, Interest, Deposit
Ratio, Inflation, Return on Equity, Commercial Bank, Loan, GMM, ARDL.

Contents

Chapter 1: Introduction

1.0 Background of the Study

The study requires to specify the origin and objective of the study that will guide the complete study. The introduction chapter will provide the reason to study and the expected objective of the study. Completing the study might need to experience about some prospects and limitations in different aspects of making the study conductive and conclusive. This chapter is divided into three sections.

Risk can be defined as anything that can create problems in the way of achievement of certain objectives. It can be because of either internal factors or external factors, depending upon the type of risk that exists within a particular situation. Exposure to that risk can make a situation more critical. A better way to deal with such a situation; is to take certain proactive measures to identify any kind of risk that can result in undesirable outcomes. In simple terms, it can be said that managing a risk in advance is far better than waiting for its occurrence. Risks are uncertainties. In the banking universe, there are a large number of risks. As the goal of any privately own company, the main goal of bank's management is to maximize the shareholders' value. In order to avoid that the banks are constantly under pressure and have to assume high risks and at the same time manage the risks in order to avoid, or at least minimize losses.

Risk management is not a new concept rather it has been conceptualized in the early 1950s. It is the application of practices stability to plan, lead, organize and control various risks that are rushed into the fabric of an organization daily and long-term functioning. The feature of banking will undoubtedly rest on risk management dynamics. Only those banks that have effective management system will survive in the market and the long run success in banking industry. Banks should take risk more consciously, anticipates adverse changes and hedges accordingly, it becomes a source of competitive advantage, and efficient management of the banking industry. "Risk management is not a destination, but a journey". It is not a onetime exercise but a life time exercise, which needs to be practiced repeatedly.

The process of banking risk management includes the risk forecast, determination of the probability, values and effects, the development and implementation of measures to prevent or minimize related losses. This includes the development of the banking risk management strategy, the decision-making policy allowing a timely and consistent use of all bank possibilities and keeping risk at the acceptable and controlled level.

Since a few years ago there was a financial crisis, the Basel Committee on Banking Supervision is developing new international regulations designed to minimize the possibility of the next large-scale financial crisis. The latest Committee "frame" (Basel III) includes strict capital rules which will force all banks to increase more than three times the capital amount in order to avoid the future rescue by taxpayers. The main purpose of the Basel III is to improve the quality of risk management in the banking business, which in turn should enhance financial system stability as a whole. A central focus of the BASEL guide has been on capital adequacy as a cushioning mechanism for risk exposure of bank assets. In other words, a higher exposure of a financial institution to credit and operation risk will require an augmentation of its capital to safeguard future operation in case of losses from such risk. Financial crisis has not only rocked big economies of the world but developing economies have been badly affected. Many financial institutions have either collapsed and or are facing near collapse because of badly functioned subprime mortgage lending to firms and people with bad and unreliable credit.

The main direction of banking risk management improvement is the methodological framework development for risk assessment and banking information systems. This process should consider the new regulatory and technological requirements regarding the implementation of financial and risk management integrated approach. The study is devoted to these issues. The task of the study was, first, to analyze the banking risks characteristics, the main methods of their assessment used in practice; to suggest new promising assessment approaches based on the most advanced methods of data analysis and, secondly, to identify the promising directions for improving the banking information systems and to offer the possibilities of their implementation.

1.1 Objectives of the Study

While doing business, it is inevitable that someone will be faced with unexpected and very often unpleasant surprises that threaten to undercut or, even worse, to destroy the business. Credit risk analysis and credit risk management has got much importance in the Bangladeshi Economy during this liberalization period. The foremost among the challenges faced by the banking sector today is the challenge of understanding and managing risk. For management of risk at corporate level, various risks like credit risk, market risk or operational risk have to be converted into one composite measure. After reviewing different literature, it has been noticed that multiple objectives on credit risk management must be adopted. This research is intended to meet the following objectives to reach a conclusion of managing multiple risks in banking industry of Bangladesh.

- To trace the credit risks faced by the scheduled banks and different aspects of credit risk management in banking sector of Bangladesh.

- To assess the relationship between the theories, concepts, and models of credit risk management and what is going on particularly in banking.
- To identify the standard process of credit risk management used by banks.
- To evaluate whether the banks under study follow the guidelines of Bangladesh Bank regarding credit risk management.
- To examine the tools and techniques used by banks for managing credit risk and for measuring all possible impacts of those tools and techniques for credit risk management & know how banks use credit risk evaluation and assessment tools to mitigate their risk exposure.

1.2 Problem Statement

The task of credit risk management is no longer considered separately from the problems of capital management and profitability. The rapid business development on the background of growing competition requires a more careful operation profitability assessment and customer service quality improvement. Bangladesh has been suffering from credit risk and operational risk severely for last couple of years. Some of the state owned and private commercial banks have lost a significant portion of their capital due to loan default as well as fund embezzlement.

Bangladesh's Non-Performing Loans Ratio stood at 8.1 % in Dec 2020, compared with the ratio of 8.9 % in the previous quarter. The data reached an all-time high of 28.0 % in Mar 2003 and a record low of 6.1 % in Dec 2011 (Source: CIB, Bangladesh Bank).

Besides NPL problem interest rate changes significantly affect solvency of banks. Due to the loan rate between 6% to 9% adopted by BB in April, 2020 the excess liquidity problem reduced the earning capability of banks and incurred increased cost of capital for the banks. Deposit and advances concentration tend to rise due to single digit rate implementation. 99.92% of deposit account holders will forgo 89.52 billion takas as deposit interest and 99.10% of loan account holders will save 86.39 billion taka that incurs 313 crore taka net loss.

On the contrary 0.08% (top 1%) of deposit account holders will forgo 71.20 billion as deposit interest where as 0.90% (top 1%) loan account holders will save 227.59 billion that results in net save from top 1% around 156.39 billion. However, 80396 deposits accounts holder have average deposit balance of more than 6 crore and 96360 advance accounts holder have average balance of 100 million. Per member of top 1% is earning 1.77 million takas where as 99% general lenders and borrowers are incurring losses over time (Source: The Financial Express, 21st June, 2021).

All these problems occur on the background of the tendencies of international standards' implementation in financial accounting and risk management, which make a fundamentally new emphasis on management. Obviously, it is impossible to solve the new problems by using accounting schemes common for many banks.

A major concern of the Basel framework is its inability to explain systemic risk which could come as a result of economic changes. Its applicability to developing countries such as in the case of Nigeria, India, Pakistan and Italy has also raised more questions.

1.3 Rationale of the Study

Banking sector is one of the fastest growing sectors in our country. There are more than 50 banks operating in Bangladesh which includes local and foreign venture. Some new banks are coming in the market. Therefore, the banking industry is very much lucrative and at the same time very competitive too. All banks are offering newer products and facilities to attract the customers and retain them. Appropriate customer selection and retention is vital for bank profitability.

In order to make the credit risk management effective in the listed commercial banks operating in Bangladesh, the major types of risks, e.g., credit risk, market risk, operational risk, interest rate risk, foreign exchange risk, equity risk, liquidity risk, money laundering risk, information technology risk, marketing risk and human resource risk need to be emphasized by the concerned bank authority. As use of these risks extends the credit risk also.

In the course of their operations, banks are invariably faced with different types of risks that may have a potentially negative effect on their business. Credit risk management in the banking sector comprises of capital adequacy, asset quality, expenditure- income ratio and return on Asset (ROA), return on Equity (ROE) and non-performing loan (NPL) which indicates the lack of presence of prudential surveillance on the financial sector and profitability of bank. Most of the bank manager's time and efforts are devoted to credit risk management. Still, a rapid transformation of the banking sector has been attributed to inability of managers to assess and control properly risks of different situations. Banks are therefore required to form a special organizational unit in charge of credit risk management. Also, they are required to prescribe procedures for credit risk identification, measurement, and assessment, as well as procedures for credit risk management. Hence, there is a need to develop sustainable credit risk management practices in the banking sector.

1.4 Scope and Limitation

The banking sectoral credit volatility is a major concern in the economy of Bangladesh. The possible credit risk management related changes can significantly alter the market performance. During the last decade, some of the some of the banks have reached its default rate at a higher rate. Besides, some problems in regulatory and management have become the concern for the risky banks in Bangladesh. The study on the credit risk management in the listed commercial banks in Bangladesh excluding Islamic Banks pave the way to find pitfalls and ensures the future sustainability to impressive growth of credit in the banking industry. This study allows to learn about the sustainability and safety of credit market along with the changes in the policy impact on the credit risk management. There are some limitations in this project paper. To conduct a good research, different types of data are necessary to be analyzed. But we have collected secondary data as collection of a big number of primary data is difficult to gather and make conclusion from that. Lack of experience in this field is another reason to make the research more prudent. Lack of knowledge in statistical tools makes it more difficult to analyze. Lack of time is the constraint to further increasing the enrichment of the paper.

The reason behind the study is explained here. Doing any type of study needs to concentrate on the objective and at the same time some problems and solutions might be experienced in time of the study. However, due to the systematic differences Islamic Commercial Banks have been excluded in the study that might make the study rigorous. There might have outstanding literatures that can greatly contribute to the study but due to the constraint it has been shortened. Finally, significant credit risk bearing state owned banks have not been included in the study as these banks are not listed in the stock exchange.

1.5 Overview on Credit Risk Management in Bangladesh

Amid several challenges, Credit risk has been the most challenging risk for the banking industry of Bangladesh. The challenging issues regarding the credit risk are deepening due to the influences of vested interests, frequently policy relaxations and poor corporate governance by the banks and weak compliances of credit risk assessments.

Credit risk, also known as default risk, is a common challenge in the banking industry of Bangladesh and, indeed, globally. It is the risk that a borrower or counterparty will fail to meet its obligations in accordance with agreed terms. In the context of the banking system, credit risk arises from the possibility that a borrower may be unable or unwilling to repay a loan or meet other financial commitments. Understanding and managing credit risk is crucial for maintaining the stability and solvency of financial institutions. The assessment process of credit risk involves a comprehensive analysis of various factors to gauge the likelihood of default and the potential loss in the event of default.

The credit risk assessment process typically begins with thorough due diligence on the borrower. This includes an evaluation of the borrower's financial health, business operations, management team, and industry conditions. Financial statements, income statements, and cash flow statements are scrutinized to gain insights into the borrower's ability to generate revenue and meet financial obligations. Furthermore, the borrower's credit history, both with the lending institution and other creditors, is examined to identify any patterns of default or late payments.

Another critical aspect of credit risk assessment is the analysis of macroeconomic factors that might impact the borrower. This involves evaluating the economic conditions of Bangladesh, such as inflation rates, interest rates, and overall market stability. Additionally, industry-specific factors are considered, as certain sectors may be more susceptible to economic downturns or other external shocks.

Collateral is often used as a risk mitigant in credit transactions. Lenders assess the value and quality of the collateral offered by the borrower, whether it be real estate, inventory, or other assets. The value of the collateral serves as a secondary source of repayment in case of default. However, it's important to note that relying solely on collateral can be insufficient, as the value of assets can fluctuate, and the liquidation process may not fully cover the outstanding debt.

Credit risk assessment also involves assigning credit ratings to borrowers. These ratings provide a standardized measure of creditworthiness and help in comparing the risk associated with different borrowers. Credit rating agencies assess a range of quantitative and qualitative factors to determine these ratings, including financial ratios, industry risk, management quality, and the overall economic environment.

In addition to initial assessments, continuous monitoring of credit risk is essential. This involves staying informed about changes in the financial health of borrowers, as well as shifts in economic and industry conditions. Regular reviews of credit portfolios help identify emerging risks and allow for timely adjustments to risk management strategies.

Risk mitigation strategies are integral to credit risk management. Diversification of the loan portfolio across various industries and types of loans can help minimize the impact of a downturn in a particular sector. Setting appropriate risk limits and ensuring compliance with regulatory requirements are crucial aspects of a robust risk management framework.

Furthermore, stress testing is employed to assess how the loan portfolio would perform under adverse economic conditions. By simulating scenarios such as economic recessions or severe industry downturns, banks can evaluate the resilience of their portfolios and make informed decisions about risk tolerance.

Credit risk management is relying more and more on technology. To evaluate enormous amounts of data, find trends, and improve the quality of credit risk assessments, advanced analytics and machine learning algorithms are used. The total effectiveness of the credit risk management process is increased thanks to these instruments, which help banks make quicker and more informed choices.

By keeping credit risk exposure within reasonable bounds, credit risk management seeks to maximize a bank's risk-adjusted rate of return. Banks must control both the overall portfolio's credit risk and the risk associated with each individual borrower transaction. An extensive risk management strategy must include excellent credit risk management. Any banking organization's long-term performance depends on management.

Banks should be acutely aware of the need to identify, assess, monitor, and control credit risk because it is still the main cause of issues for financial institutions.as well as to confirm that they have sufficient money to protect themselves from these risks and are sufficiently paid for taken risks.

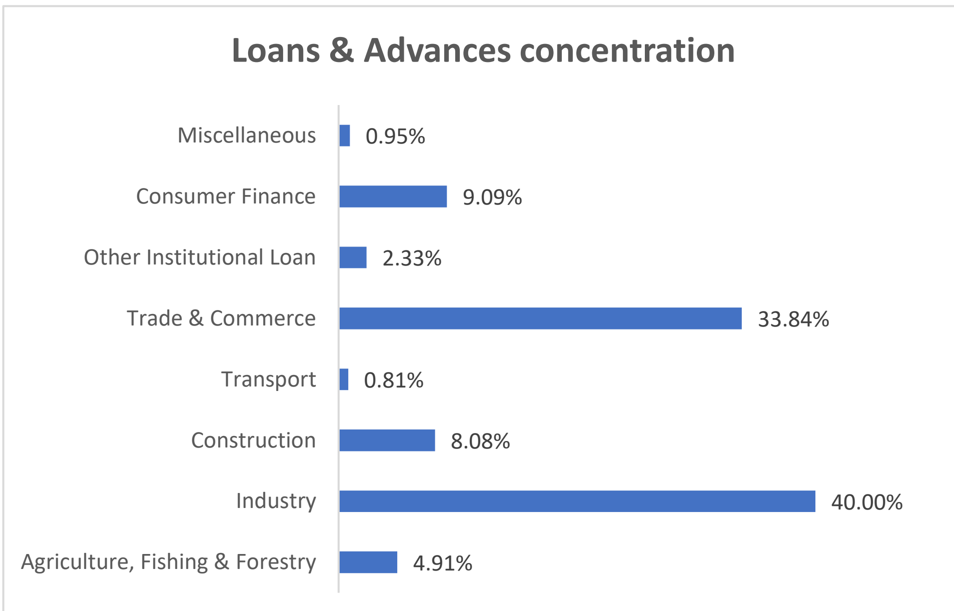
Based on the evaluation standards established for that industry, the Internal Credit Risk Rating System describes the creditworthiness of the borrower in that sector. The ICRRS is designed to calibrate such diversities into the rating system because leverage, liquidity, profitability, as well as other quantitative and qualitative indicators, differ greatly from sector to sector. Additionally, the Internal Credit Risk Rating System uses the pertinent and acceptable figures of financial ratios to evaluate the borrowers' financial and credit standing. Additionally, a more comprehensive set of qualitative questionnaires was used in the process. This would effectively guarantee that the borrowers from various businesses and sectors are evaluated in accordance with the special traits of those industries and sectors.

The credit risk-weighted asset was 88.21% of the total RWA at the end of 2022 in Bangladesh banking sector, whereas the RWA related to the market and operational risks were 3.45% and 8.34% respectively. In the review period, credit risk-weighted assets as a ratio of total RWA increased by 0.39 % point, whereas market risk-weighted assets and operational risk-weighted assets as a ratio of total RWA decreased by 0.16 % point and 0.22 % point respectively compared to the preceding period. Notably, the market risk decreased in terms of its share in the overall banking sector's risk whereas the risk increased in terms of risk weighted assets' nominal amount. Importantly, the 90.52 % of the credit risk was derived from balance sheet exposures.

In Bangladesh's banking sector, credit risk is a complex challenge that necessitates a comprehensive and dynamic risk management strategy. In-depth examinations of the borrower's finances, the economy, the collateral, and credit ratings are all part of the evaluation process. An efficient credit risk management framework must include ongoing monitoring, risk mitigation techniques, and technological integration. Given the cyclical nature of financial markets and the interdependence of world economies, Bangladeshi banks' ability to adapt and innovate in the area of credit risk management is crucial for their long-term survival and resilience.

1.5.1 Existing Concentration of Loans and Advances in the Bangladesh Economy

Now let us have a look in the overall loan concentration of the banking industry on the basis of economic purposes. On the basis of economic purposes, the loans and advances of Bangladesh banking industry are classified into 8 categories. Among the entire sectors industrial sector constitutes the highest 40% of the total outstanding loans



Graph 1: Concentration of Loans and Advances in Bangladesh. Source: Bangladesh Bank

The data sheds light on the intricate landscape of the lending sector in Bangladesh, offering a nuanced perspective on the distribution of loans across various key sectors. In the realm of Agriculture, Fishing & Forestry, the numbers unveil a considerable engagement, with 6,553,334 accounts reflecting a lending amount of 7,102,140 BDT. Despite representing a challenging portion of the loan market at 4.91%, the sector's robust growth rate emphasizes its resilience and economic significance. Industry emerges as a juggernaut in the loan landscape, commanding a substantial 40% of the total loans. The sheer magnitude of this sector is evident not just in the number of accounts, 285,829, but more strikingly in the astronomical loan amount of 57,845,386 BDT. This underscores the pivotal role of industry in Bangladesh's economic fabric and the financial ecosystem.

Moving to Construction, the data underscores a sector on the rise, with 390,862 accounts contributing to loans amounting to 11,681,517 BDT. This growth, quantified at 8.08%, attests to the sector's dynamic nature and its role in the country's infrastructural development. Transport, though holding a modest portion at 0.81%, showcases an essential presence with 5,567 accounts securing loans totaling 1,165,840 BDT. Trade & Commerce emerges as a powerhouse, representing 33.84% of total loans, a testament to its economic vitality. The sector boasts 1,312,879 accounts, reflecting a substantial lending amount of 48,934,577 BDT. This prominence emphasizes the symbiotic relationship between the financial sector and the trade and commerce domain.

In the financial tapestry of Bangladesh, Other Institutional Loans contribute a nuanced 2.33% to the total loans. With 13,098 accounts securing loans of 3,367,956 BDT, this category encapsulates a diverse range of institutions and their financial interactions. Consumer Finance, with its 9.09% share, illuminates the consumer-centric facet of the financial landscape. A staggering 3,285,959 accounts are associated with loans totaling 13,140,633 BDT, showcasing the role of consumer spending in the economy. Finally, the category of Miscellaneous, albeit holding a modest 0.95%, represents a myriad of financial engagements. With 594,098 accounts and loans amounting to 1,369,225 BDT, this sector captures a spectrum of financial activities that defy easy categorization.

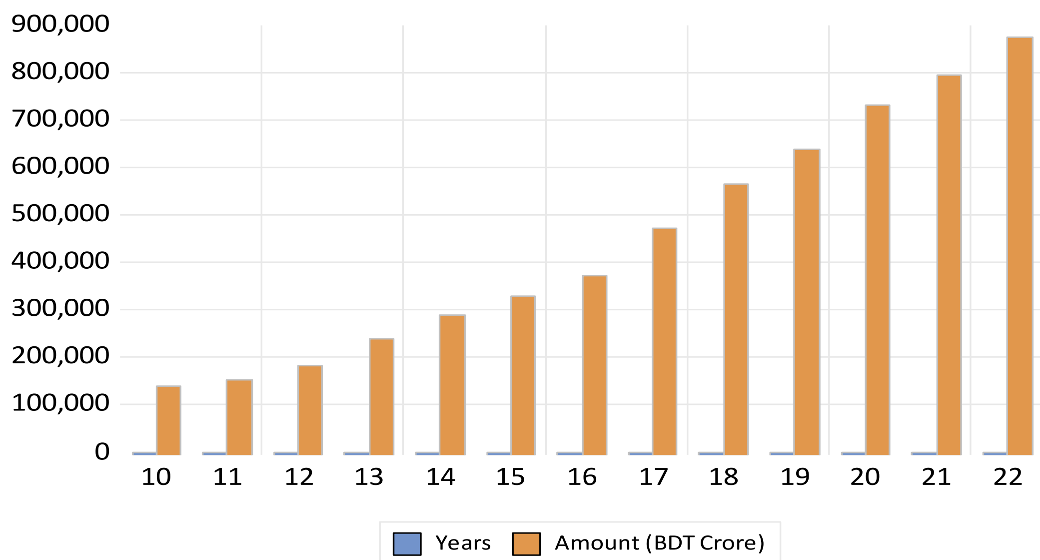
The data, beyond its numerical presentation, unravels the intricate interplay between sectors, loans, and economic growth. It underscores the strategic importance of industries like Agriculture, Fishing & Forestry and Trade & Commerce, while also acknowledging the diverse contributions of sectors like Consumer Finance and Construction. The growth rates embedded in these figures tell a story of economic dynamism, reflecting the adaptability and resilience of various sectors in the face of evolving financial landscapes. This granular understanding of the lending sector in Bangladesh is not only invaluable for financial institutions and policymakers but also offers insights into the broader economic narrative of a nation in flux, where sectors intertwine, and financial currents shape the trajectory of growth.

1.5.2 Mortgages Kept by the Banks against the Total Outstanding Loans and Advances in Bangladesh

The country's banking sector still relies on immovable property like land or flats as collateral for lending. However, it is not possible to recover the defaulted loan even by selling the assets mortgaged to the bank. According to a study by Bangladesh Institute of Bank Management (BIBM), the country's banks are able to recover only 12.77 % of defaulted loans by selling collateral assets. Accordingly, more than 87 % of defaulted loans remain unpaid despite collateral.

Although it is not possible to collect the loan by selling the collateral assets, the banks increased the disbursement of loans by mortgaging land and houses. A century ago, in 2010, the amount of loans disbursed against land mortgages was BDT 1 lakh 41 thousand 834 crores, which was 47.94 % of the total loans disbursed at that time. At the end of June'23, the amount of loans distributed by the banks by mortgaging the land has reached 9 lakh 20 thousand 904 crores. Accordingly, 63.68 % of the loans disbursed by the banks were against mortgages on real estate properties including.

According to the data of Bangladesh Bank, at the end of June of the current financial year, 63.68 % of the customer's collateral against the credit status of the country's banking sector was immovable property. Although a century ago in 2010, this rate was 47.94 %. The trend of mortgaging land against loans has steadily increased over the past decade. Bank guarantee is the second highest 15.78 % of the country's bank sector collateral. Besides, 7.06 % of bank guarantee financial obligations, 5.12 % export documents and goods, 1.00 %



Graph 2: Time Series Data of Mortgages Kept Against the Outstanding Loans and Advances

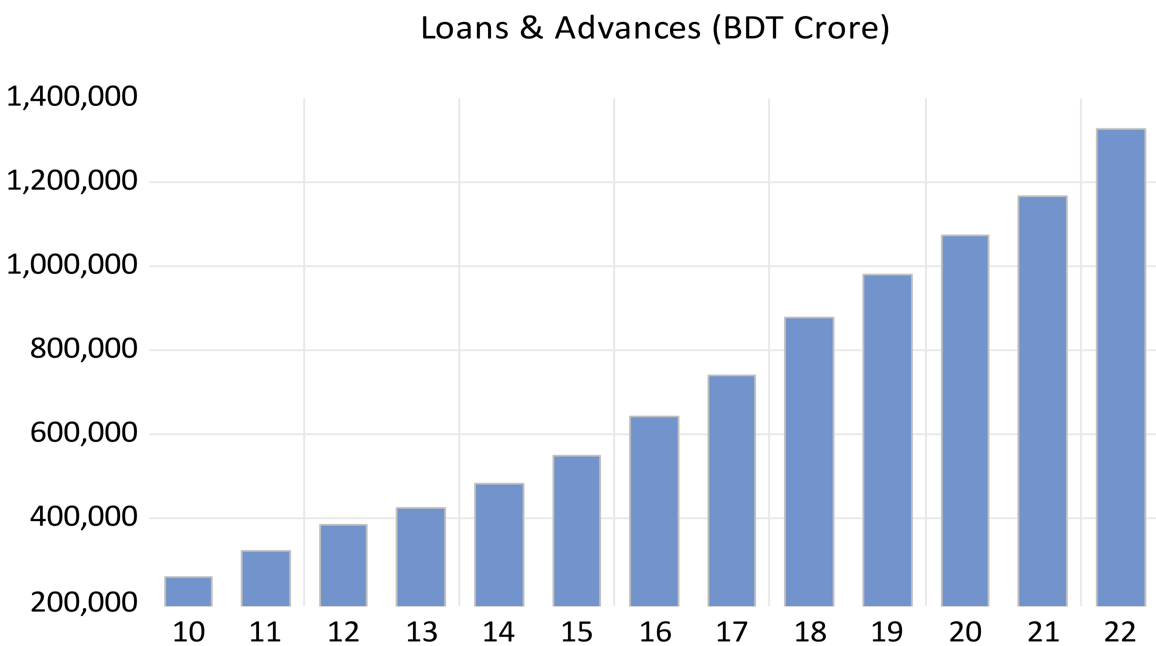
Source: Loans and Advances of Bangladesh Bank

1.5.3 Total Loans and Advances of Bangladesh Economy over Time

The time series data on overall loans and advances in Bangladesh, spanning from the fiscal year 2009-10 to 2021-22, unveils a compelling narrative of the nation's economic trajectory. The journey commences with the fiscal year 2009-10, where loans and advances amounted to BDT 264,182 crore, reflecting the financial landscape in the aftermath of the global economic downturn. As the years unfold, a consistent and robust upward trend emerges, signifying not only recovery but substantial growth.

Notable inflection points mark each fiscal year, showcasing the resilience of the financial sector and the dynamic nature of economic activities. The fiscal years 2015-16, 2016-17, and 2017-18 particularly stand out, witnessing a significant acceleration in loans and advances, culminating in a record high of 877,675 BDT crore. The subsequent fiscal years continue this momentum, with values surpassing the 1 trillion BDT mark in 2018-19 and further escalating to 1,324,942 BDT crore in 2021-22.

This remarkable growth is indicative of an expanding economy, fueled by increased investments, robust financial activities, and strategic fiscal policies. The data not only reflects the resilience of Bangladesh in the face of global economic challenges but also underscores the nation's positioning as an economic powerhouse in the region. Such a comprehensive understanding of the time series data on loans and advances is indispensable for policymakers, economists, and financial institutions in steering the nation's financial strategies and ensuring sustained economic development. It offers a glimpse into the evolving financial landscape, providing insights that are crucial for informed decision-making and proactive planning to navigate the complexities of a dynamic and thriving economy.



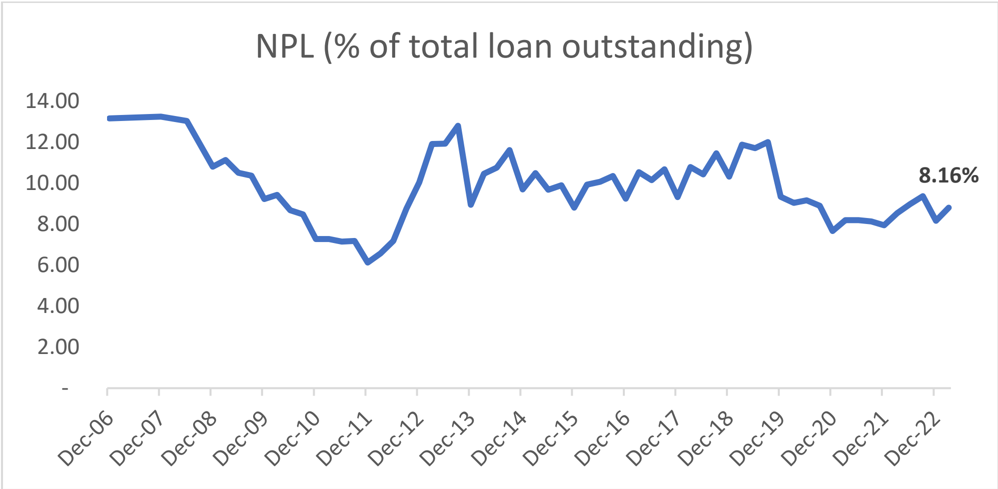
Graph 3: Time Series Data of Total Loans & Advances: Source: Bangladesh Bank, BRPD

1.5.4 Classified or Non-Performing Loans against the Total Loans & Advances

The banking sector gross reached to 8.16 % at end-December 2022 which was 7.93 % in the corresponding period of the previous year (Chart 2.8), Compared to end-December 2021, the gross NPL ratio increased by 0.23 % point at end-December 2022. Noteworthy that the gross NPL amount increased by BDT 173.83 billion following an increase of total outstanding of loans and advances by BDT 1,759.92 billion in the banking sector. The asset quality of the banking sector may be improved by ensuring adequate monitoring of regular and rescheduled/restructured loans and the speed at which NPLs are recovered. However, external factors like the extension of the Russia-Ukraine conflict and other geopolitical difficulties may cause sluggish business as well as impaired borrowers' ability to pay their debts, which might ultimately worsen the asset quality of Bangladesh's whole banking industry.

The gross NPL ratio of SOCBs registered an increase of 1.0 % point compared to end-December 2021 and reached at 20.28 % at end-December 2022 (Chart 2.9). FCBs and SDBs also demonstrated a slight increase in the NPL ratio. For FCBs and SDBs, the NPL ratios reached at 4.91 % and 12.80 % respectively. On the contrary, PCBs experienced an improvement in asset quality during the reporting year as they showed an overall decline in NPL ratio of 0.18 % point and reached at 5.13 % at end-December 2022. It is worth mentioning that, SOCBs and PCBs both individually held equal share of the total NPL of the banking industry, around 46.8 %, at end-December 2022. For FCBs and SDBs, the share stood at 2.53 and 3.90 % respectively.

At the end of the 2022, the total amount of problematic loans held by the banking sector totaled BDT 377,922 crore, which provides a dismal indication of the actual state of this important sector of the economy. The sum was determined by adding together all outstanding rescheduled loans, outstanding written-off loans, and non-performing loans (NPL). The amount of non-performing loans in the banking sector at the end of 2022 was BDT 120,649 crore, BDT 212,780 crore in outstanding rescheduled loans, and BDT 44,493 crore in outstanding written-off loans.



Graph 4: Non-Performing Loans (NPL) Over Time. Source: Bangladesh Bank, CIB

The overall asset quality of the banking industry somewhat declined in 2022 as gross NPLs marginally increased. NPLs made for 8.16% of all outstanding loans at the end of 2022 compared to 7.93% a year earlier. The industry of shipbuilding and shipbreaking accounted for the highest percentage of NPLs (22.43%). The next largest NPLs (11.75%) were in the leather and leather-based industries, followed by textile (11.54%) and apparel (11.12%). The asset quality of the banking sector may be improved by ensuring effective monitoring of regular and rescheduled/restructured loans and the rate of NPL recovery. Meanwhile, when the loan moratorium facility put in place during the pandemic was tapered off, approximately twice as many loans were rescheduled in 2022 than in 2021. Loans of BDT 63,720 crore were rescheduled in 2022, an increase from BDT 26,810 crore the year before.

The sum that was rescheduled in the review year was not much larger than the pre-COVID condition. The total amount of debts that were rescheduled in 2019 was BDT 52,370 crore. Around 80.8% of the rescheduled loans were still unclassified at the end of 2022. And 33.8% of the outstanding rescheduled loans were in the ship building and ship-breaking business, followed by the industrial sector (29.2%) and the textile and apparel industry (21.1%). Across most of the sectors, there has been an increase in the ratio of classified outstanding rescheduled loans. The industry for shipbuilding and shipbreaking had the greatest ratio, followed by the industrial, apparel and textile, and export credit sectors.

1.5.5 Default Loans Trapped Under Artha Rin Adalat (Money Loan Courts)

Amid skyrocketing the distressed assets including the non-performing loans, till the end of 2022, the amount of default loans gripped in legal snares will increase by BDT 1.78 trillion, due to lack of effective lending and recovery operations. The current scenario is considered to be far worse, with the amount of bad loans that were officially counted up until June now further inflating to drive up mountains of non-performing loans (NPL) in Bangladesh's banking sector.

In June of this year, after some cases were settled, the amount of defaulted loans embroiled in legal complexities increased by almost BDT 213.04 billion.

Files Cases			Cases Settled			Under Trial		
Banks	**Number**	**Amount Claimed (BDT bn)**	**Number**	**Amount Claimed (BDT bn)**	**Actual Recovery**	**Number**	**Amount Claimed (BDT bn)**	**Actual Recovery (BDT bn)**
State-Owned	84,119	1,339.87	69,639	580.14	111.65	14,480	759.73	15.91
Specialized	37,727	52.92	32,794	28.43	24.96	4,933	24.40	0.29
Private	96,387	1,269.67	51,782	310.31	94.24	44,605	959.36	52.05
Foreign	10,195	42.40	1,673	3.22	2.41	8,522	39.18	0.99
Total	228,428	2,704.86	155,888	922.10	233.26	72,540	1,782.67	69.24

Table 1: Default Loans That are Trapped under Artha Rin Adalat. Source: News Journal & Bangladesh Bank.

1.5.6 Internal Credit Assessment Process in Bangladesh

Banks should be acutely aware of the necessity to identify, measure, monitor, and control credit risk as well as to ensure that they hold adequate capital against these risks and that they are adequately compensated for risks incurred. This is because exposure to credit risk continues to be the main cause of issues in banks. Based on the evaluation standards established for that industry, the Internal Credit Risk Rating System describes the creditworthiness of the borrower in that sector. The ICRRS is designed to adjust for such diversities in the rating system because leverage, liquidity, profitability, and other quantitative and qualitative indicators differ greatly from sector to sector. Additionally, the Internal Credit Risk Rating System uses the pertinent and acceptable figures of financial ratios to evaluate the borrowers' financial and credit standing. Additionally, a more comprehensive set of qualitative questionnaires was used in the process. This would effectively guarantee that the borrowers from various businesses and sectors are evaluated in accordance with the special traits of those industries and sectors.

1.5.7 Definition of Internal Credit Risk Rating System and Internal Credit Risk Rating

The term "internal credit risk rating system" refers to a system that evaluates a borrower's capacity to repay a loan using data on their financial situation, including their liquidity, cash flow, profitability, debt profile, market indicators, industry and operational background, management skills, and other indicators.

Internal Credit Risk Rating (ICRR), a vital resource for determining credit risk, will be the summary indication generated by the system.

1.5.8 Use of Internal Credit Risk Rating System (ICRRS)

An essential component of the banks' management of credit risk is their internal credit risk rating system. These are the main applications for this recommendation:

a) To offer a precise, objective, transparent, and consistent framework for measuring and evaluating the credit risk of borrowers.

b) To make the portfolio management processes easier.

c) To identify the quality of the credit portfolio, the branch's line of business, or the Bank as a whole by evaluating the quality of each individual borrower.

d) To be used for choosing individual credit, setting credit limits, and determining terms and conditions. These weights have been updated for the ICRR, where 60% of the weights are given to quantitative indicators and 40% to qualitative indicators.

Quantitative measures and corresponding weights Leverage, liquidity, profitability, coverage, operational efficiency, and earning quality are six major areas in which quantitative indicators in ICRR are divided. Below are provided details on the indicators under these categories and their corresponding weights.

Quantitative Indicators		Weight	Definition
1. Leverage (10%)	a) Debt to Tangible Net Worth (DTN)	7	Total Interest-Bearing Liabilities or Financial Debt/Total Tangible Net Worth
	b) Debt to Total Assets (DTA)	3	Total Interest-Bearing Liabilities or Financial Debt/Total Assets
2. Liquidity (10%)	a) Current Ratio (CR)	7	Current Assets/Current Liabilities
	b) Cash Ratio (Cash)	3	Cash and Easily Marketable Securities/Current Liabilities
3. Profitability (10%)	a) Net Profit Margin (NPM)	5	Net Profit after Tax/Net Sales
	b) Return on Assets (ROA)	3	Net Profit after Tax/Total Assets
	c) Operating Profit to Operating Assets (OPOA)	2	Operating Profit/Average Operating Assets
4. Coverage (15%)	a) Interest Coverage (IC)	3	Earnings Before Interest and Tax/Interest Expense
	b) Debt Service Coverage Ratio (DSCR)	5	Earnings Before Interest Tax Depreciation Amortization/Debts to be Serviced
	c) Operating Cash Flow to Financial Debt Ratio (OCDR)	4	Operating Cash Flow/Financial Debt
	d) Cash Flow Coverage Ratio (CCR)	3	Cash Flow from Operation/Debts to be Serviced
5.Operational Efficiency (10%)	a) Stock Turnover Days (STD)	4	(Total Inventory/Cost of Goods Sold)*360
	b) Trade Debtor Collection Days (TDCD)	3	(Total Accounts Receivable/Sales)*360
	c) Asset Turnover (AT)	3	Sales/Total Assets
6. Earning Quality (5%)	a) Operating Cash Flow to Sales (OCFS)	3	Operating Cash Flow/Sales
	b) Cash Flow based Accrual Ratio (CFAR)	2	NI-(CFO+CFI)/Average Net Operating Assets

Table 2: Six Quantitative Measures for Credit Rating. Source: Annual Report, Bangladesh Bank.

And six key areas of the organizations or institutions to be graded are covered by **qualitative indicators:** business/industry risk, credit quality improvement, performance behavior, management risk, relationship risk, and compliance risk. It is noteworthy that the overall weights against the qualitative indicators are 40%

Indicators	Weights
1. Performance Behavior	10
Performance Behavior with Banks Borrowings	
Regarding Classification	5
Regarding Rescheduling /Restructuring	4
Performance Behavior with Suppliers/Creditors	1
2. Business and Industry Risk	7
Sales Growth	2
Age of Business	2
Industry Prospects	1
Long-Term External Credit Rating of the Borrower	2
3. Management Risk	7
Experience of the Management	2
Existence of Succession Plan	2
Auditing Firms	2
Change of Auditors in Last 4 Years	1
4. Security Risk	11

Indicators	Weights
Primary Scarify	2
Collateral	2
Eligible Collateral Coverage	5
Type of Guarantee	2
5. Relationship Risk	3
Account Conduct	3
6. Compliance Risk	2
Compliance with Environmental Rules, Regulations and Covenants	1
Corporate Governance	1
Total	40

Table 3: Qualitative factors for internal credit risk measure. Source: BRPD, Bangladesh Bank.

The following table is showing the both short term and long-term credit rating of scheduled commercial banks of Bangladesh. The banking industry has around 61 scheduled banks including state owned 4 banks, 23 private commercial banks, 9 foreign banks, and 7 Islamic banks etc.

Banks	Name of ECAI	Rating	Rating	Short Term Rating	Date of Rating
SCBs(04)					
Sonali Bank PLC	CRISL	A+(AAA)	2	ST-2(ST-1)	June 30, 2022
Janata Bank Limited	CRISL	A+(AAA)	2	ST-2(ST-1)	June 29, 2022
Agrani Bank Limited	Alpha	A+(AAA)	2	ST-2(ST-1)	July 26, 2022
Rupali Bank Limited			Unrated		
PCBs (23)					
Mercantile Bank Limited	CRISL	AA	1	ST-2	May 19, 2022
AB Bank Limited	Argus	AA-	1	ST-2	Dec 19, 2021
One Bank Limited	ECRL	AA	1	ST-2	Mar 10, 2022
Eastern Bank Ltd	CRISL	AA+	1	ST-1	June 28, 2022
Standard Bank Limited (Islamic)	ARGUS	AA+	1	ST-2	June 29, 2022
Uttara Bank PLC	ECRL	AA	1	ST-2	July 01, 2022
Dutch-Bangla Bank Limited	CRAB	AAA	1	ST-1	Aug 04, 2022
Pubali Bank Limited	CRISL	AA+	1	ST-1	July 25, 2022
Dhaka Bank Limited	ECRL	AA	1	ST-2	April 8, 2022
Jumuna Bank Limited	CRAB	AAI	1	ST-1	June 27, 2022
The City Bank Limited	CRAB	AAI	1	ST-1	June 01, 2022
United Commercial Bank Ltd	ECRL	AA	1	ST-2	May 07, 2022
Bank Asia Limited	CRAB	AAI	1	ST-1	June 15, 2022
IFIC Bank Limited	ECRL	AA	1	ST-2	July 01, 2022
BRAC Bank Limited	CRISL	AA+	1	ST-1	July 03, 2022
Premier Bank Limited	ARGUS	AA+	1	ST-1	June 29, 2022
Prime Bank Limited	ECRL	AA	1	ST-2	July 01, 2022
Mutual Trust Bank Ltd.	CRISL	AA	1	ST-2	May 12, 2022
NCC Bank Ltd	CRISL	AA	1	ST-1	June 23, 2022
National Bank Limited	ECRL	AA-	1	ST-2	July14, 2022
Southeast Bank Limited	CRISL	AA	1	ST-2	Aug 04, 2022
Bangladesh Commerce Bank Ltd.	NCRL	B88-	3	ST-3	Aug 21, 2022
Trust Bank Limited	CRAB	AAI	1	ST-1	June 30, 2022
FBs(09)					
Standard Chartered Bank	CRISL	AAA	1	ST-1	March 03, 2022
Bank Alfalah Limited	Alpha	AA+	1	ST-1	April 28, 2022
Commercial Bank of Ceylon PLC	CRISL	AAA	1	ST-1	June 21, 2022
National Bank of Pakistan	CRAB	B881	3	ST-3	Sept 29, 2022
HSBC	CRAB	AAA	1	ST-1	Feb 03, 2022
Woori Bank	S&P, Moody, Fitch	A+, Al, A	2	A-1, P-1,F1+	July 29,2022
Citi Bank. N.A	S&P, Moody, Fitch	A+, Aa3, A+	2	A-1, P-1, F1+	Aug 05, 2022
Habib Bank Limited	CRISL	A+	2	ST-2	July 03, 2022
State Bank of India	Alpha	AAA	1	ST-1	July 02,2022
Mam Banks (07)					
Social Islami Bank Limited	Alpha	AA+	1	ST-2	March 08, 2022

Banks	Name of ECAI	Rating	Rating	Short Term Rating	Date of Rating
Islami Bank Bangladesh Limited	ECRL	AAA	1	ST-1	July 06, 2022
AL-Arafah Islami Bank Limited	CRISL	AA	1	ST-2	July 18, 2022
ICB Islami Bank Limited	Unrated				
Shahjalal Islami Bank Limited	ECRL	AA	1	ST-2	March 25, 2022
First Security Islami Bank Ltd.	ECRL	A+	2	ST-2	May 15, 2022
Exim Bank of Bangladesh Ltd.	CRISL	AA	1	ST-2	May 31, 2022
SBs					
BDBL	ECRL	A (AAA)	2	ST-3(ST-1)	July 31,2022
BASIC Bank Limited	NCRL	B+ (AAA)	5	ST-5(ST-1)	July 24, 2022
Bangladesh Krishi Bank	Alpha	BB^AAA)	4	ST-4, ST-1	Sept 18, 2022
Rajshahi Krishi Unnayan Bank			Unrated		
Probashi Kolyan Bank			Unrated		
Hew Barts					
NRB Bank	CRISL	A+	2	ST-2	June 30, 2022
NRB Commercial Bank Limited	ECRL	A+	2	ST-2	June 22,2022
Global Islami Bank PLC (Islamic)	Alpha	A+	2	ST-2	July 12,2022
SBAC Bank Ltd	CRISL	A	2	ST-2	June 27, 2022
Union Bank Limited (Islamic)	Alpha	A+	2	ST-2	June 16, 2022
Midland Bank Limited	ECRL	A+	2	ST-2	July 01, 2022
Modhumoti Bank Limited	CRAB	AA3	1	ST-2	June 21, 2022
Meghna Bank Limited	Alpha	AA-	2	ST-2	June 26, 2022
Padma Bank Limited	ECRL	BBB+	3	ST-3	Dec 30,2021
Shimanto Bank Ltd.	CRISL	A	2	ST-3	02 Dec ,2021
Bengal Commercial Bank	CRISL	BBB+	3	ST-3	01 Sep, 2022
Community Bank Bangladesh Ltd.	ECRL	A+	2	ST-2	18 Mar, 2022
Citizens Bank	CRISL	B88	3	ST-3	Dec 03,2021

Table 4: Credit Rating Results of Scheduled Banks: Source: BRPD, Bangladesh Bank

1.5.9 Credit Risk Management of Listed Banks and Their Loan Portfolio

Among all the listed banks at Dhaka Stock Exchange (DSE), 33 banks have been taken for analysis. the following part of the research is showing the loan portfolio of the listed banks with their sectoral concentration over 3 years period. Before jump into the credit risk or non-performing loans of the listed banks, let us have look into their loan portfolio from where the credit risk derives.

AB Bank						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agriculture	4,861,801,894	1.77%	4,277,151,869	1.47%	4,110,490,113	1.32%
Export	1,540,950,961	0.56%	1,653,738,274	0.57%	5,502,836,121	1.76%
Small and cottage industry	4,492,946,279	1.63%	6,324,412,820	2.18%	6,794,908,246	2.18%
Others	70,844,261,863	25.78%	51,811,610,042	17.84%	52,424,842,663	16.80%
Commercial lending	51,867,690,218	18.87%	59,867,690,218	20.61%	64,321,459,328	20.61%
Working capital	57,010,075,866	20.74%	67,578,838,524	23.27%	72,606,267,216	23.27%
Large and medium scale Mushy	84,212,134,265	30.64%	98,946,375,201	34.07%	106,307,345,833	34.07%
Total	274,829,861,346	100.00%	290,459,816,948	100.00%	312,068,149,520	100.00%

Table 5: AB Bank Loan portfolio. Source: AB Bank Annual Report

From the data that provided in the above table we can have a glimpse into AB Bank's loan portfolio distribution over the years 2020, 2021, and 2022, highlighting the diverse sectors contributing to the bank's lending activities. In 2020, the loan portfolio amounted to 274,829,861,346 BDT, with different sectors holding varying weights in the overall portfolio. Agriculture constituted 1.77% of the portfolio, totaling 4,861,801,894 BDT. Export, contributing 0.56%, amounted to 1,540,950,961 BDT. Small and cottage industry held a weight of 1.63%, accounting for 4,492,946,279 BDT. Others, a diverse category, represented a substantial 25.78%, reflecting a value of 70,844,261,863 BDT. Commercial lending and working capital contributed 18.87% and 20.74%, totaling 51,867,690,218 BDT and 57,010,075,866 BDT, respectively. Large and medium-scale industry constituted the majority, with a significant 30.64% and a value of 84,212,134,265 BDT.

In 2021, the loan portfolio expanded to 290,459,816,948 BDT, with notable shifts in sectoral weights. Agriculture, export, and small and cottage industry witnessed decreases in weights, reflecting %s of 1.47%, 0.57%, and 2.18%, and corresponding values of 4,277,151,869 BDT, 1,653,738,274 BDT, and 6,324,412,820 BDT. Others, although still significant, decreased to 17.84%, with a value of 51,811,610,042 BDT. Commercial lending and working capital saw increase in their weights to 20.61% each, representing values of 59,867,690,218 BDT and 67,578,838,524 BDT.

The year 2022 continues the trend of expansion in AB Bank's loan portfolio, reaching 312,068,149,520 BDT. Agriculture, export, and small and cottage industry further decreased in weights to 1.32%, 1.76%, and 2.18%, with values of 4,110,490,113 BDT, 5,502,836,121 BDT, and 6,794,908,246 BDT, respectively. Others sustained a gradual decrease to 16.80%, representing 52,424,842,663 BDT. Commercial lending and working capital maintained their weights at 20.61% each, with values of 64,321,459,328 BDT and 72,606,267,216 BDT. Large and medium-scale industry, with a weight of 34.07%, reached a value of 106,307,345,833 BDT, solidifying its pivotal role in the bank's portfolio.

Bank Asia						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Term loan- others	34,484,219,425	15.09%	37,349,511,472	15.94%	48,696,524,190	19.13%
Loans (General)/ Musharaka	19,204,212,902	8.41%	24,968,594,140	10.66%	39,417,520,074	15.49%
Overdrafts/ Quard against scheme	37,334,786,408	16.34%	33,590,107,929	14.34%	32,110,440,520	12.62%
Demand loan	32,210,343,715	14.10%	26,285,494,980	11.22%	27,234,992,836	10.70%
Term loan- industrial/ Hire purchase under Shirkatul Melk	26,477,173,539	11.59%	30,259,129,196	12.92%	26,527,284,618	10.42%
Export Development Fund (EDF)	15,130,653,340	6.62%	23,507,498,252	10.04%	21,663,457,255	8.51%
Consigner credit scheme	13,449,332,124	5.89%	15,292,210,573	6.53%	15,781,494,644	6.20%
Loan against trust receipts/ Bai Murabaha post import	13,163,763,436	5.76%	11,094,981,464	4.74%	14,331,955,769	5.63%
Loan under Covit-19 stimulus package	15,450,815,316	6.76%	8,120,879,445	3.47%	5,322,077,781	2.09%
Cash credit/Bai Murabaha (Muajjal)	6,475,321,470	2.83%	6,078,813,107	2.60%	5,303,713,589	2.08%
Agricultural loan	2,652,039,116	1.16%	4,214,162,268	1.80%	4,937,948,904	1.94%
Off-shore banking wit	3,773,686,591	1.65%	3,703,506,372	1.58%	3,716,111,667	1.46%
Credit card	2,732,685,187	1.20%	3,102,706,568	1.32%	3,631,193,880	1.43%
Staff loan	1,551,039,312	0.68%	1,722,495,464	0.74%	1,891,324,867	0.74%
Transport loan	2,032,418,741	0.89%	2,142,778,993	0.91%	1,811,882,853	0.71%
House building loans	1,753,894,542	0.77%	1,575,852,924	0.67%	1,059,855,713	0.42%
Packing credit	483,400,366	0.21%	708,453,691	0.30%	928,694,041	0.36%
Payment against documents	99,931,390	0.04%	518,606,158	0.22%	128,062,570	0.05%
Credit for poverty alleviation scheme-micro credit	7,613,585	0.00%	7,934,974	0.00%	8,247,947	0.00%

Bank Asia						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Total	**228,467,332,525**	**100.00%**	**234,243,719,991**	**100.00%**	**2 54,502,783,718**	**100.00%**

Table 6: Bank Asia Loan Portfolio. Source: Bank Asia Annual Report

Bank Asia's detailed breakdown of its loan portfolio over the years 2020, 2021, and 2022 provides insights into the composition and development of its major lending activities. In 2020, the total loan portfolio amounted to 228,467,332,525 BDT, with different sectors holding varying weights in the overall portfolio. Term Loan-Others constituted 15.09%, Loans (General)/Musharaka held 8.41%, and Overdrafts/Quard against Scheme represented 16.34%. The subsequent year, 2021, witnessed an increase in the total loan portfolio to 234,243,719,991 BDT. Term Loan-Others, Loans (General)/Musharaka, and Overdrafts/Quard against Scheme maintained their significance, while Export Development Fund (EDF) emerged as a noteworthy contributor, growing from 6.62% to 10.04%. By 2022, the total loan portfolio expanded to 254,502,783,718 BDT. Term Loan-Others, Loans (General)/Musharaka, and Overdrafts/Quard against Scheme continued to play pivotal roles, while Term Loan-Industrial/Hire Purchase under Shirkatul Melk saw a significant decrease in weight from 11.59% to 10.42%. Export Development Fund (EDF) and Consumer Credit Scheme maintained their importance.

These three years capture a period for Bank Asia, marked by shifts in sectoral weights within its loan portfolio. Term Loan-Others consistently emerged as a substantial contributor, indicating the diverse nature of loans provided by the bank. The Loans (General)/Musharaka category showcased robust growth, reflecting the bank's commitment to general lending activities. Overdrafts/Quard against Scheme retained its significance, emphasizing the importance of flexible financing options.

THE CITY BANK						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Readymade garments industry	47,234,565,191	17.64%	55,895,474,394	19.55%	60,249,132,914	17.01%
Consigner credit	40,471,886,865	15.12%	48,579,926,597	17.00%	58,752,408,734	16.58%
Energy and power industry	30,633,402,946	11.44%	38,294,817,873	13.40%	50,465,523,039	14.25%
Trade service	28,891,191,233	10.79%	32,541,741,752	11.38%	40,266,080,664	11.37%
Other manufacturing industry	32,500,250,508	12.14%	21,076,445,319	7.37%	37,192,113,065	10.50%
Textile & spinning mis	14,556,815,769	5.44%	14,585,478,183	5.10%	17,318,281,335	4.89%
Real estate financing	12,606,353,466	4.71%	13,981,724,944	4.89%	17,152,466,026	4.84%
Steel industry	11,330,966,627	4.23%	11,714,170,336	4.10%	16,063,339,200	4.53%
Agri & micro-credit through NGO	11,783,745,960	4.40%	9,150,568,326	3.20%	11,071,850,265	3.13%
Service industry	5,924,871,985	2.21%	8,764,792,801	3.07%	9,746,027,990	2.75%
Others	6,278,766,406	2.35%	8,427,189,589	2.95%	9,607,065,335	2.71%
Assembling industry	3,953,552,329	1.48%	7,400,704,223	2.59%	8,527,217,046	2.41%
Pharmaceuticals industry	4,535,545,508	1.69%	4,487,092,257	1.57%	5,416,483,192	1.53%
Edible oil and food processing	5,812,010,707	2.17%	3,687,538,755	1.29%	3,309,664,016	0.93%
Construction	6,111,967,899	2.28%	2,422,311,500	0.85%	2,871,692,089	0.81%
Transport, storage & cornification	3,071,861,140	1.15%	2,310,004,701	0.81%	2,342,120,164	0.66%
Ship breaking & building	1,317,351,185	0.49%	1,405,809,673	0.49%	1,857,527,422	0.52%
Chemical industry	720,528,338	0.27%	1,112,039,937	0.39%	2,051,968,784	0.58%
Hospitals	465,886,499	0.17%	541,847,316	0.19%	512,724,974	0.14%
Total	267,735,634,062	100.00%	285,837,831,160	100.00%	354,260,961,280	100.00%

Table 7: The City Bank's Loan portfolio. Source: The City Bank Annual Report

City Bank's detailed breakdown of its loan portfolio for the years 2020, 2021, and 2022 provides insights into the diverse sectors contributing to the bank's lending activities. In 2020, the total loan portfolio amounted to 267,735,634,062 BDT, with different sectors holding varying weights in the overall portfolio. The Readymade Garments Industry emerged as a dominant player, constituting 17.64%, followed by Consumer Credit at 15.12%, and the Energy and Power Industry at 11.44%. The subsequent year, 2021, witnessed an increase in the total loan portfolio to 285,837,831,160 BDT. The Readymade Garments Industry continued to be a major contributor at 19.55%, followed by Consumer Credit at 17.00%, and Energy and Power Industry at 13.40%. By 2022, the total loan portfolio expanded significantly to 354,260,961,280 BDT. The Readymade Garments Industry retained its dominance but with a decreased weight of 17.01%. Consumer Credit and Energy and Power Industry maintained their significance, while Trade Service and Other Manufacturing Industry emerged as noteworthy contributors.

These three years encapsulate a dynamic period for City Bank, marked by shifts in sectoral weights within its loan portfolio. The Readymade Garments Industry consistently played a pivotal role, reflecting the importance of this sector in Bangladesh's economy. Consumer Credit showcased robust growth, indicating the bank's commitment to retail lending activities. The Energy and Power Industry witnessed substantial expansion, underscoring the bank's engagement with key sectors driving economic growth. Other notable sectors include Trade Service, Real Estate Financing, and Steel Industry, each contributing to the bank's diverse lending landscape. This detailed breakdown offers stakeholders a comprehensive understanding of City Bank's strategic lending focus and the evolving dynamics within its diverse loan portfolio.

Dhaka Bank						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Textile & Garment	48,484,611,372	24.41%	51,901,680,790	24.09%	60,854,896,857	25.39%
Others	51,423,538,138	25.89%	60,863,412,428	28.25%	59,802,845,809	24.95%
Housing & Construction	19,449,027,665	9.79%	20,236,080,710	9.39%	20,969,487,900	8.75%
Engineering & Metal Industries including Ship Breaking	19,112,373,004	9.62%	19,284,999,698	8.95%	19,544,800,565	8.15%
Service	14,293,188,682	7.19%	16,191,527,959	7.51%	14,787,661,589	6.17%
Chemical	8,535,216,564	4.30%	7,355,278,187	3.41%	12,237,775,490	5.11%
Food & Abed	10,463,998,030	5.27%	10,495,144,171	4.87%	12,202,127,681	5.09%
Electronics & Automobile	10,108,418,099	5.09%	9,912,394,776	4.60%	12,154,572,098	5.07%
Energy & Power	6,741,724,693	3.39%	8,371,590,892	3.89%	11,293,328,530	4.71%
Agricultural	2,245,928,541	1.13%	3,530,982,759	1.64%	6,842,327,057	2.85%
Pharmaceuticals	2,829,775,434	1.42%	2,442,609,619	1.13%	4,743,535,766	1.98%
Transport & Communication	4,972,673,698	2.50%	4,872,941,704	2.26%	4,252,389,087	1.77%
Total	198,660,473,920	100.00%	215,458,643,693	100.00%	239,685,748,429	100.00%

Table 8: Dhaka Bank's loan portfolio. Source: Dhaka Bank Annual Report

Dhaka Bank's comprehensive breakdown of its loan portfolio over the years 2020, 2021, and 2022 offers a detailed insight into the sectors contributing to the bank's lending activities. In 2020, the total loan portfolio amounted to 198,660,473,920 BDT, with different sectors holding varying weights in the overall portfolio. The Textile & Garment sector emerged as a significant player, constituting 24.41% of the portfolio, reflecting the bank's engagement with one of Bangladesh's key economic pillars. Other sectors such as Others, Housing & Construction, and Engineering & Metal Industries also played substantial roles. The subsequent year, 2021, witnessed an increase in the total loan portfolio to 215,458,643,693 BDT. The Textile & Garment sector maintained its dominance, now at 24.09%, saw an increase in its weight to 28.25%, showcasing the dynamic nature of the bank's lending activities. Housing & Construction, Engineering & Metal Industries, and Service sectors continued to contribute significantly to the overall portfolio. By 2022, the total loan portfolio expanded further to 239,685,748,429 BDT. The Textile & Garment sector remained a dominant force, constituting 25.39% of the portfolio. Others, although slightly reduced in weight, continued to be a substantial contributor at 24.95%. Housing & Construction, Engineering & Metal Industries, and Service sectors maintained their positions, reflecting the bank's commitment to diverse sectors.

Dutch Bangla Bank limited						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Other industries	82,410,260,440	31.91%	108,789,384,235	36.15%	132,883,681,629	38.37%
Textile industries	64,336,344,447	24.91%	61,701,115,923	20.50%	58,789,456,324	16.98%
Ready- made garment industries	35,997,423,500	13.94%	41,643,101,225	13.84%	44,154,907,713	12.75%
Service industries	18,482,137,909	7.16%	19,821,707,930	6.59%	26,481,959,391	7.65%
Electronics and automobile industries	5,603,026,994	2.17%	12,763,045,674	4.24%	14,922,699,364	4.31%
Housing and construction industries	12,155,804,271	4.71%	11,267,738,152	3.74%	10,579,620,959	3.06%
Food and abed industries	8,182,158,978	3.17%	9,394,463,131	3.12%	9,665,047,436	2.79%
Engineering and metal industries including ship breaking	5,139,991,274	1.99%	8,966,282,243	2.98%	9,095,870,929	2.63%
Energy and power industries	5,881,341,940	2.28%	10,108,406,897	3.36%	8,665,735,498	2.50%
Transport and communication	4,299,909,630	1.67%	3,039,304,150	1.01%	7,820,378,675	2.26%
Cement and ceramic industries	2,844,408,280	1.10%	2,381,314,677	0.79%	6,747,587,203	1.95%
Agriculture, fisheries and forestry	5,198,927,388	2.01%	2,004,074,810	0.67%	5,816,719,897	1.68%
Pharmaceutical industries	4,459,596,321	1.73%	4,508,402,992	1.50%	4,752,033,481	1.37%
Bank and other financial institutions	1,180,138,516	0.46%	1,594,128,471	0.53%	3,224,122,732	0.93%
Chemical industries	2,057,432,003	0.80%	2,946,406,727	0.98%	2,678,892,011	0.77%
Total	2 58,228,901,891	100.00%	300,928,877,237	100.00%	346,278,713,242	100.00%

Table 9: Loan Portfolio of Dutch Bangla Bank Limited. Source: DBBL Bank Annual Report

Dutch Bangla Bank Limited has demonstrated a dynamic and evolving loan portfolio over the years 2020, 2021, and 2022, showcasing both growth and shifts in sectoral allocations. In 2020, the total loan portfolio amounted to 258,228,901,891 BDT, with different sectors contributing to the overall composition. Notably, the "Other Industries" category held the highest weight at 31.91%, indicating the bank's engagement with a diverse range of economic sectors. The Textile Industries sector followed closely, constituting 24.91%, reflecting the bank's involvement in one of Bangladesh's key economic pillars.

As we progress to 2021, the total loan portfolio witnessed a substantial increase to 300,928,877,237 BDT. The "Other Industries" category further expanded its weight to 36.15%, emphasizing the bank's commitment to varied sectors. While the Textile Industries sector's weight slightly decreased to 20.50%, it remained a significant contributor. Ready-Made Garment Industries and Service Industries played substantial roles, showcasing the bank's strategic approach to supporting critical sectors of the economy.

By 2022, Dutch Bangla Bank's loan portfolio continued its upward trajectory, reaching 346,278,713,242 BDT. The "Other Industries" category-maintained dominance, now representing 38.37% of the total loans, highlighting the bank's emphasis on diversification. The Textile Industries sector, while experiencing a relative reduction in weight to 16.98%, remained a formidable force. Ready-Made Garment Industries and Service Industries sustained their importance, underscoring the bank's commitment to a well-rounded portfolio.

EBL						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Readymade garments industry	36,830,131,190	15.98%	40,356,406,325	14.86%	44,155,307,591	14.19%
Commercial and trading	30,669,916,120	13.30%	31,896,939,865	11.74%	38,619,270,185	12.41%
Consigner finance	32,827,061,558	14.24%	34,571,098,127	12.73%	36,774,625,528	11.82%
Food and abed industries	10,873,444,694	4.72%	15,672,423,545	5.77%	23,443,538,196	7.54%
Other manufacturing or extractive industries	12,777,907,895	5.54%	16,624,117,554	6.12%	23,234,154,591	7.47%
Metal and steel products	17,487,016,658	7.59%	19,137,968,412	7.05%	22,284,789,692	7.16%
Agri and micro credit through NGO	14,219,286,426	6.17%	19,174,907,218	7.06%	21,434,208,317	6.89%
Textile mills	11,712,847,293	5.08%	11,934,819,628	4.39%	14,792,286,481	4.76%
Power and fuel	8,058,035,313	3.50%	14,203,762,643	5.23%	14,293,116,796	4.59%
Others	11,181,522,423	4.85%	14,412,611,911	5.31%	13,815,861,942	4.44%
Sugar and edible oil refinery	4,873,212,500	2.11%	1,488,466,688	0.55%	10,401,002,652	3.34%
Construction	8,789,387,758	3.81%	10,967,738,014	4.04%	9,901,819,827	3.18%
Transport and e-communication	5,559,431,577	2.41%	6,137,473,849	2.26%	6,506,344,038	2.09%
Pharmaceutical industries	2,703,502,985	1.17%	4,552,721,588	1.68%	6,275,522,955	2.02%
Electronics and electrical goods	3,756,582,128	1.63%	6,947,074,382	2.56%	6,048,765,067	1.94%
Cement and ceramic industries	3,666,702,809	1.59%	3,892,666,033	1.43%	5,506,735,518	1.77%
Rubber and plastic industries	2,799,428,682	1.21%	4,934,701,188	1.82%	4,779,740,278	1.54%
Chemical and fertilizer	3,824,905,455	1.66%	3,590,702,695	1.32%	4,547,798,423	1.46%
Ship building & breaking industry	6,710,289,548	2.91%	10,364,441,265	3.82%	3,640,377,487	1.17%
Crops, fisheries and livestocks	1,224,443,160	0.53%	740,622,727	0.27%	629,467,998	0.20%
Total	**230,54 5,0 58,192**	**100%**	**271,601,665,678**	**100%**	**311,084,733,562**	**100%**

Table 10: Eastern Bank PLC Loan Portfolio. Source: EBL Bank Annual Report

Eastern Bank Ltd. loan portfolio analysis for the years 2020, 2021, and 2022 provides insights into the bank's lending strategy and the sectors contributing significantly to its loan book.

In 2020, the total loan portfolio for Eastern Bank Ltd amounted to 230,545,058,192 BDT. The Readymade Garments Industry held the highest weight at 15.98%, indicating a notable focus on one of Bangladesh's key economic sectors. Commercial and Trading, along with Consumer Finance, also made substantial contributions, reflecting the bank's diversified approach.

Moving to 2021, the bank's total loan portfolio increased to 271,601,665,678 BDT. Despite a slight decrease in the Readymade Garments Industry's weight to 14.86%, it remained a significant player. Commercial and Trading, along with Consumer Finance, maintained their importance, showcasing the bank's commitment to a balanced sectoral mix.

By 2022, Eastern Bank Ltd. loan portfolio further expanded to 311,084,733,562 BDT. The Readymade Garments Industry continued to hold a prominent position with a 14.19% weight. Commercial and Trading, along with Consumer Finance, retained their significance, contributing to the bank's comprehensive and diversified lending activities.

EXIMBANK						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Tracing and others	164,843,856,197	41.95%	195,400,785,131	21.05%	206,164,990,000	45.56%
Other industry	127,395,065,514	32.42%	130,069,717,708	14.01%	128,411,370,000	28.38%
Garments	50,964,177,536	12.97%	552,839,558,637	59.56%	52,625,060,000	11.63%
Argo based industry	24,625,870,263	6.27%	27,162,929,687	2.93%	41,950,200,000	9.27%
Textile weaving and spinning	25,090,693,021	6.39%	22,731,920,466	2.45%	23,396,250,000	5.17%
Total	**392,919,662,531**	**100.00%**	**928,204,911,629**	**100.00%**	**452,547,870,000**	**100.00%**

Table 11: Loan Portfolio for EXIM Bank. Source: EXIM Bank Annual Report

In 2020, the total loan portfolio for EXIMBANK amounted to 392,919,662,531 BDT. The largest share was in the category of Trading and Others, representing 41.95% of the total portfolio. Other Industries, Garments, Agro-based Industry, and Textile Weaving and Spinning also contributed significantly to the diverse portfolio.

The year 2021 saw a substantial shift in the loan distribution. Trading and Others still held the highest weight, but it decreased significantly to 21.05%. Meanwhile, Garments surged to 59.56%, becoming the dominant sector in the portfolio. Other Industries, Agro-based Industry, and Textile Weaving and Spinning also underwent changes in their weights, reflecting the dynamic nature of EXIMBANK's lending strategy.

By 2022, the bank's loan portfolio shifted again. Trading and Others regained a higher weight at 45.56%, indicating a return to a more balanced distribution. Garments, although still significant, decreased in weight. Other Industries, Agro-based Industry, and Textile Weaving and Spinning maintained their positions, contributing to a comprehensive sectoral mix.

FIRSTSBANK						
Industry wise Investments	2020	Weights	2021	Weights	2022	Weights
Agriculture:						
Fishing	702,720,065	0.17%	712,859,872	0.16%	1,051,695,979	0.20%
Others	1,386,675,136	0.33%	1,538,075,623	0.34%	1,820,087,830	0.35%
Textile and Readymade Garments:						
Readymade Garments - Export	8,338,569,412	2.01%	14,016,255,418	3.07%	18,755,554,319	3.57%
Textile and Textile Products-Import	9,209,496,003	2.22%	8,681,278,129	1.90%	11,266,321,218	2.15%
Others -Export	3,855,204,918	0.93%	4,473,124,631	0.98%	7,316,060,538	1.39%
Others -Import	22,997,645,937	5.54%	26,822,319,093	5.88%	27,888,900,918	5.31%
Contractor Finance	7,915,159,857	1.91%	7,415,416,841	1.62%	2,513,053,677	0.48%
Transport	1,910,558,797	0.46%	1,357,130,931	0.30%	1,407,827,508	0.27%
Internal Trade Finance:						
Whole Sale Trading	198,908,459,712	47.89%	201,876,887,460	44.23%	208,479,037,508	39.73%
Retail Trading	10,802,568,713	2.60%	13,158,546,511	2.88%	15,104,326,157	2.88%
Others	3,914,300,646	0.94%	7,971,465,785	1.75%	7,421,417,716	1.41%
House Building:						
Residential & Commercial	20,344,259,715	4.90%	21,092,971,244	4.62%	24,170,650,623	4.61%
Staff	1,070,917,146	0.26%	1,227,542,095	0.27%	1,227,003,514	0.23%
Special Program:						
Consumer Finance and Hire Purchase Scheme	169,052,063	0.04%	188,291,822	0.04%	221,129,970	0.04%
Others	123,781,814,336	29.80%	145,896,370,227	31.96%	196,152,083,550	37.38%
Total	415,307,402,456	100.00%	456,428,535,682	100.00%	524,795,151,025	100.00%

Table 12: Investment Portfolio of First Security Islami Bank. Source: FSIBL Bank Annual Report

The bank's total industry-wise investments grew from 415,307,402,456 BDT in 2020 to 524,795,151,025 BDT in 2022, representing a notable 26.33% increase. The bank's investment in fishing activities increased from 702,720,065 BDT in 2020 to 1,051,695,979 BDT in 2022, indicating a substantial 49.62% growth. This suggests a focus on supporting the fisheries sector, contributing to food security and employment. Investments in other agricultural activities grew from 1,386,675,136 BDT in 2020 to 1,820,087,830 BDT in 2022, marking a 31.25% increase. This demonstrates the bank's commitment to a diversified agricultural portfolio. Significant investments in this sector rose from 8,338,569,412 BDT in 2020 to 18,755,554,319 BDT in 2022, showcasing a remarkable 124.16% growth. This aligns with the dominance of the textile industry in Bangladesh's economy. Although showing a modest increase, investments in textile imports grew from 9,209,496,003 BDT in 2020 to 11,266,321,218 BDT in 2022, indicating a 22.30% rise. This suggests a strategic approach to balancing export-oriented and import-dependent segments. Investments in this segment experienced a substantial decrease from 7,915,159,857 BDT in 2020 to 2,513,053,677 BDT in 2022, showing a significant decline of 68.19%. Further analysis would be needed to understand the reasons behind this contraction. Despite a relatively small portion, investments in the transport sector increased from 1,910,558,797 BDT in 2020 to 1,407,827,508 BDT in 2022, reflecting a 26.37% decrease. This might be an area for reconsideration in the bank's portfolio strategy. The bank maintained a significant focus on wholesale trading, with investments growing from 198,908,459,712 BDT in 2020 to 208,479,037,508 BDT in 2022, demonstrating a 4.82% increase. This sustained commitment to internal trade reflects economic stability. Investments in retail trading also increased from 10,802,568,713 BDT in 2020 to 15,104,326,157 BDT in 2022, signaling a substantial 39.84% growth. The bank's involvement in retail suggests a keen interest in consumer-oriented economic activities. While relatively small, investments in other internal trade activities increased from 3,914,300,646 BDT in 2020 to 7,421,417,716 BDT in 2022, showing an impressive 89.78% growth. Investments in residential and commercial projects increased from 20,344,259,715 BDT in 2020 to 24,170,650,623 BDT in 2022, marking an 18.76% growth. This signifies continued support for the real estate and housing sectors. Consumer Finance and Hire Purchase Scheme segment witnessed an increase from 169,052,063 BDT in 2020 to 221,129,970 BDT in 2022, reflecting a growth of 30.76%. This could indicate the bank's responsiveness to consumer financing needs. Investments in various special programs surged from 123,781,814,336 BDT in 2020 to 196,152,083,550 BDT in 2022, showing a substantial 58.50% growth. This underlines the bank's adaptability to emerging financial landscapes.

Global Islami Bank limited						
Investment Concentration	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agriculture	751,870,381	0.81%	332,285,632	0.31%	393,271,837	0.33%
Commercial real estate financing	36,664,818	0.04%	47,174,585	0.04%	64,327,190	0.05%
Construction	2,275,895,690	2.46%	2,484,262,437	2.33%	2,679,796,313	2.27%
Consigner finance	73,043,286	0.08%	137,422,110	0.13%	176,557,302	0.15%
Residential real estate financing	66,848,579	0.07%	169,252,184	0.16%	223,819,324	0.19%
Capital market institution	543,991,707	0.59%	593,325,144	0.56%	695,445,688	0.59%
Transport, storage and communication	246,915,958	0.27%	242,836,987	0.23%	305,655,556	0.26%
Retail investments	1,865,411,870	2.01%	1,972,287,128	1.85%	2,252,762,886	1.90%
Commercial and trading services	76,097,371,487	82.18%	88,435,616,685	82.91%	97,583,083,264	82.52%
Ready Made Garments-RMG	1,911,659,893	2.06%	1,852,296,524	1.74%	2,107,454,457	1.78%
Small and Medium Enterprise investments	3,570,452,668	3.86%	3,955,588,248	3.71%	4,695,715,085	3.97%
Textile industries	1,857,197,470	2.01%	2,502,487,930	2.35%	2,747,516,259	2.32%
Other manufacturing industries	3,302,244,420	3.57%	3,941,035,330	3.69%	4,335,512,428	3.67%
Total	92,599,568,227	100.00%	106,665,870,924	100.00%	118,260,917,589	100.00%

Table 13: Investment portfolio of Global Islami Bank Limited. Source: NRBG Bank Annual Report

Global Islami Bank Limited displayed noteworthy changes in its investment portfolio from 2020 to 2022, showcasing strategic shifts and sectoral growth. Agriculture witnessed a gradual increase, growing from 0.81% in 2020 to 0.33% in 2022. Real estate financing, both commercial and residential, exhibited a positive trajectory, indicating the bank's confidence in this sector. The construction sector also experienced consistent support, with a rise from 2.46% in 2020 to 2.27% in 2022. Consumer finance demonstrated substantial growth, increasing from 0.08% to 0.15%. Notably, the bank showed a strategic focus on retail investments, marking a rise from 2.01% in 2020 to 1.90% in 2022. The commercial and trading services sector remained dominant but slightly decreased as a %age of the total portfolio, from 82.18% in 2020 to 82.52% in 2022. These changes suggest a deliberate effort by the bank to balance and optimize its investment portfolio over this period.

IFIC						
Industry wise Investments	2020	Weights	2021	Weights	2022	Weights
Cold storage	53,439,785	0.02%	23,053,798	0.01%		
Consigner finance	45,925,172,870	17.55%	63,819,575,809	20.83%	93,003,600,026	26.13%
Garments	36,205,734,042	13.83%	47,453,561,687	15.49%	48,806,996,382	13.72%
Housing societies/companies	31,426,089,915	12.01%	33,196,690,742	10.84%	32,700,280,093	9.19%
Trade & commerce	23,358,849,646	8.93%	23,578,635,978	7.70%	26,251,850,336	7.38%
Other service industries	27,835,622,387	10.64%	25,356,805,913	8.28%	25,823,194,719	7.26%
Construction firms/companies	19,969,381,860	7.63%	26,251,068,261	8.57%	24,206,131,466	6.80%
Textile	12,008,054,318	4.59%	13,024,952,014	4.25%	19,445,124,895	5.46%
Others	7,089,830,914	2.71%	8,067,259,970	2.63%	13,694,615,539	3.85%
Other small industries	8,937,475,690	3.42%	9,127,798,359	2.98%	11,235,923,048	3.16%
Telecommunication	9,655,497,612	3.69%	10,174,041,517	3.32%	11,097,235,492	3.12%
Engineering & metal	5,970,450,060	2.28%	6,264,389,567	2.04%	10,188,878,512	2.86%
Energy	8,243,559,495	3.15%	8,863,345,743	2.89%	8,635,132,783	2.43%
Jute	4,688,649,495	1.79%	5,024,594,668	1.64%	5,537,019,975	1.56%
IT sector	4,488,377,896	1.72%	4,571,697,852	1.49%	5,298,962,072	1.49%
Food products & processing	5,614,527,142	2.15%	4,893,129,859	1.60%	4,368,585,357	1.23%
Brides & ceramic	1,228,855,597	0.47%	4,286,605,832	1.40%	4,006,448,192	1.13%
Paper & paper products	2,951,564,934	1.13%	3,081,608,710	1.01%	3,210,642,751	0.90%
Cement	2,242,982,069	0.86%	4,561,601,319	1.49%	2,874,712,180	0.81%
Drugs & pharmaceuticals	882,241,618	0.34%	1,649,611,902	0.54%	2,800,458,403	0.79%
Agriculture	1,549,034,081	0.59%	1,565,239,846	0.51%	1,556,206,067	0.44%
Transport	1,214,043,298	0.46%	1,154,798,383	0.38%	694,646,876	0.20%
Hospital & clinics	94,862,671	0.04%	79,201,766	0.03%	197,782,914	0.06%
Chemical and chemical products	54,928,753	0.02%	87,554,948	0.03%	129,650,018	0.04%
NBFI’s	8,201,326	0.00%	176,529,899	0.06%	94,793,422	0.03%
Total	**261,697,427,474**	**100.00%**	**306,333,354,342**	**100.00%**	**355,858,871,518**	**100.00%**

Table 14: IFIC Bank's Industry-Wise Investments. Source: IFIC Bank Annual Report

IFIC Bank's industry-wise investments demonstrated notable shifts from 2020 to 2022, reflecting a dynamic strategy in response to market changes. Consumer finance witnessed substantial growth, surging from 17.55% in 2020 to an impressive 26.13% in 2022, indicating a strategic focus on this sector. The garments industry, although maintaining a significant share, saw a slight dip from 15.49% to 13.72%, suggesting a nuanced approach. Housing societies/companies and trade & commerce sectors exhibited a declining trend, while other service industries remained relatively stable. Noteworthy is the remarkable growth in the IT sector, rising from 1.49% to 1.49%, showcasing the bank's interest in technology-related investments. The energy sector saw a modest decline, and the pharmaceuticals sector experienced significant growth. Overall, IFIC Bank's portfolio diversification and sectoral adjustments reflect a proactive approach to market dynamics.

Islami Bank						
Investment Concentration	2020	Weights	2021	Weights	2022	Weights
Investment to directors						
Investment to chief executive & other senior executives	1,438,634,458	0.14%	1,601,240,640	0.13%	1,729,627,570	0.12%
Sector wise other investments:						

Islami Bank						
Trade & commerce	304,478,371,536	29.41%	377,471,856,473	31.69%	478,872,859,614	32.77%
Real-estate	65,913,751,572	6.37%	78,279,954,216	6.57%	84,824,439,721	5.80%
Transport	8,192,135,987	0.79%	9,550,583,572	0.80%	9,358,061,358	0.64%
Agriculture (inducting fertilizer & agriculture implements)	29,541,041,273	2.85%	35,589,480,273	2.99%	46,982,709,146	3.21%
Industrial investment (Note-11.5.1)	562,743,323,334	54.36%	634,313,415,162	53.25%	772,147,671,644	52.84%
Others	62,980,624,173	6.08%	54,366,469,910	4.56%	67,450,128,460	4.62%
Total	1,035,287,882,333	100.00%	1,191,173,000,246	100.00%	1,461,365,497,513	100.00%

Table 15: Islami Bank's Investment Portfolio. Source: IBBL Bank Annual Report

ISLAMI Bank's investment portfolio underwent notable shifts from 2020 to 2022. Investments in Trade & Commerce remained significant, increasing from 29.41% to 32.77%, showcasing a sustained focus on this sector. Real Estate investments slightly decreased from 6.37% to 5.80%, possibly indicating a nuanced approach to real estate holdings. The Industrial sector experienced substantial growth, rising from 54.36% to 52.84%, demonstrating a sustained commitment to industrial ventures. Agriculture investments also saw an increase, from 2.85% to 3.21%, possibly reflecting a focus on agribusiness. Notably, investments in 'Others' grew from 6.08% to 4.62%. The concentration of investments in key sectors highlights ISLAMI Bank's strategic allocation, with a significant emphasis on trade, industry, and agriculture over the examined period.

JAMUNABANK						
Sector wise loans & advances	2020	Weights	2021	Weights	2022	Weights
Agricultural & Fisheries	1,991,094,289	1.22%	3,279,859,237	1.88%	4,018,451,741	2.23%
Large & Medium Scale Industry	28,156,885,422	17.31%	31,085,739,264	17.78%	31,223,732,459	17.30%
Working Capital	39,844,038,085	24.50%	43,719,130,893	25.01%	43,554,807,497	24.13%
Export Credit	7,070,828,004	4.35%	12,303,023,591	7.04%	12,772,030,363	7.08%
Commercial Credit	45,998,006,754	28.28%	45,576,163,576	26.07%	47,119,109,143	26.11%
Small and Cottage Industries	7,632,831,576	4.69%	8,186,101,452	4.68%	8,699,813,911	4.82%
Others	31,964,749,011	19.65%	30,674,765,164	17.55%	33,102,847,112	18.34%
Total	162,658,433,141	100.00%	174,824,78 3,177	100.00%	180,490,792,226	100.00%

Table 16: Jamuna Bank's Sector-Wise Loans and Advances. Source: Jamuna Bank Annual Report

Jamuna Bank's sector-wise loans and advances reveal insights into its diverse portfolio over the years. Notably, the Agricultural & Fisheries sector experienced a substantial increase from 1.22% in 2020 to 2.23% in 2022, indicating a focus on supporting these segments. Large & Medium Scale Industry and Working Capital remained consistent, with slight variations, showcasing stability in these crucial sectors.

Export Credit demonstrated a significant rise from 4.35% to 7.08%, suggesting an increased focus on facilitating and promoting export activities. Commercial Credit, comprising a significant portion, grew from 28.28% to 26.11%, showcasing a sustained emphasis on supporting commercial endeavors. Investments in Small and Cottage Industries also increased from 4.69% to 4.82%, reflecting an effort to foster small-scale enterprises.

Despite minor fluctuations, the overall distribution signifies a well-diversified approach, balancing support for agriculture, industry, commerce, and smaller enterprises, contributing to the bank's comprehensive economic impact.

MTB						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
a) Directors						
Credit Cards (Note - 46)	85,555	0.00%	1,077,300	0.00%	1,263,220	0.00%
b) Chief Executive & other Senior Executives	897,359,140	0.44%	848,343,729	0.37%	1,013,709,459	0.40%
i) Managing Director	-		-			
ii) Other Senior Executives	897,359,140	0.44%	848,343,729	0.37%	1,013,709,459	0.40%
c) Advances to Industries						
Other Manufacturing industry	51,853,880,070	25.70%	21,140,856,876	9.32%	88,723,446,369	34.81%
RMG	36,061,274,711	17.87%	37,054,273,187	16.33%	38,210,821,382	14.99%
SME tans	29,607,882,775	14.68%	27,820,139,675	12.26%	32,376,279,324	12.70%
Consigner credit	12,793,694,375	6.34%	16,223,382,149	7.15%	18,888,018,055	7.41%
Trade Service	14,449,080,029	7.16%	24,018,150,476	10.59%	15,784,403,073	6.19%
Construction	3,606,234,828	1.79%	14,134,021,171	6.23%	10,401,416,269	4.08%
Textile	15,509,761,634	7.69%	12,409,196,162	5.47%	10,243,389,051	4.02%
Others	10,419,310,629	5.16%	41,345,723,620	18.23%	8,587,194,248	3.37%
Commercial real estate financing	9,280,232,917	4.60%	5,398,960,541	2.38%	6,115,036,200	2.40%
NBAs	4,136,463,046	2.05%	8,354,889,242	3.68%	4,746,788,198	1.86%
Agriculture	1,072,530,729	0.53%	3,188,679,653	1.41%	4,176,042,840	1.64%
Ship Breaking	3,772,626,707	1.87%	3,803,379,886	1.68%	3,785,669,260	1.49%
Capital Market	841,858,789	0.42%	4,265,258,632	1.88%	3,313,377,822	1.30%
Power, Gas	2,815,397,515	1.40%	3,102,653,120	1.37%	2,670,674,429	1.05%
Transport, Storage and Communication	374,732,171	0.19%	881,582,573	0.39%	2,085,813,435	0.82%
Ship Building	2,250,291,971	1.12%	2,005,332,100	0.88%	1,982,118,073	0.78%
Residential real estate financing	1,105,407,245	0.55%	15,674,580	0.01%	730,233,679	0.29%
Total	201,745,463,976	100.00%	226,859,918,401	100.00%	254,849,403,845	100.00%

Table 17 : MTB's Loan Portfolio. Source: MTB Bank Annual Report

MTB's loan portfolio demonstrates a diverse investment strategy across sectors and groups. Notably, advances to directors and chief executives remained marginal, with credit cards being a minor component.

The sector-wise distribution reveals interesting trends. Other Manufacturing Industries experienced a substantial increase from 25.70% in 2020 to 34.81% in 2022, indicating a heightened focus on this sector. Ready-Made Garments (RMG) remained a significant portion but showed a slight decrease from 17.87% to 14.99%. SME loans and consumer credit also demonstrated consistent contributions.

Trade service witnessed fluctuations, declining from 10.59% to 6.19%. Construction and textile sectors showed variations, reflecting adjustments in the bank's exposure. There was a significant shift in investments in 'Others,' decreasing from 18.23% to 3.37%.

National Bank Ltd (NBL)						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agriculture	4,399,021,072	1.07%	4,597,466,378	1.03%	4,594,615,362	1.07%
Term loan to small cottage industries	7,366,419,716	1.79%	6,378,459,504	1.42%	6,278,695,415	1.47%
Term loan to large and medium industries	134,336,123,568	32.69%	161,683,377,045	36.06%	170,247,355,565	39.83%
Working capital to industries	71,257,832,773	17.34%	72,598,531,837	16.19%	72,970,486,217	17.07%
Export credit	17,814,293,562	4.34%	15,360,985,778	3.43%	13,376,089,220	3.13%
Trade finance	101,883,883,293	24.79%	108,872,756,890	24.28%	79,546,411,310	18.61%
Consigner credit	2,320,124,157	0.56%	3,030,721,310	0.68%	2,738,726,057	0.64%

Credit cards	1,209,987,185	0.29%	1,202,700,519	0.27%	1,186,725,918	0.28%
Others	70,350,473,235	17.12%	74,673,915,050	16.65%	76,539,289,065	17.90%
Total	410,938,158,561	100.00%	448,398,914,311	100.00%	427,478,394,129	100.00%

Table 18: National Bank Ltd (NBL). Source: NBL Bank Annual Report

National Bank Ltd (NBL) exhibited a progress in its loan portfolio from 2020 to 2022, reflecting strategic adaptability. The overall loan portfolio witnessed growth, escalating from $410.94 billion in 2020 to $448.40 billion in 2021. However, in 2022, there was a marginal decrease to $427.48 billion. Sectoral, NBL showed a noteworthy surge in large and medium-scale industries, escalating from 32.69% in 2020 to 39.83% in 2022. The agricultural sector remained steadfast at around 1%. Export credit experienced a reduction from 4.34% to 3.13%, indicating an adjustment in the bank's approach. Trade finance saw a notable decrease from 24.79% to 18.61%, reflecting changing strategies in this domain. NBL's year-over-year adaptations underscore its commitment to a diversified and resilient loan portfolio in response to economic shifts and sectoral dynamics.

NCC BANK						
Loan Portfolio	2020	Weights	2021	Weights	2022	Weights
Argo based industries	8,274,784,315	9.68%	8,391,845,784	8.31%	7,647,522,176	6.80%
Textile industries	12,404,247,826	14.51%	14,840,284,594	14.69%	18,212,125,154	16.20%
Food and abed industries	2,249,349,720	2.63%	2,538,748,549	2.51%	3,280,946,547	2.92%
Pharmaceutical industries	2,532,812,147	2.96%	2,525,215,461	2.50%	3,687,154,859	3.28%
Leather, chemical, cosmetics, etc.	2,890,574,045	3.38%	2,785,485,495	2.76%	2,846,598,713	2.53%
Cement and ceramic industries	2,031,599,833	2.38%	1,284,095,882	1.27%	1,557,515,485	1.39%
Service industries	12,468,761,931	14.58%	9,613,815,241	9.52%	9,953,315,458	8.85%
Transport and communication industries	909,424,958	1.06%	850,042,172	0.84%	1,112,985,261	0.99%
Other industries	41,728,951,395	48.81%	58,160,009,598	57.59%	64,124,489,517	57.04%
Total	85,490,506,170	100.00%	100,989,544,797	100.00%	112,422,655,192	100.00%

Table 19: Loan Portfolio of NCC Bank. Source: NCC Bank Annual Report

NCC Bank showcased a strategic shift in its loan portfolio composition from 2020 to 2022.The overall loan portfolio exhibited robust growth, reaching $85.49 billion in 2020, escalating to $100.99 billion in 2021, and further expanding to $112.42 billion in 2022. Across various sectors, agro-based industries-maintained stability around 6.80%, while textile industries and food and allied industries experienced incremental growth. The pharmaceutical sector demonstrated a notable increase from 2.96% to 3.28%. Service industries and transport and communication industries witnessed a dip, potentially indicative of sectoral adjustments. NCC Bank's dynamic portfolio adjustments align with industry trends and evolving economic landscapes, ensuring resilience and adaptability.

ONEBANKLTD						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Trade finance	26,545,989,378	12.05%	25,325,320,855	11.37%	29,823,178,437	13.21%
Steel Re-Rolling	13,567,052,940	6.16%	10,119,266,543	4.54%	11,654,283,477	5.16%
Readymade Garments	36,449,214,264	16.54%	38,723,012,051	17.39%	41,273,316,967	18.29%
Textiles	22,081,889,873	10.02%	19,699,634,092	8.85%	21,356,693,357	9.46%
Edible oil, Rice, Flour etc.	5,806,855,355	2.64%	4,220,934,565	1.90%	4,579,810,797	2.03%
Power	9,790,707,476	4.44%	6,862,416,236	3.08%	9,873,428,444	4.37%

Transport & communication	2,420,670,174	1.10%	1,995,648,088	0.90%	3,097,015,725	1.37%
Construction/Engineering	8,194,271,621	3.72%	13,202,732,999	5.93%	7,701,850,191	3.41%
Personal	2,592,216,227	1.18%	6,285,876,810	2.82%	4,670,771,010	2.07%
Pharmaceuticals	7,574,602,323	3.44%	6,816,064,917	3.06%	7,200,219,873	3.19%
Real Estate	11,966,026,196	5.43%	6,200,818,459	2.78%	12,123,867,628	5.37%
Cargo and Travel Services	365,117,469	0.17%	7,416,836	0.00%	164,333,295	0.07%
Paper & Packaging	747,907,521	0.34%	646,112,352	0.29%	803,524,579	0.36%
Agro based industry/ Dairy products/ Food & Beverage	5,757,715,638	2.61%	5,188,596,532	2.33%	8,622,444,872	3.82%
Others	66,481,309,978	30.17%	77,400,295,837	34.76%	62,764,548,288	27.81%
Total	220,341,546,433	100.00%	222,694,147,172	100.00%	225,709,286,940	100.00%

Table 20: ONE Bank LTD's Loan Portfolio. Source: ONE Bank Annual Report

Over the years, ONE Bank Ltd has manifested a growth in its loan portfolio, reflecting strategic adaptations to sectoral weights. In 2020, the total loan portfolio amounted to 220.34 billion BDT, which grew to 222.69 billion BDT in 2021 and further expanded to 225.71 billion BDT in 2022. Trade finance-maintained significance, contributing 13.21% in 2022, indicative of its sustained importance. Notably, Readymade Garments, Textiles, and Pharmaceuticals demonstrated fluctuations, while Real Estate exhibited substantial growth from 2.78% in 2021 to 5.37% in 2022. The 'Others' category, encompassing diverse sectors, contributed significantly at 27.81% in 2022.

PREMIER BANK						
Advances to abed concerns of directors	2020	Weights	2021	Weights	2022	Weights
Advances to chief executives and senior executives	54,429,770	0.03%	48,348,064	0.02%	81,849,969	0.03%
Loans ft Advances to industries						0.00%
Textile fit RMG industries	52,852,262,751	24.56%	76,851,540,956	30.50%	82,463,282,797	30.92%
Cement and ceramic industries	2,310,536,523	1.07%	2,310,684,747	0.92%	3,243,344,027	1.22%
Food and abed industries	4,977,979,198	2.31%	5,176,972,129	2.05%	8,469,907,769	3.18%
Transport and communication industries	1,656,122,407	0.77%	584,399,953	0.23%	933,628,925	0.35%
Iron and steel industries	4,795,674,995	2.23%	5,144,133,395	2.04%	4,826,391,787	1.81%
Other industries	51,900,346,972	24.12%	57,934,514,975	22.99%	87,100,000,423	32.66%
Loans ft Advances to other customer groups	118,844,579,890	55.22%	148,264,396,400	58.84%	187,367,885,553	70.26%
Commercial lending	34,350,592,316	15.96%	17,936,019,076	7.12%	35,140,324,058	13.18%
Export financing	8,714,474,600	4.05%	6,779,016,566	2.69%	11,052,232,539	4.14%
House building	8,534,139,528	3.97%	7,101,257,114	2.82%	4,521,947,582	1.70%
Consigner credit	7,613,952,397	3.54%	9,476,682,864	3.76%	9,282,975,697	3.48%
Small and median enterprises	24,010,423,414	11.16%	45,758,448,949	18.16%	4,100,903,433	1.54%
Other staff loan	232,016,843	0.11%	554,429,940	0.22%	571,876,768	0.21%
Other customers	12,915,755,875	6.00%	16,121,068,830	6.40%	14,638,746,378	5.49%
Total Other customer loans	96,371,354,973	44.78%	103,726,923,339	41.16%	79,309,006,455	29.74%
Total	215,215,934,863	100.00%	251,991,319,739	100.00%	266,676,892,008	100.00%

Table 21: Loan portfolio of Premier Bank. Source: Premier Bank Annual Report

In 2020, Premier Bank presented a diverse loan portfolio valued at 215.22 billion BDT, which expanded to 251.99 billion BDT in 2021 and reached 266.68 billion BDT in 2022. This growth reflects the bank's strategic approach in catering to various sectors. Textile & RMG industries held a substantial share, contributing 30.92% in 2022. Noteworthy shifts occurred in Cement and ceramic industries, Food and allied industries, and Transport and communication industries, reflecting dynamic market conditions. The category of other industries exhibited remarkable growth from 22.99% in 2021 to 32.66% in 2022. Loans & Advances to other customer groups accounted for 70.26% in 2022, emphasizing Premier Bank's diverse client base. The Commercial lending sector fluctuated but held a considerable share, and Small and Medium Enterprises experienced a notable decrease from 18.16% in 2021 to 1.54% in 2022.

PRIMEBANK						
Loans, advances and lease / investments	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
a) Loans, advances and lease / investments to Directors of the Bank			900,042	0.0003%	621,107	0.00021%
b) Loans, advances and lease	1,316,446,818	0.57%	1,649,880,387	0.63%	2,030,590,112	0.68%
c) Loans, advances and lease / divestments to customer groups:		0.00%		0.00%		
i) Commercial lending	10,399,477,952	4.47%	11,407,982,707	4.34%	10,834,594,011	3.65%
ii) Export financing	15,042,811,346	6.47%	23,517,508,291	8.94%	27,500,136,228	9.28%
iii) House building loan	1,859,082,012	0.80%	1,437,498,456	0.55%	8,491,377,083	2.86%
iv) Retail loan	14,570,611,514	6.27%	16,835,739,547	6.40%	14,063,960,797	4.74%
v) Small and median enterprises	29,118,062,698	12.53%	33,927,706,462	12.90%	34,039,518,794	11.48%
vi) Industrial loans / investments (note-7a.4 d)	143,865,018,445	61.90%	154,940,009,320	58.91%	179,548,926,378	60.56%
vii) other loans and advances	16,228,572,148	6.98%	19,299,022,679	7.34%	19,971,624,762	6.74%
Total	231,083,636,115	99.43%	261,365,467,462	99.37%	294,450,138,053	99.31%
Total Loans and Advances	232,400,082,933	100.00%	263,016,247,891	100.00%	296,481,349,272	100.00%

Table 22: Loan Portfolio of Prime Bank. Source: Prime Bank Annual Report

In 2020, Prime Bank maintained a substantial loan portfolio of BDT 232.4 billion, with a notable share in Industrial loans/investments at 61.90%. Over the years, the bank demonstrated growth, reaching 263.02 billion BDT in 2021 and 296.48 billion BDT in 2022. The bank's strategic focus is evident in the diversified loan distribution among various sectors. Commercial lending, Export financing, and Small and Medium Enterprises (SMEs) were consistent contributors, with SMEs exhibiting a slight decrease from 12.90% in 2021 to 11.48% in 2022. Industrial loans/investments maintained a dominant position, growing from 58.91% in 2021 to 60.56% in 2022.

Pubali Bank						
Loan Concentration	**2020**	**Pubali Bank Weights**	**2021**	**Weights**	**2022**	**Weights**
Jute	157,541,346	0.05%	198,295,028	0.05%	608,921,373	0.13%
Textile	25,115,135,520	7.96%	35,183,627,519	9.34%	46,807,328,394	10.13%
Ready-made garments	24,387,172,355	7.73%	28,003,130,511	7.43%	33,676,578,915	7.29%
Steel fit engineering	11,985,967,411	3.80%	15,885,448,581	4.22%	22,617,419,541	4.90%
Ship breaking	2,961,544,783	0.94%	2,908,570,809	0.77%	2,907,010,499	0.63%

Pubali Bank						
Loan Concentration	**2020**	**Pubali Bank Weights**	**2021**	**Weights**	**2022**	**Weights**
Edible Oil	9,277,075,594	2.94%	9,904,622,939	2.63%	15,616,818,043	3.38%
Cement	6,294,999,986	1.99%	7,398,826,350	1.96%	7,609,589,986	1.65%
Pharmaceuticals	7,679,063,363	2.43%	9,157,796,176	2.43%	12,130,011,758	2.63%
Food fit abed	13,181,603,715	4.18%	26,057,961,291	6.92%	30,857,862,042	6.68%
Electrical equipments fit Electronic Goods	5,798,885,361	1.84%	12,168,356,992	3.23%	17,622,036,739	3.82%
Paper, pa per products and packaging	1,713,700,130	0.54%	3,029,573,740	0.80%	4,310,243,616	0.93%
Leather	94,438,658	0.03%	860,945,752	0.23%	381,561,694	0.08%
Printing & Dyeing Industries	6,509,818,788	2.06%	6,955,849,552	1.85%	4,218,867,603	0.91%
Others Manufacturing Industries	21,763,256,865	6.90%	25,200,198,395	6.69%	37,079,254,550	8.03%
Energy and power	5,434,061,317	1.72%	7,866,558,117	2.09%	7,452,797,855	1.61%
Hospitals, Clinics and other health services	5,933,516,575	1.88%	5,585,026,149	1.48%	7,046,081,841	1.53%
Construction	15,439,028,416	4.89%	15,615,146,107	4.15%	16,999,334,318	3.68%
Housing	12,419,106,551	3.94%	13,119,170,249	3.48%	11,396,175,500	2.47%
Transport and communication	3,353,645,880	1.06%	2,145,815,225	0.57%	2,137,407,820	0.46%
Others Service Industries	5,026,691,429	1.59%	6,150,393,198	1.63%	9,704,482,673	2.10%
Trade fit Commerce	64,106,995,361	20.31%	75,274,839,530	19.99%	82,273,454,120	17.81%
NBF1 (Non Bank Financial Institution)	4,876,746,425	1.55%	4,104,174,312	1.09%	3,764,994,321	0.82%
NGO	7,372,897,455	2.34%	5,259,627,866	1.40%	9,878,224,497	2.14%
Consumer Finance	27,356,996,133	8.67%	32,353,690,730	8.59%	39,536,380,144	8.56%
Others	21,260,135,665	6.74%	19,298,377,117	5.12%	25,960,191,937	5.62%
Total	315,578,899,240	100.00%	376,656,431,938	100.00%	461,884,126,081	100.00%

Table 23: Loan Portfolio of Pubali Bank. Source: Pubali Bank Annual Report

In 2020, Pubali Bank demonstrated a diverse loan portfolio of 315.58 billion BDT, encompassing various sectors. The following years exhibited considerable growth, reaching 376.66 billion BDT in 2021 and soaring to 461.88 billion BDT in 2022. The bank's commitment to agriculture is evident, with a consistent increase from 1.93% in 2020 to 2.01% in 2022. Notable expansions include the textile industry, with a rise from 7.96% to 10.13%, and the ready-made garments sector, growing from 7.73% to 7.29%. The service sector maintained a substantial share, with trade and commerce contributing 17.81% in 2022. Consumer finance exhibited growth, increasing from 8.67% to 8.56%. Overall, Pubali Bank's dynamic sectoral distribution reflects its strategic approach to balance risk and foster economic development.

RUPALIBANK						
Loan Concentration	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agriculture	11,116,400,000	3.30%	13,045,100,000	3.43%	6,066,800,000	1.39%
Industry	205,207,500,000	60.92%	230,192,500,000	60.44%	226,708,302,212	52.07%
Trade fit Commerce	70,553,400,000	20.95%	79,546,400,000	20.89%	86,043,100,000	19.76%
Construction	6,413,900,000	1.90%	7,305,100,000	1.92%	5,887,200,000	1.35%
Transport	3,314,600,000	0.98%	3,699,400,000	0.97%	6,132,700,000	1.41%
Consigner trance	13,131,100,000	3.90%	25,214,900,000	6.62%	52,388,000,000	12.03%
Miscellaneous	27,098,314,789	8.04%	21,830,304,514	5.73%	52,174,671,503	11.98%
Total	336,835,214,789	100.00%	380,833,704,514	100.00%	435,400,773,715	100.00%

Table 24: Loan Portfolio of Rupali Bank. Rupali Bank Annual Report

In 2020, Rupali Bank displayed a loan portfolio with a total value of BDT 336.84 billion, distributed across various sectors. Over the next two years, the bank's loan concentration increased, reaching BDT 380.83 billion in 2021 and BDT 435.40 billion in 2022. Agriculture, despite a temporary decline from 3.30% to 1.39%, retained its significance in supporting the rural economy. The industrial sector remained a dominant force, maintaining a consistent share of around 60% throughout the period. Trade and commerce, constituting nearly 21%, showcased steady growth. Consumer finance experienced remarkable expansion, escalating from 3.90% to 12.03%, indicating a strategic focus on retail lending. The miscellaneous category, encompassing diverse segments, demonstrated significant volatility, decreasing in 2021 but rebounding in 2022.

SBAC BANK						
Loan concentration	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agriculture, fisheries and forestry	1,269,845,704	2.21%	185,607,327	0.28%	2,666,821,867	3.42%
Agro base processing industries	6,652,997,400	11.60%	5,739,412,839	8.70%	6,001,587,338	7.70%
Small & medium enterprise financing (SMET)	22,256,584,236	38.81%	24,415,884,495	37.02%	28,371,555,881	36.38%
RMG & textile industries	5,531,782,128	9.65%	6,920,200,276	10.49%	8,211,600,726	10.53%
Hospitals, clinics & medical colleges	430,467,041	0.75%	536,043,894	0.81%	648,968,310	0.83%
Trade & commerce	4,054,251,831	7.07%	5,516,421,904	8.36%	6,166,429,149	7.91%
Transport and communications	407,641,050	0.71%	326,913,079	0.50%	566,058,218	0.73%
Rubber & plastic industries	1,158,079,800	2.02%	1,022,787,032	1.55%	1,730,206,008	2.22%
Iron, steel & aluminium industries	1,729,871,836	3.02%	2,963,615,350	4.49%	3,468,343,081	4.45%
Printing & Packaging industries	370,294,347	0.65%	92,437,523	0.14%	191,577,128	0.25%
Other manufacturing industries	4,976,262,278	8.68%	5,975,787,524	9.06%	7,165,073,470	9.19%
Housing & construction industries	702,643,427	1.23%	870,941,258	1.32%	983,401,075	1.26%
Consigner credit	753,152,938	1.31%	901,086,302	1.37%	1,030,987,576	1.32%
Others	7,047,224,679	12.29%	10,488,542,263	15.90%	10,789,708,188	13.83%
Total	57,341,098,695	100.00%	65,955,681,066	100.00%	77,992,318,015	100.00%

Table 25: Loan Portfolio of SBAC Bank. Source: SBAC Bank Annual Report

In 2020, SBAC Bank exhibited a loan portfolio valued at 57.34 billion BDT, which witnessed significant growth over the subsequent years. The loan concentration increased to 65.96 billion BDT in 2021 and further to 77.99 billion BDT in 2022. The sectoral distribution highlights the bank's diversified approach. Agriculture, Fisheries, and Forestry Initially at 2.21%, this sector experienced a notable increase to 3.42% in 2022. Agro Base Processing Industries Accounting for 11.60% in 2020, it maintained relevance, contributing 7.70% in 2022. Small & Medium Enterprise Financing (SMEF) significant portion of the portfolio, with a slight decrease from 38.81% to 36.38%. RMG & Textile Industries sector expanded from 9.65% to 10.53% over the years. Trade & Commerce representing 7.07% in 2020, it saw growth to 7.91% in 2022. Transport and Communications segment increased slightly from 0.71% to 0.73%. Other Manufacturing Industries grew from 8.68% to 9.19%. Housing & Construction Industries registered a moderate increase from 1.23% to 1.26%. Consumer Credit contributed 1.31% in 2020, it expanded to 1.32% in 2022. Others sector initially at 12.29%, reaching 13.83% in 2022.

Shahjalal Bank						
Loan Portfolio	2020	Weights	2021	Weights	2022	Weights
Agriculture & Fishing	4,428,100,000	2.25%	3,745,300,000	1.73%	3,750,070,867	1.58%
Cotton & Textile	14,204,891,416	7.23%	15,986,252,326	7.38%	19,698,236,300	8.30%
Garments	35,917,795,745	18.28%	48,795,252,329	22.53%	53,779,166,142	22.67%
Cement	2,909,125,717	1.48%	1,377,204,327	0.64%	1,973,238,650	0.83%
Pharmaceutical & Chemicals	3,502,368,796	1.78%	5,765,427,211	2.66%	7,198,057,346	3.03%
Real Estate	6,823,342,294	3.47%	7,861,742,082	3.63%	8,303,793,964	3.50%
Transport	3,852,956,608	1.96%	3,612,697,161	1.67%	3,064,912,499	1.29%
Information Technology	1,049,993,980	0.53%	785,682,273	0.36%	700,689,623	0.30%
Non-Banking Financial Institutions	1,547,537,178	0.79%	1,049,270,234	0.48%	1,439,455,629	0.61%
Steel & Engineering	10,718,891,585	5.45%	7,861,742,082	3.63%	8,403,069,265	3.54%
Food Processing & Beverage	11,586,731,440	5.90%	13,394,922,486	6.18%	17,157,443,728	7.23%
Power & Energy	6,157,617,851	3.13%	5,718,061,127	2.64%	7,780,171,632	3.28%
Paper & Paper Products	2,220,723,185	1.13%	2,128,663,687	0.98%	1,743,874,720	0.74%
Plastic & Plastic Product	5,605,896,330	2.85%	6,299,677,023	2.91%	7,206,031,728	3.04%
Electronics	5,629,384,876	2.86%	6,650,416,932	3.07%	9,527,940,996	4.02%
Services Industries	6,660,892,213	3.39%	7,314,961,280	3.38%	7,935,089,101	3.34%
Trading	31,252,429,405	15.90%	30,870,690,066	14.25%	32,884,014,916	13.86%
Construction incl. Work Order finance	20,620,941,948	10.49%	21,190,235,269	9.78%	19,053,683,321	8.03%
Share business	2,256,505,482	1.15%	2,388,413,151	1.10%	2,369,005,756	1.00%
Staff Investment	1,881,187,195	0.96%	2,013,480,269	0.93%	2,224,379,061	0.94%
Others	17,685,337,995	9.00%	21,776,492,686	10.05%	21,037,652,348	8.87%
Total	196,512,651,241	100.00%	216,586,58 3,999	100.00%	237,229,977,592	100.00%

Table 26: Loan Portfolio of Shahjalal Bank. Source: Shahjalal Islami Bank Annual Report

Over the period from 2020 to 2022, Shahjalal Bank exhibited remarkable growth and diversification in its loan portfolio, which expanded from 196.51 billion BDT in 2020 to 237.23 billion BDT in 2022. The sectoral distribution of loans underwent notable changes during this period. While agriculture and fishing experienced a reduction in share from 2.25% to 1.58%, the cotton and textile sector grew from 7.23% to 8.30%. Garments emerged as a significant contributor, increasing from 18.28% to 22.67%. Conversely, the cement sector witnessed a decrease from 1.48% to 0.83%. Pharmaceuticals and chemicals expanded from 1.78% to 3.03%. Real estate maintained a stable share around 3.47% to 3.50%, while the transport sector slightly decreased from 1.96% to 1.29%. Information technology saw a reduction from 0.53% to 0.30%, and non-banking financial institutions (NBFI) fluctuated around 0.79%, 0.48%, and 0.61% in 2020, 2021, and 2022, respectively. The steel and engineering sector contributed 5.45%, 3.63%, and 3.54% in 2020, 2021, and 2022. Food processing and beverage showed growth from 5.90% to 7.23%. The power and energy sector increased from 3.13% to 3.28%. Conversely, the paper and paper products sector declined from 1.13% to 0.74%. Plastic and plastic products expanded from 2.85% to 3.04%, and electronics grew from 2.86% to 4.02%. Services industries maintained a stable share around 3.39% to 3.34%. Trading remained consistent, contributing 15.90%, 14.25%, and 13.86% in 2020, 2021, and 2022. Construction, including work order financing, experienced a slight decrease from 10.49% to 8.03%. Share business remained relatively stable, contributing around 1.15% to 1.00%. Staff investment slightly decreased from 0.96% to 0.94%. The others category contributed 9.00%, 10.05%, and 8.87% in 2020, 2021, and 2022, respectively. This diversified portfolio reflects Shahjalal Bank's strategic approach to risk management and capitalizing on opportunities across various segments of the economy.

SIBL						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Commercial landing	63,085,991,368	Weights	66,983,216,806		108,243,332,400	
Export Financing	7,421,291,294	2.47%	10,018,240,417	3.20%		
House Building Investment	4,016,753,073	1.34%	3,864,365,305	1.24%		
Investment against Scheme fit MTDR	5,291,700,741	1.76%	6,907,453,322	2.21%		
Small and Medium Enterprises	61,920,979,098	20.60%	57,263,505,578	18.31%		
Micro Investment	678,555,344	0.23%	785,791,674	0.25%	4,188,171,402	1.22%
Other Investments	15,673,861,882	5.21%	14,324,315,811	4.58%	42,026,222,733	12.25%
Off-shore Banking Unit	4,308,095,641	1.43%	5,071,054,090	1.62%		
Executives fit Staffs of SIBL	2,333,636,172	0.78%	2,167,849,126	0.69%		
Agricultural Industries	3,123,138,160	1.04%	3,251,358,104	1.04%	4,877,182,262	1.42%
Textile fit Abed Industries	41,971,323,395	13.96%	44,333,363,875	14.17%	45308526320	13.21%
Food fit Abed Industries	13,678,729,468	4.55%	14,171,054,554	4.53%	18,744,312,583	5.47%
Pharmaceutical Industries	1,756,699,072	0.58%	1,791,887,029	0.57%	1,489,012,956	0.43%
Leather, Chemical, Cosmetic etc.	4,215,657,911	1.40%	4,205,065,075	1.34%	5,257,533,755	1.53%
Construction Industries	9,140,136,470	3.04%	9,933,688,170	3.18%	2,212,630,165	0.65%
Cement and Ceramic Industries	5,027,401,867	1.67%	5,014,614,486	1.60%	5,555,868,687	1.62%
Service Industries	16,686,788,763	5.55%	13,314,958,894	4.26%	37,619,006,445	10.97%
Transport and communication Industries	4,143,127,206	1.38%	2,794,855,884	0.89%		
Other Industries	36,144,076,640	12.02%	46,577,182,327	14.89%	67,422,357,795	19.66%
Total	300,617,943,565	100.00%	312,773,820,527	100.00%	342,944,157,503	100.00%

Table 27: Social Islami Bank Limited (SIBL)'S Investment Concentration. Source: SIBL Bank Annual Report.

During the years 2020 to 2022, Social Islami Bank Limited (SIBL) endured notable changes in its loan portfolio, reflecting strategic shifts in its lending focus. The total loan portfolio increased from 300.62 billion BDT in 2020 to 342.94 billion BDT in 2022. Commercial lending emerged as a dominant category, exhibiting substantial growth from 20.99% to 31.56%. Export financing, house building investment, and investment against scheme & MTDR also contributed to the portfolio, albeit with varying weights. Small and Medium Enterprises (SMEs) constituted a significant portion, showing a decrease from 20.60% to 18.31%. Micro-investment experienced a notable increase from 0.23% to 1.22%, reflecting the bank's focus on the microfinance sector. Other investments, including off-shore banking units and loans to executives and staff, exhibited shifts in their weights. Agricultural industries, textile and allied industries, food and allied industries, pharmaceutical industries, and other manufacturing sectors demonstrated varied patterns in their contributions. Notably, service industries saw a substantial increase from 4.26% to 10.97%, indicating a strategic emphasis on this sector. The transport and communication industries witnessed fluctuations, while other industries exhibited significant growth from 12.02% to 19.66%. This diversified and dynamic loan portfolio reflects SIBL's adaptive strategies to cater to various sectors of the economy and align its lending practices with emerging market trends.

Southeast Bank						
Loan Portfolio	2020	Weights	2021	Weights	2022	Weights
Agriculture	3,843,409,443	1.20%	4,604,216,534	1.38%	8,324,946,400	2.41%
Industrial (Manufacturing)	161,770,004,160	50.50%	161,325,882,519	48.37%	167,972,736,939	48.70%
Industrial (Services)	46,073,077,916	14.38%	47,050,477,149	14.11%	49,157,538,853	14.25%
Expert Financing	34,602,234,676	10.80%	46,249,695,331	13.87%	50,295,053,069	14.58%
Commercial Loans	39,517,386,857	12.33%	37,969,927,761	11.39%	38,040,021,248	11.03%
Consigner Credit	5,071,136,407	1.58%	5,626,616,644	1.69%	5,999,570,675	1.74%
Others:						
a) Off-shore Banking Loans	19,478,341,589	6.08%	21,887,800,000	6.56%	18,354,882,515	5.32%
b) Finance to NBFIs	1,113,249,140	0.35%	1,007,763,311	0.30%	982,496,426	0.28%
c) Loans to Capital Market	1,863,905,128	0.58%	1,588,268,068	0.48%		
d) Miscellaneous	7,035,413,554	2.20%	6,194,085,023	1.86%	5,805,019,877	1.68%
Total	320,368,158,870	100%	333,504,732,340	100%	344,932,266,002	100.00%

Table 28: Loan portfolio of Southeast Bank Limited. Source: Southeast Bank Annual Report

In the years 2020 through 2022, Southeast Bank Limited (SOUTHEASTB) experienced changes in its loan portfolio, showcasing strategic adjustments in its lending priorities. The total loan portfolio increased from 320.37 billion BDT in 2020 to 344.93 billion BDT in 2022. Industrial (Manufacturing) loans, constituting 50.50% in 2020, slightly decreased to 48.37% in 2022. Meanwhile, Industrial (Services) loans maintained a substantial share, with slight growth from 14.38% to 14.25%. Export financing exhibited an upward trajectory, rising from 10.80% to 14.58%, indicating an increased focus on facilitating trade. Commercial loans witnessed a marginal decrease from 12.33% to 11.03%. Consumer credit, while a smaller portion, experienced a modest increase from 1.58% to 1.74%. The category labeled as "Others" includes various segments such as off-shore banking loans, finance to Non-Banking Financial Institutions (NBFIs), and loans to the capital market. Off-shore banking loans showed fluctuations, declining from 6.08% to 5.32%. Loans to NBFIs and the capital market demonstrated varying patterns. The miscellaneous category in the "Others" segment witnessed a decline from 2.20% to 1.68%.

STANDARD BANK						
Loan portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Investments to allied concerns of Directors/Sponsors of the Bank	463,698,000	0.29%	504,880,000	0.31%	303,318,000	0.17%
Investments to Chief Executive and other senior executives (inc.)	1,033,343,645	0.65%	1,087,682,623	0.66%	1,054,159,396	0.60%
investments to customers group :						
Commercial lending	14,352,100,000	9.00%	9,689,900,000	5.91%	11,194,100,000	6.42%
Export financing	3,333,300,000	2.09%	1,589,200,000	0.97%	2,700,000,000	1.55%
House building Investment	2,401,911,213	1.51%	6,582,500,000	4.01%	8,357,600,000	4.79%
Consigners Investment Scheme	3,297,800,000	2.07%	4,551,400,000	2.78%	5,340,200,000	3.06%
Small and medium enterprises	32,304,395,658	20.26%	33,203,400,000	20.25%	35,110,000,000	20.14%
Special program Investment	483,790,293	0.30%	3,818,283,389	2.33%	296,496,912	0.17%

STANDARD BANK						
Loan portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Other Investments	4,581,766,587	2.87%	789,200,000	0.48%	2,067,000,000	1.19%
Subtotal investments	60,755,063,751	38.10%	60,223,883,389	36.73%	65,065,396,912	37.32%
industrial investments		0.00%				
Agricultural Industries	2,726,900,000	1.71%	3,188,500,000	1.94%	4,730,000,000	2.71%
Textile Industries	5,754,800,000	3.61%	23,239,000,000	14.17%	6,720,000,000	3.85%
Food and abed Industries	10,659,000,000	6.68%	10,477,800,000	6.39%	11,464,400,000	6.58%
Pharmaceuticals Industries	258,700,000	0.16%	5,200,000	0.00%	60,000,000	0.03%
Leather, Chemical and Cosmetics etc.	2,212,500,000	1.39%	2,441,700,000	1.49%	2,471,500,000	1.42%
Cement and Ceramic Industries	1,398,400,000	0.88%	1,326,100,000	0.81%	1,432,900,000	0.82%
Service Industries	4,997,800,000	3.13%	4,908,400,000	2.99%	1,312,400,000	0.75%
Transport and Communication Industries	3,475,900,000	2.18%	3,391,300,000	2.07%	2,500,000,000	1.43%
Other Industries	65,714,100,001	41.21%	53,164,210,968	32.43%	77,229,833,390	44.30%
Subtotal investments	97,198,100,001	60.96%	102,142,210,968	62.30%	107,921,033,390	61.90%
Total investments	159,450,205,397	100.00%	163,958,656,980	100.00%	174,343,907,698	100.00%

Table 29: Standard Bank Limited's Loan Portfolio. Source: Standard Annual Report.

Standard Bank Limited (STANDBANKL) experienced remarkable changes in its loan portfolio structure from 2020 to 2022, indicating shifts in investment priorities. The total investments increased from 159.45 billion BDT in 2020 to 174.34 billion BDT in 2022. Investments in allied concerns of Directors/Sponsors experienced fluctuations, decreasing from 0.29% to 0.17%. Similarly, investments in the Chief Executive and other senior executives slightly decreased from 0.65% to 0.60%. In the customer group investments category, commercial lending exhibited a relative decrease from 9.00% to 6.42%, while export financing and house building investments showed varying patterns. Consumer investment schemes and small and medium enterprises (SMEs) witnessed increases from 2.07% to 3.06% and 20.26% to 20.14%, respectively. Special program investments fluctuated. Other investments in this category showed a decrease from 2.87% to 1.19%. The industrial investments category demonstrated considerable changes. Textile industries exhibited a substantial increase from 3.61% to 14.17%, while service industries and other industries showed fluctuations. The total investments in industrial sectors increased from 60.96% to 61.90%

TRUSTBANK						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agro fit Fisheries	3,810,252,852	1.72%	6,170,234,944	2.40%	4,284,302,376	1.44%
RMG	26,412,133,373	11.95%	26,796,646,389	10.41%	31,950,478,246	10.71%
Textile	8,428,761,984	3.81%	16,934,027,611	6.58%	20,150,756,736	6.75%
Food and abed industries (Edible oil included)	15,097,584,749	6.83%	17,645,090,278	6.86%	22,466,795,278	7.53%
Pharmaceutical industries	2,944,069,105	1.33%	2,767,979,853	1.08%	4,116,612,489	1.38%
Chemical, fertilizer, etc.	3,660,757,709	1.66%	5,577,971,862	2.17%	8,574,296,665	2.87%
Cement and ceramic industries	4,717,331,025	2.13%	8,892,094,293	3.46%	7,099,323,484	2.38%
Ship building industries	1,198,212,293	0.54%	1,160,962,025	0.45%	1,831,145,256	0.61%
Ship breaking industries	3,005,928,836	1.36%	-	0.00%		0.00%
Power and gas	11,388,738,745	5.15%	14,043,743,164	5.46%	19,137,705,730	6.41%
Other manufacturing or extractive industries (Rubber fit Plastic	29,369,399,581	13.29%	33,934,521,226	13.19%	37,928,329,633	12.71%

TRUSTBANK						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Service Industries (Telecom fit ICT, Medical Service included)	16,121,251,464	7.29%	18,770,651,631	7.30%	23,318,813,593	7.82%
Other Industry	466,089,546	0.21%	332,219,985	0.13%	313,672,656	0.11%
Trade fit Commerce	18,473,595,232	8.36%	21,241,875,472	8.26%	25,457,458,701	8.53%
Residential Real Estate	11,691,257,977	5.29%	7,996,018,526	3.11%	5,506,084,539	1.85%
Commercial Real Estate	10,160,746,312	4.60%	13,354,121,560	5.19%	14,690,385,237	4.92%
Infrastructure Development	11,530,423,487	5.22%	11,044,782,536	4.29%	13,263,310,581	4.45%
Construction fit Housing	77,658,430	0.04%	481,747,886	0.19%	515,916,780	0.17%
Transport	847,313,878	0.38%	1,529,614,597	0.59%	1,412,313,953	0.47%
Consigner Financing (Personal Services)	35,438,850,758	16.03%	38,841,920,131	15.10%	41,112,809,465	13.78%
Loans to Financial Institution (NBFI & NGO included)	3,862,127,322	1.75%	7,312,679,333	2.84%	12,327,813,103	4.13%
Miscellaneous (Others)	2,361,201,523	1.07%	2,466,481,053	0.96%	2,918,123,608	0.98%
	221,063,686,181	100.00%	257,295,384,355	100.00%	298,376,448,109	100.00%

Table 30: Loan Portfolio of Trust Bank Limited. Source: Trust Bank Annual Report.

Trust Bank Limited (TRUSTBANK) has exhibited significant shifts in its loan portfolio composition from 2020 to 2022, reflecting changes in the bank's lending strategy and economic dynamics. The total loan portfolio increased from 221.06 billion BDT in 2020 to 298.38 billion BDT in 2022.

In the industrial sector, there were fluctuations in allocations. Notably, the textile industry's share increased from 3.81% to 6.75%, while ship breaking industries saw a reduction to 0.00%. Power and gas, along with other manufacturing or extractive industries, experienced growth, reflecting the bank's focus on these sectors.

The real estate sector witnessed changes, with a decrease in residential real estate from 5.29% to 1.85%, and a simultaneous increase in commercial real estate from 4.60% to 4.92%. Infrastructure development and construction and housing loans also showed variations.

Trade and commerce loans increased from 8.36% to 8.53%, indicating sustained support for businesses in this sector. Consumer financing, including personal services, maintained a substantial share, though it decreased from 16.03% to 13.78%.

UCB						
Loan portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
RMG & Accessories	62,515,449,692	17.78%	85,745,065,804	21.30%	84,079,761,237	17.94%
Textile Industries	18,327,435,620	5.21%	24,789,611,096	6.16%	32,456,282,644	6.93%
Agriculture	3,279,965,989	0.93%	4,766,106,487	1.18%	6,272,720,919	1.34%
Food Products & Processing	16,340,896,582	4.65%	15,604,962,054	3.88%	18,416,246,261	3.93%
Jute Industries	224,193,408	0.06%	219,726,904	0.05%	227,457,203	0.05%
Leather & Leather Products	1,152,539,648	0.33%	1,283,409,827	0.32%	1,345,234,575	0.29%
Paper & Paper Products Industries	7,331,200,429	2.08%	7,443,876,678	1.85%	6,880,541,819	1.47%
Wood & Wooden Products	2,690,550,710	0.77%	2,822,102,309	0.70%	2,229,491,533	0.48%
Chemical & Chemical Products	3,167,747,693	0.90%	6,541,225,453	1.63%	9,846,114,838	2.10%

UCB						
Loan portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Cement Industries	10,482,244,648	2.98%	10,458,041,616	2.60%	14,806,113,247	3.16%
Bride Field, Auto Brides, Ties	978,940,459	0.28%	1,503,664,468	0.37%	2,330,461,103	0.50%
Engineering, Basic Metal & Products	20,703,994,701	5.89%	11,559,966,845	2.87%	16,818,759,987	3.59%
Ship Re-cycling	4,971,358,112	1.41%	7,011,565,533	1.74%	11,943,009,041	2.55%
Ship Manufacturing	3,844,326,395	1.09%	2,320,056,667	0.58%	1,850,623,547	0.39%
Educational Institute, Hotel, Restaurant	1,957,061,686	0.56%	3,169,071,431	0.79%	5,839,267,577	1.25%
Telecommunication	1,886,155,481	0.54%	2,441,694,716	0.61%	2,442,455,755	0.52%
Transport & communication	3,020,436,166	0.86%	3,715,012,679	0.92%	3,766,590,422	0.80%
Diagnostic/Medical/Clinic	3,614,654,436	1.03%	3,641,814,854	0.90%	3,849,136,870	0.82%
Housing Industry	21,696,876,534	6.17%	23,753,409,182	5.90%	25,025,888,198	5.34%
Construction (Other than Housing)	31,789,433,864	9.04%	34,831,450,370	8.65%	38,105,193,198	8.13%
Electronics Media	372,992,024	0.11%	342,143,301	0.09%	335,270,270	0.07%
Power & Energy	9,914,024,298	2.82%	9,960,279,417	2.47%	10,870,069,620	2.32%
Commercial Trade Financing	64,435,460,067	18.32%	73,169,869,658	18.18%	78,427,799,048	16.74%
Glass & Glassware Product Industries	4,083,208	0.00%	273,075,916	0.07%	518,954,390	0.11%
Tea Manufacturing	533,516,992	0.15%	702,871,809	0.17%	421,550,403	0.09%
Others	56,448,020,560	16.05%	64,411,660,672	16.00%	89,500,102,311	19.10%
Total	351,683,559,403	100.00%	402,481,735,743	100.00%	468,605,096,016	100.00%

Table 31: United Commercial Bank (UCB)'S Loan Portfolio. Source: UCB Bank Annual Report

United Commercial Bank (UCB) has demonstrated notable changes in its loan portfolio from 2020 to 2022, reflecting adjustments in the bank's lending strategies and market dynamics. The total loan portfolio increased substantially from BDT 351.68 billion in 2020 to BDT 468.61 billion in 2022.

In terms of sectoral allocations, the Ready-Made Garments (RMG) and accessories continued to hold a significant share, though it decreased from 17.78% to 17.94%. Textile industries witnessed a substantial increase from 5.21% to 6.93%, showcasing the bank's focus on this sector.

Agriculture, food products and processing, and jute industries experienced variations in their shares, while leather and leather products, paper and paper products industries, and wood and wooden products showed a decrease in their weights.

Commercial trade financing maintained its prominence, although there was a slight decrease from 18.32% to 16.74%. Other sectors, including power and energy, construction, and electronics media, showed relatively stable weights.

The "Others" category exhibited a significant rise from 16.05% to 19.10%, indicating diverse lending in various sectors beyond the specified ones.

UTTARA BANK						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Agriculture (Dairy, Poultry, Nursery etc.)	4,994,563,490	3.73%	4,619,695,762	3.10%	4,636,740,510	2.83%
Agriculture (Crops)	503,737,308	0.38%	563,817,490	0.38%	245,450,866	0.15%
Agriculture (Non-crops)	4,490,826,182	3.36%	4,055,878,272	2.72%	4,391,289,644	2.68%
Industries (Manufacture/Power/Service/Agro-based)	53,128,025,216	39.69%	57,517,496,614	38.61%	68,652,866,870	41.87%
Agro based	7,864,938,167	5.88%	8,678,253,460	5.82%	13,360,005,159	8.15%
Construction- Apartment/Housing	10,631,443,259	7.94%	12,784,487,029	8.58%	14,009,962,488	8.54%
Construction- Commercial	3,642,915,532	2.72%	3,250,032,932	2.18%	2,197,222,045	1.34%

UTTARA BANK						
Loan Portfolio	**2020**	**Weights**	**2021**	**Weights**	**2022**	**Weights**
Drugs & Pharmaceuticals	951,373,259	0.71%	825,973,390	0.55%	458,642,860	0.28%
Food & Beverage	2,504,930,897	1.87%	2,892,080,485	1.94%	14,625,535,650	8.92%
Fuel & Power	6,516,110	0.00%	352,498,917	0.24%		
ICT	143,432,975	0.11%	55,019,898	0.04%	111,863,417	0.07%
Iron & Steels	6,030,648,864	4.51%	3,980,401,287	2.67%	3,367,803,901	2.05%
Jute & Jute Products	308,594,588	0.23%	276,440,135	0.19%	138,673,131	0.08%
Leather & Leather Products	825,919,512	0.62%	848,400,916	0.57%	505,813,281	0.31%
Manufacturing of Chemical & Chemical Products	1,712,080,948	1.28%	1,589,352,775	1.07%	1,564,045,965	0.95%
Manufacturing of Non-Metallic	4,105,349,981	3.07%	6,545,421,868	4.39%	1,793,442,780	1.09%
Paper, Paper Products & Publishing	2,098,340,653	1.57%	2,079,812,994	1.40%	1,866,467,409	1.14%
Plastic & Plastic Products	1,288,813,122	0.96%	870,771,155	0.58%	1,168,047,740	0.71%
RMG	6,190,896,714	4.63%	6,491,385,917	4.36%	7,234,510,527	4.41%
Textile- Others	4,821,830,635	3.60%	5,997,163,456	4.03%	6,250,830,517	3.81%
Consigner Loan	3,788,280,805	2.83%	4,409,563,364	2.96%	12,965,472,038	7.91%
NGOs and MFIs	7,969,740,994	5.95%	7,401,498,477	4.97%	9,066,710,339	5.53%
Trading- Retail	18,786,818,007	14.04%	20,845,269,635	13.99%	21,973,187,079	13.40%
Trading- Wholesale	30,522,820,559	22.80%	32,307,528,093	21.69%	35,290,504,775	21.52%
Others	14,663,756,760	10.96%	21,884,130,196	14.69%	11,379,779,959	6.94%
Total	133,854,005,831	100.00%	148,985,182,141	100.00%	163,965,261,570	100.00%

Table 32: Uttara Bank's Loan Portfolio. Source: Uttara Bank Annual Report

Uttara Bank's loan portfolio has undergone noticeable changes from 2020 to 2022, reflecting adjustments in its lending strategies and market dynamics. The total loan portfolio has increased from 133.85 billion BDT in 2020 to 163.97 billion BDT in 2022.

In terms of sectoral allocations, the "Industries (Manufacture/Power/Service/Agro-based)" category holds the largest share, increasing from 39.69% to 41.87%. Within this category, there are various subsectors, such as agro-based, construction (apartment/housing and commercial), drugs and pharmaceuticals, food and beverage, ICT, iron and steels, jute and jute products, leather and leather products, manufacturing of chemical and chemical products, manufacturing of non-metallic, paper, paper products and publishing, plastic and plastic products, RMG, textile-others, and consumer loans. Each of these subsectors has shown fluctuations in their weights.

The "Trading- Retail" and "Trading- Wholesale" categories maintain significant shares, with the former slightly decreasing from 14.04% to 13.40%, and the latter increasing from 22.80% to 21.52%. The "Others" category, representing diverse lending activities beyond the specified sectors, has shown a substantial decrease from 14.69% to 6.94%.

The banking sector's exposure to NGOs and MFIs increased from 5.95% to 5.53%. Additionally, the "Agriculture" category, including dairy, poultry, nursery, and crops, has experienced variations in its shares.

The "Consumer Loan" category has seen a noteworthy increase from 2.83% to 7.91%, indicating a focus on retail lending.

These changes in Uttara Bank's loan portfolio reflect a dynamic approach, aligning with market trends and the bank's strategic objectives during the observed period.

Union Bank						
Sector wise Investments	2020	Weights	2021	Weights	2022	Weights
Ready Made Garments (RMG)	3,086,122,456	1.86%	3,826,313,083	1.97%	4,060,955,438	1.83%
Textile	10,153,069,584	6.10%	12,784,715,912	6.60%	15,171,916,578	6.83%
Ship Building	5,560,981	0.00%	7,271,359	0.00%	7,279,577	0.00%
Other Manufacturing industry	8,390,714,351	5.04%	10,122,696,880	5.22%	15,110,008,831	6.80%
SME Investment	5,431,842,020	3.27%	5,524,375,881	2.85%	5,338,308,735	2.40%
Construction	5,683,862,096	3.42%	5,642,476,378	2.91%	6,461,203,277	2.91%
Power, Gas	1,657,709,174	1.00%	1,841,682,541	0.95%	1,913,618,227	0.86%
Transport, Storage and Communication	373,375,444	0.22%	342,992,455	0.18%	287,094,026	0.13%
Trade Service	115,861,118,631	69.65%	135,852,698,569	70.09%	153,444,664,781	69.03%
Commercial real estate financing	7,132,275,007	4.29%	9,658,496,364	4.98%	11,407,054,343	5.13%
Residential real estate financing	832,677,549	0.50%	942,928,413	0.49%	928,871,285	0.42%
Consigner investment	100,801,246	0.06%	82,729,033	0.04%	69,458,104	0.03%
Capital market	1,312,374,216	0.79%	1,282,107,978	0.66%	1,332,076,893	0.60%
Non-Banking Financial Institutions (NBFI)	132,822,500	0.08%	-	0.00%		
Others	5,190,226,253	3.12%	4,548,850,758	2.35%	5,335,529,061	2.40%
Total	166,337,195,954	100.00%	193,822,280,481	100.00%	222,275,438,478	100.00%

Table 33: Union Bank's Sector-Wise Investments. Source: Union Bank Annual Report

Union Bank's sector-wise investments have undergone some changes from 2020 to 2022, reflecting adjustments in its investment strategies and market dynamics. The total investment portfolio has increased from 166.34 billion BDT in 2020 to 222.28 billion BDT in 2022.

In terms of sectoral allocations, "Trade Service" holds the largest share, comprising 69.65%, 70.09%, and 69.03% in 2020, 2021, and 2022 respectively. This category includes significant investments in various trade-related activities.

The "Other Manufacturing Industry" category has also shown notable growth, increasing from 5.04% to 6.80% over the observed period. Investments in "Textile" have increased from 6.10% to 6.83%, indicating a focus on this sector.

"Construction" investments have grown from 3.42% to 2.91%, while "SME Investment" has decreased slightly from 3.27% to 2.40%.

"Ready Made Garments (RMG)" investments have increased from 1.86% to 1.83%, maintaining a substantial portion of the portfolio.

Real estate financing, both commercial and residential, has seen growth, with "Commercial real estate financing" increasing from 4.29% to 5.13%, and "Residential real estate financing" remaining relatively stable.

The "Capital Market" category has maintained a consistent share, around 0.79% to 0.60%.

The "Non-Banking Financial Institutions (NBFI)" category, which had a share in 2020, is not reported for 2021 and 2022.The "Others" category has shown some fluctuations, decreasing from 3.12% to 2.40%.

1.5.10 Asset Quality of Listed Banks and Assessment Process by Bangladesh Bank and BASEL

Apart from the international standards for credit risk measures and asset quality assessment, Bangladesh bank has some adjustment to assess the risks and risk weighted assets.

To improve credit discipline and reduce the bank's credit risk, the bank defines past due and impaired loans and advances in accordance with the pertinent Bangladesh Bank standards. On the basis of (i) objective/quantitative criteria and (ii) qualitative assessment, the impaired loans and advances are defined. All loans and advances are divided into four groups for these purposes: continuous loans, demand loans, fixed-term loans, and short-term agricultural and microcredit loans.

To be late or past due means: Any Continuous Loan that is not repaid/renewed by the fixed expiry date for repayment or after the bank issues a demand will be treated as past due/overdue as of the day following the expiry date. Similarly, any Demand Loan that is not repaid by the fixed expiry date for repayment or after the bank issues a demand will be treated as past due/overdue as of the day following the expiry date.

And last, if the fixed payback deadline for the short-term agricultural and microcredit is not met, it will be deemed past due/overdue six months after the deadline.

However, a continuous loan, demand loan, or term loan that is two months or more past due will be placed into the "Special Mention Account (SMA)," changing the loan's former status from performing to impaired or categorized. The following is the definition of impaired, categorized, and non-performing loans and advances:

Continuous Loans are Classified as Follows

Substandard: If it is three (three) months past due or more overdue but less than nine (nine) months.

Doubtful: If the amount is past due or late by nine (9) months or more but fewer than twelve (12) months; and

Bad/Loss: If the amount is past due or overdue by twelve (12) months or more.

1.5.11 Demand Loans are Classified as Follows

Substandard: If it is past due or overdue for more than three months, but less than nine months, from the date of expiration or claim by the bank or from the day the forced loan was created;

Doubtful: If it continues to be past due or past due for 9 (nine) months or longer, but not for more than 12 (twelve) months from the date of expiration or claim by the Bank or from the day the forced loan was created;

Bad/Loss: If it is unpaid for 12 (twelve) months or more after it has expired, been claimed by the bank, or been created as a forced loan.

1.5.12 Fixed Term Loans are Classified as Follows

Substandard: The total loan will be categorized as "Sub-standard" if the amount of the past-due installment is equal to or more than 3 (three) months but less than 9 (nine) months;

Doubtful: The total loan will be categorized as "Doubtful" if the amount of the past-due installment is equal to or higher than 9 (nine) months but less than 12 (twelve) months; and

Bad/Loss: The total loan will be labeled as 'Bad/Loss' if the number of past-due installments exceeds 12 (twelve) months.

Short-term Agricultural and Microcredit: If the short-term agricultural and microcredit is not repaid by the due date specified in the loan agreement, it will be deemed irregular. If the aforementioned irregular status persists, the credit will be categorized as "Sub-standard" after a period of 12 months, as "Doubtful" after a period of 36 months, and as "Bad/ Loss" after a time of 60 months as per the loan agreement.

Small, Micro, and Cottage Credits through CMSME:

A Continuous Loan, Demand Loan and Fixed Term Loan will be classified are as under:

The following categories will be used to classify continuous loans, demand loans, and fixed-term loans:

Substandard: If it has been late for more than six (six) months but less than eighteen (eighteen) months;

If it has been late for 18 (eighteen) months or longer but less than 30 (thirty) months, it is doubtful;

If it has been overdue for 30 (thirty) months or longer, it is a loss**.**

Now we will turn our gear to look into the asset quality of the listed banks under different category of loans.

1.5.13 Standard Including Staff Loan of The Listed Banks at Central Bank's Guideline

ABBANK has experienced fluctuations in standard loan, with a peak in 2021 at 83.22% followed by a slight decrease in 2022 to 77.55%.

ALARABANK displayed a relatively stable trend in standard loan, maintaining values above 91% throughout the period.

BANKASIA demonstrated consistency in maintaining standard loan, with values ranging from 90.58% to 93.90% over the years.

BRACBANK maintained high standard loan, consistently above 95% throughout the years.

CITYBANK exhibited fluctuations in standard loan, with a peak in 2020 (95.71%) and a slight decrease in 2022 to 95.19%.

DHAKABANK showed a gradual increase in standard loan, reaching 94.01% in 2021, followed by a slight decrease in 2022 to 92.55%.

DUTCHBANGL experienced fluctuations, with a peak in standard loan in 2020 at 96.39%, followed by a slight decrease in 2022 to 94.29%.

EBL maintained consistently high standard loan, with values above 95% throughout the period.

EXIMBANK exhibited fluctuations in standard loan, with a peak in 2022 at 95.20%.

FIRSTSBANK displayed a significant drop in standard loan in 2020 (28.74%), followed by a recovery in the subsequent years.

ICBIBANK showed fluctuations in standard loan, with a peak in 2018 at 15.46%, followed by a decrease in the subsequent years.

IFIC demonstrated a relatively stable trend in standard loan, maintaining values above 88% throughout the period.

ISLAMIBANK exhibited significant variations, with a highest in standard loan in 2020 at 94.57%, followed by a decrease in the subsequent years.

MTB displayed fluctuations in standard loan, with values extending from 90.63% to 92.48% over the years.

NBL showed a decreasing trend in standard loan, reaching 70.54% in 2021, followed by a slight increase in 2022 to 74.05%.

NCCBANK exhibited oscillations in standard loan, with a crowning in 2018 at 94.09%, followed by a decrease in the subsequent years.

NRBCBANK maintained standard loan above 92% throughout the period, with a highest in 2018 at 92.71%.

ONEBANKLTD showed a declining trend in standard loan, reaching 82.85% in 2022.

PREMIERBAN displayed fluctuations in standard loan, with values extending from 91.81% to 94.96% over the years.

PRIMEBANK demonstrated a gradual increase in standard loan, reaching 95.36% in 2022.

PUBALIBANK exhibited fluctuations in standard loan, with a peak in 2022 at 96.08%.

RUPALIBANK showed fluctuations in standard loan, with a peak in 2020 at 81.51%, followed by a gradual decrease in the subsequent years.

SBACBANK maintained standard loan above 89%, with a peak in 2020 at 93.55%.

SHAHJABANK exhibited fluctuations in standard loan, reaching 94.03% in 2022.

SIBL demonstrated fluctuations in standard loan, with values ranging from 89.50% to 91.94% over the years.

SOUTHEASTB exhibited fluctuations in standard loan, with a highest in 2020 at 94.07%, followed by a steady decrease in the subsequent years.

STANDBANKL displayed fluctuations in standard loan, with values oscillating from 91.34% to 92.44% over the years.

TRUSTBANK exhibited fluctuations in standard loan, with a highest in 2022 at 95.08%.

UCB showed fluctuations in standard loan, with a significant drop in 2022 to 1.24%.

UNIONBANK maintained standard loan above 95%, with a peak in 2018 at 97.45%.

UTTARABANK exhibited fluctuations in standard loan percentages, with values oscillating from 90.50% to 92.61% over the years.

Banks	Standard including staff loan				
Year	**2018**	**2019**	**2020**	**2021**	**2022**
ABBANK	54.34%	75.56%	77.11%	83.22%	77.55%
ALARABANK	92.04%	91.84%	94.55%	93.74%	92.04%
BANKASIA	90.58%	91.67%	93.90%	93.11%	93.05%
BRACBANK	95.63%	95.12%	96.24%	95.35%	95.65%
CITYBANK	92.31%	93.36%	95.71%	94.47%	95.19%
DHAKABANK	91.08%	91.14%	93.75%	94.01%	92.55%
DUTCHBANGL	93.62%	92.56%	96.39%	94.01%	94.29%
EBL	95.65%	95.48%	96.31%	95.41%	95.74%
EXIMBANK	91.55%	93.67%	94.78%	94.87%	95.20%
FIRSTSBANK	91.65%	90.76%	28.74%	29.06%	93.58%
ICBIBANK	15.46%	15.53%	18.69%	18.12%	11.40%
IFIC	88.52%	90.83%	94.01%	91.93%	92.09%
ISLAMIBANK	20.62%	19.81%	94.57%	95.49%	95.63%
JAMUNABANK	0.00%	0.00%	1.58%	1.78%	0.00%
MERCANBANK	0.09%	0.09%	0.09%	0.09%	0.00%
MTB	92.22%	90.63%	92.48%	91.33%	91.98%
NBL	79.91%	83.40%	87.28%	70.54%	74.05%
NCCBANK	94.09%	1.30%	92.34%	92.55%	91.64%
NRBCBANK	92.71%	92.88%	94.52%	92.17%	94.47%
ONEBANKLTD	92.92%	90.72%	87.49%	84.10%	82.85%
PREMIERRBAN	92.53%	91.81%	94.94%	94.96%	94.09%
PRIMEBANK	89.69%	92.98%	94.62%	93.57%	95.36%
PUBALIBANK	92.77%	91.60%	93.83%	95.80%	96.08%
RUPALBANK	13.20%	17.12%	81.51%	77.09%	74.85%
SBACBANK	93.55%	89.44%	91.25%	92.69%	93.35%
SHAHJABANK	92.29%	92.33%	92.54%	94.03%	93.89%
SIBL	91.94%	90.61%	89.50%	90.56%	91.22%
SOUTEEASTB	90.53%	92.28%	94.07%	92.45%	89.75%
STANDBANKL	91.96%	91.68%	92.44%	91.34%	91.58%
TRUSTBANK	88.07%	91.85%	94.32%	95.08%	94.01%
UCB	89.72%	94.94%	94.79%	1.24%	91.45%
UNIONBANK	97.45%	95.67%	96.82%	95.76%	95.46%
UTTARABANK	92.03%	90.50%	92.61%	90.78%	90.97%

Table 34: Standard Loan of Listed Banks. Source: Credit Information Bureau, Bangladesh Bank

1.5.14 Special Mention Account (SMA)

ABBANK has shown a consistent decrease in SMA over the years, indicating an improvement in the quality of its loan portfolio. The SMA declined from 12.46% in 2018 to 1.97% in 2022. ALARABANK experienced a decline in SMA from 2018 to 2020, reaching the lowest point at 1.65%, followed by a slight increase in 2021 and a subsequent decrease in 2022 to 2.56%. BANKASIA displayed a decreasing trend in SMA, suggesting effective management of loans over the years. The SMA decreased from 5.32% in 2018 to 2.09% in 2022. BRACBANK maintained relatively low SMA throughout the period, shiny a stable loan portfolio. The SMA remained below 1% in all years. CITYBANK exhibited fluctuations in SMA, with a peak in 2018 at 2.36%, followed by a general decrease in subsequent years. DHAKABANK showed fluctuations in SMA, with a peak in 2018 at 3.94%, followed by a general decrease in the subsequent years. DUTCHBANGL experienced fluctuations in SMA, with a peak in 2018 at 2.24%, a decrease in 2019, followed by a slight increase in 2020, and subsequent decreases in 2021 and 2022. EBL demonstrated fluctuations in SMA, with a peak in 2018 at 2.03%, followed by a general decrease in the subsequent years. EXIMBANK exhibited fluctuations in SMA, with a highest in 2018 at 3.33%, followed by a general decrease in subsequent years. FIRSTSBANK displayed fluctuations in SMA, with a peak in 2018 at 5.01%, a decrease in 2019 and 2020, followed by increases in 2021 and 2022. ICBIBANK showed fluctuations in SMA, with a peak in 2018 at 2.54%, followed by a decrease in 2019, an increase in 2020, and subsequent decreases in 2021 and 2022. IFIC demonstrated fluctuations in SMA, with a peak in 2018 at 5.32%, followed by a general decrease in subsequent years. ISLAMIBANK exhibited fluctuations in SMA, with a peak in 2020 at 2.03%, followed by a decrease in 2021 and a slight increase in 2022.

JAMUNABANK had minimal SMA, reaching 0.14% in 2020, with other years showing negligible values. MERCANBANK maintained very low SMA, remaining negligible in all years. MTB displayed fluctuations in SMA, with a peak in 2019 at 3.98%, followed by general decreases in subsequent years. NBL showed a decreasing trend in SMA, reaching 0.99% in 2022, following higher in the previous years. NCCBANK exhibited a significant increase in SMA in 2019 (31.30%), followed by decreases in subsequent years. NRBCBANK showed fluctuations in SMA, with a peak in 2018 at 4.35%, followed by general decreases in subsequent years. ONEBANKLTD showed fluctuations in SMA, with a peak in 2022 at 4.34%, following a decrease in 2020. PREMIERBAN displayed fluctuations in SMA, with a peak in 2018 at 3.48%, a decrease in 2019, followed by increases in subsequent years. PRIMEBANK demonstrated fluctuations in SMA, with a peak in 2018 at 4.14%, followed by general decreases in subsequent years. PUBALIBANK exhibited fluctuations in SMA, with a peak in 2019 at 3.97%, a decrease in 2020, followed by increases in subsequent years. RUPALIBANK showed fluctuations in SMA, with a peak in 2020 at 6.69%, followed by decreases in subsequent years. SBACBANK maintained fluctuations in SMA, with a peak in 2018 at 4.48%, followed by general decreases in subsequent years. SHAHJABANK exhibited fluctuations in SMA, with a peak in 2018 at 2.76%, followed by general decreases in subsequent years. SIBL demonstrated fluctuations in SMA, with a peak in 2020 at 4.38%, followed by decreases in subsequent years. SOUTHEASTB displayed fluctuations in SMA, with a peak in 2018 at 3.61%, followed by general decreases in subsequent years. STANDBANKL showed fluctuations in SMA, with a peak in 2019 at 2.48%, followed by general decreases in subsequent years. TRUSTBANK exhibited fluctuations in SMA, with a peak in 2018 at 4.02%, followed by general decreases in subsequent years. UCB showed fluctuations in SMA, with a peak in 2018 at 3.49%, followed by general decreases in subsequent years. UNIONBANK maintained fluctuations in SMA, with a peak in 2018 at 0.94%, followed by general increases in subsequent years. UTTARABANK exhibited fluctuations in SMA, with a peak in 2018 at 1.64%, followed by general increases in subsequent years.

Banks	**Special mention account (SMA)**				
Year	**2018**	**2019**	**2020**	**2021**	**2022**
ABBANK	12.46%	6.11%	6.07%	260%	1.97%
ALARABANK	3.17%	3.34%	1.65%	1.45%	256%
BANKASIA	5.32%	3.72%	286%	1.76%	209%
BRACBANK	0.76%	0.44%	0.39%	0.39%	0.35%
CITYBANK	236%	0.87%	0.24%	0.68%	0.96%
DHAKABANK	3.94%	4.12%	3.11%	267%	236%
DUTCHBANGL	224%	3.06%	1.44%	224%	1.42%
EBL	203%	1.14%	0.76%	0.75%	1.35%
EXIMBANK	3.33%	1.99%	1.40%	1.15%	0.94%
FIRSTSBANK	5.01%	4.29%	4.18%	234%	241%
ICBIBANK	254%	0.43%	294%	1.08%	4.26%
IFIC	5.32%	3.81%	202%	1.98%	232%
ISLAMIBANK	1.32%	0.51%	203%	1.20%	0.68%
JAMUNABANK	0.00%	0.00%	0.14%	0.12%	0.00%
MERCANBANK	0.001%	0.001%	0.001%	0.001%	0.00%
MTB	239%	3.98%	291%	287%	225%
NBL	10.68%	5.70%	3.40%	8.80%	0.99%
NCCBANK	0.11%	31.30%	268%	288%	1.51%
NRBCBANK	4.35%	3.92%	256%	3.27%	0.84%
ONEBANKLTD			3.87%	4.34%	3.18%
PREMIERRBAN	3.48%	1.49%	257%	233%	3.03%
PRIMEBANK	4.14%	237%	1.93%	1.59%	1.22%
PUBALIBANK	1.71%	3.97%	3.41%	1.15%	1.29%
RUPALBANK	0.74%	268%	6.69%	5.41%	3.96%
SBACBANK	4.48%	4.47%	253%	1.41%	1.49%
SHAHJABANK	0.87%	276%	290%	1.55%	1.33%
SIBL	0.24%	268%	4.38%	4.26%	3.97%
SOUTEEASTB	3.61%	285%	283%	275%	3.70%
STANDBANKL	0.14%	248%	269%	246%	0.48%
TRUSTBANK	4.02%	266%	1.18%	1.27%	1.22%
UCB	3.49%	1.37%	265%	4.64%	256%
UNIONBANK	0.94%	1.17%	0.65%	0.76%	1.01%
UTTARABANK	1.64%	1.69%	1.03%	1.69%	220%

Table 35: SMA of Listed Banks. Source: Credit Information Bureau, Bangladesh Bank

1.5.15 Total Unclassified Loans Constitute Standard and SMA Loans

ABBANK has shown a fluctuating trend in Total Unclassified percentages. The percentage increased from 66.80% in 2018 to 85.82% in 2021, followed by a decrease to 79.77% in 2022. ALARABANK maintained relatively high Total Unclassified percentages, with a slight decrease from 95.21% in 2018 to 94.59% in 2022. BANKASIA exhibited fluctuations in Total Unclassified percentages, with a peak at 96.76% in 2020 and subsequent decreases in the following years. BRACBANK showed fluctuations in Total Unclassified percentages, with a peak at 96.62% in 2020, followed by a slight decrease in

2021 and a subsequent increase to 96.00% in 2022. CITYBANK displayed fluctuations in Total Unclassified percentages, with a peak at 95.95% in 2020, followed by decreases in 2021 and 2022. DHAKABANK exhibited fluctuations in Total Unclassified percentages, with a peak at 96.87% in 2020, followed by decreases in 2021 and 2022. DUTCHBANGL showed fluctuations in Total Unclassified percentages, with a peak at 97.83% in 2020, followed by decreases in 2021 and 2022. EBL demonstrated fluctuations in Total Unclassified percentages, with a peak at 97.68% in 2018, followed by decreases in subsequent years. EXIMBANK exhibited fluctuations in Total Unclassified percentages, with a peak at 96.18% in 2020, followed by slight increases in 2021 and 2022. FIRSTSBANK displayed a significant decrease in Total Unclassified percentages from 96.66% in 2018 to 31.41% in 2021, followed by a slight increase to 95.99% in 2022. ICBIBANK showed fluctuations in Total Unclassified percentages, with a peak at 18.00% in 2018, followed by a general decrease in subsequent years. IFIC demonstrated fluctuations in Total Unclassified percentages, with a peak at 96.03% in 2020, followed by decreases in subsequent years. ISLAMIBANK exhibited fluctuations in Total Unclassified percentages, with a peak at 96.59% in 2020, followed by a slight decrease in 2021 and a subsequent increase to 96.30% in 2022. JAMUNABANK showed fluctuations in Total Unclassified percentages, with a peak at 97.05% in 2020, followed by a decrease to 94.68% in 2022. MERCANBANK exhibited fluctuations in Total Unclassified percentages, with a peak at 95.28% in 2019, followed by general decreases in subsequent years. MTB displayed fluctuations in Total Unclassified percentages, with a peak at 95.39% in 2020, followed by decreases in subsequent years. NBL showed a decreasing trend in Total Unclassified percentages, reaching 75.04% in 2022, following higher percentages in the previous years. NCCBANK exhibited fluctuations in Total Unclassified percentages, with a significant decrease from 94.20% in 2018 to 32.61% in 2019, followed by fluctuations in subsequent years. NRBCBANK showed fluctuations in Total Unclassified percentages, with a peak at 97.07% in 2020, followed by decreases in subsequent years. ONEBANKLTD exhibited fluctuations in Total Unclassified percentages, with a peak at 92.92% in 2018, followed by general decreases in subsequent years. PREMIERBAN displayed fluctuations in Total Unclassified percentages, with a peak at 97.51% in 2020, followed by a decrease in 2021 and a subsequent increase to 97.12% in 2022. PRIMEBANK demonstrated fluctuations in Total Unclassified percentages, with a peak at 96.54% in 2020, followed by decreases in subsequent years. PUBALIBANK exhibited fluctuations in Total Unclassified percentages, with a peak at 97.24% in 2020, followed by slight decreases in subsequent years. RUPALIBANK showed fluctuations in Total Unclassified percentages, with a peak at 88.21% in 2020, followed by decreases in subsequent years. SBACBANK maintained fluctuations in Total Unclassified percentages, with a peak at 98.03% in

2018, followed by general decreases in subsequent years. SHAHJABANK exhibited fluctuations in Total Unclassified percentages, with a peak at 95.43% in 2020, followed by slight decreases in subsequent years. SIBL demonstrated fluctuations in Total Unclassified percentages, with a peak at 93.88% in 2020, followed by slight increases in subsequent years. SOUTHEASTB displayed fluctuations in Total Unclassified percentages, with a peak at 96.90% in 2020, followed by slight decreases in subsequent years. STANDBANKL showed fluctuations in Total Unclassified percentages, with a peak at 95.13% in 2020, followed by slight decreases in subsequent years. TRUSTBANK exhibited fluctuations in Total Unclassified percentages, with a peak at 96.35% in 2021, followed by a slight decrease to 95.24% in 2022. UCB showed fluctuations in Total Unclassified percentages, with a peak at 97.45% in 2020, followed by a decrease in 2021 and a subsequent increase to 94.01% in 2022. UNIONBANK maintained fluctuations in Total Unclassified percentages, with a peak at 98.39% in 2018, followed by general decreases in subsequent years. UTTARABANK exhibited fluctuations in Total Unclassified percentages, with a peak at 93.67% in 2018, followed by general decreases in subsequent years.

Banks	**Total Unclassified**				
Year	**2018**	**2019**	**2020**	**2021**	**2022**
ABBANK	66.80%	81.67%	83.17%	85.82%	79.77%
ALARABANK	95.21%	95.18%	96.20%	95.19%	94.59%
BANKASIA	95.90%	95.39%	96.76%	94.86%	95.13%
BRACBANK	96.39%	95.56%	96.62%	95.73%	96.00%
CITYBANK	94.67%	94.23%	95.95%	95.14%	96.15%
DHAKABANK	95.01%	95.26%	96.87%	96.68%	94.92%
DUTCHBANGL	95.86%	95.62%	97.83%	96.25%	95.71%
EBL	97.68%	96.62%	97.07%	96.16%	97.09%
EXIMBANK	94.89%	95.67%	96.18%	96.02%	96.14%
FIRSTSBANK	96.66%	95.06%	32.91%	31.41%	95.99%
ICBIBANK	18.00%	15.96%	21.63%	19.20%	15.66%
IFIC	93.84%	94.63%	96.03%	93.91%	94.41%
ISLAMIBANK	2L93%	20.32%	96.59%	96.69%	96.30%
JAMUNABANK	96.23%	96.30%	97.05%	97.03%	94.68%
MERCANBANK	95.18%	95.14%	95.28%	95.46%	92.91%
MTB	94.61%	94.61%	95.39%	94.20%	94.23%
NBL	90.59%	89.10%	90.67%	79.34%	75.04%
NCCBANK	94.20%	32.61%	95.02%	95.43%	93.15%
NRBCBANK	97.06%	96.80%	97.07%	95.44%	95.31%
ONEBANKLTD	92.92%	90.72%	91.37%	88.45%	86.03%
PREMIERRBAN	96.01%	93.30%	97.51%	97.29%	97.12%
PRIMEBANK	93.84%	95.34%	96.54%	95.17%	96.58%
PUBALIBANK	94.48%	95.57%	97.24%	96.95%	97.38%
RUPALBANK	13.94%	19.80%	88.21%	82.50%	78.81%
SBACBANK	98.03%	93.91%	93.78%	94.10%	94.83%
SHAHJABANK	93.16%	95.09%	95.43%	95.58%	95.22%
SIBL	92.18%	93.29%	93.88%	94.81%	95.19%
SOUTEEASTB	94.13%	95.13%	96.90%	95.19%	93.46%
STANDBANKL	92.10%	94.16%	95.13%	93.81%	92.06%
TRUSTBANK	92.10%	94.51%	95.49%	96.35%	95.24%
UCB	93.21%	96.31%	97.45%	95.59%	94.01%
UNIONBANK	98.39%	96.85%	97.47%	96.51%	96.46%
UTTARABANK	93.67%	92.19%	93.64%	92.47%	93.17%

Table 36: Total Unclassified loans of listed Banks. Source: Credit Information Bureau, Bangladesh Bank

Total classified loans consist of sub-standard, doubtful and bad/loss categories. The breakdowns of classified loans are given in the following sections.

1.5.16 Sub-Standard Loans Scenario of Listed Banks

ABBANK has seen a consistent decrease in sub-standard loans from 1.73% in 2018 to 0.06% in 2022. This signifies a strong improvement in the quality of its loan portfolio.

ALARABANK experienced fluctuations in sub-standard loans, reaching 0.92% in 2019 and decreasing to 0.92% in 2022. The bank needs to maintain vigilance to ensure further reduction.

BANKASIA had fluctuations in sub-standard loans, reaching 0.50% in 2021 and decreasing to 0.28% in 2022. The bank should continue efforts to manage and reduce sub-standard assets.

BRACBANK's sub-standard assets fluctuated, reaching 0.82% in 2022. The bank should focus on strategies to stabilize and reduce these assets.

CITYBANK experienced fluctuations in sub-standard loans, reaching 0.62% in 2022. The bank should implement measures to mitigate the risk associated with these assets.

DHAKABANK has shown a consistent decrease in sub-standard loans from 0.66% in 2018 to 0.25% in 2022. This reflects positive efforts in risk management.

DUTCHBANGLA had fluctuations in sub-standard loans, reaching 0.37% in 2020 and decreasing to 0.25% in 2022. The bank should aim for stability in managing these assets.

EBL's sub-standard assets fluctuated, reaching 0.50% in 2018 and decreasing to 0.19% in 2022. The bank should continue proactive measures for risk reduction.

EXIMBANK had fluctuations in sub-standard loans, reaching 0.23% in 2022. The bank needs to monitor and manage these assets effectively.

FIRSTSSBANK's sub-standard loans fluctuated significantly, reaching 1.80% in 2019 and decreasing to 0.51% in 2022. The bank should focus on maintaining a stable loan portfolio.

ICBIBANK experienced fluctuations in sub-standard loans, reaching 1.34% in 2022. The bank should adopt strategies to reduce the volatility of these assets.

IFIC had fluctuations in sub-standard loans, reaching 1.91% in 2018 and decreasing to 0.80% in 2022. Continued efforts are essential for sustained improvement.

ISLAMIBANK had fluctuations in sub-standard loans, reaching 1.14% in 2019 and decreasing to 0.54% in 2022. The bank should continue risk management practices.

JAMUNABANK's sub-standard loans fluctuated, reaching 0.71% in 2022. The bank should aim for stability and implement strategies for risk mitigation.

MERCANTLIEBANK's sub-standard loans fluctuated, reaching 0.53% in 2022. The bank needs to focus on maintaining a stable and low level of sub-standard assets.

MTB had fluctuations in sub-standard loans, reaching 0.53% in 2019 and decreasing to 0.43% in 2022. The bank should continue efforts to manage and reduce these assets.

NBL's sub-standard loans fluctuated, reaching 0.77% in 2019 and decreasing to 0.77% in 2022. The bank should focus on strategies for sustained improvement.

NCCBANK had fluctuations in sub-standard loans, reaching 0.53% in 2018 and decreasing to 0.10% in 2022. The bank should continue efforts to stabilize and reduce these assets.

NRBCBANK's sub-standard loans fluctuated, reaching 0.92% in 2022. The bank should implement measures to manage and reduce sub-standard assets effectively.

ONEBANKLTD's sub-standard loans fluctuated, reaching 0.95% in 2022. The bank should focus on maintaining stability and reducing sub-standard assets.

PREMIERBANK's sub-standard loans fluctuated, reaching 0.29% in 2019 and decreasing to 0.29% in 2022. The bank should aim for stability and sustained improvement.

PRIMEBANK's sub-standard loans fluctuated, reaching 0.67% in 2022. The bank should focus on strategies for maintaining a stable and low level of sub-standard assets.

PUBALIBANK's sub-standard loans fluctuated, reaching 0.46% in 2019 and decreasing to 0.42% in 2022. The bank should continue efforts for sustained improvement.

RUPALIBANK's sub-standard loans fluctuated, reaching 2.06% in 2019 and decreasing to 2.06% in 2022. The bank should focus on strategies for managing and reducing sub-standard assets.

SBACBANK's sub-standard loans fluctuated, reaching 1.36% in 2022. The bank should aim for stability and implement effective measures for risk reduction.

SHAHJALBANK's sub-standard loans fluctuated, reaching 0.70% in 2019 and decreasing to 0.70% in 2022. The bank should focus on strategies for maintaining a stable and low level of sub-standard assets.

SIBL's sub-standard loans fluctuated, reaching 0.28% in 2018 and decreasing to 0.26% in 2022. The bank should continue efforts for risk management and reduction.

SOUTHEASTBANK's sub-standard loans fluctuated, reaching 0.39% in 2022. The bank should focus on maintaining stability and implementing effective risk management strategies.

STANDBANKLTD's sub-standard loans fluctuated, reaching 0.92% in 2022. The bank should adopt measures for managing and reducing sub-standard assets effectively.

TRUSTBANK's sub-standard loans fluctuated, reaching 0.57% in 2022. The bank should focus on strategies for maintaining a stable and low level of sub-standard assets. UCB's sub-standard loans fluctuated, reaching 0.34% in 2022. The bank should continue efforts for risk management and maintaining a low level of sub-standard assets. UNIONBANK's sub-standard loans fluctuated, reaching 1.19% in 2019 and decreasing to 0.67% in 2022. The bank should focus on strategies for maintaining a stable and low level of sub-standard assets. UTTARABANK's sub-standard loans fluctuated, reaching 1.34% in 2019 and decreasing to 0.96% in 2022. The bank should continue efforts for risk management and maintaining a low level of sub-standard assets.

Banks	**Sub-standard**					**Doubtful**					**Bad/Loss**				
Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2018**	**2019**	**2020**	**2021**	**2022**	**2018**	**2019**	**2020**	**2021**	**2022**
ABBANK	1.73%	0.87%	0.86%	0.18%	0.06%	1.59%	1.27%	1.13%	1.08%	1.04%	2486%	31.16%	17.10%	15.92%	13.17%
ALARABANK	0.76%	0.92%	0.55%	1.36%	0.92%	0.48%	0.26%	0.34%	0.12%	1.17%	5.19%	434%	455%	3.42%	3.99%
BANKASIA	0.13%	0.81%	0.68%	0.50%	0.28%	0.32%	0.25%	0.07%	0.13%	0.09%	5.82%	3.88%	428%	3.02%	485%
BRACBANK	0.37%	1.02%	0.63%	0.68%	0.82%	0.29%	0.31%	0.42%	0.31%	0.62%	444%	3.25%	430%	287%	3.34%
CITYBANK	0.37%	1.02%	0.56%	0.62%	0.62%	0.43%	0.26%	0.36%	0.25%	0.26%	457%	499%	5.31%	3.79%	3.92%
DHAKABANK	0.66%	0.64%	0.21%	0.18%	0.25%	0.29%	0.10%	0.08%	0.03%	0.06%	6.34%	461%	467%	289%	298%
DUTCHBANGL	0.16%	1.86%	1.00%	0.37%	0.25%	0.27%	0.59%	0.10%	0.13%	0.24%	5.96%	3.74%	411%	1.85%	3.29%
EBL	0.50%	0.47%	0.45%	0.34%	0.43%	0.29%	0.16%	0.13%	0.22%	0.19%	3.30%	211%	3.51%	249%	3.33%
EXIMBANK	0.09%	0.45%	0.53%	0.11%	0.23%	0.20%	0.07%	0.04%	0.08%	0.07%	5.28%	454%	3.79%	3.51%	3.77%
FIRSTSBANK	0.04%	0.48%	1.18%	1.80%	0.51%	0.19%	1.16%	11.49%	5.58%	0.91%	437%	286%	118.59%	66.22%	201%
ICBIBANK	0.14%	0.68%	0.76%	0.15%	1.34%	0.86%	0.44%	0.49%	0.00%	0.93%	77.33%	83.70%	8299%	79.58%	83.78%
IFIC	1.91%	1.40%	1.07%	1.93%	0.80%	0.31%	0.18%	0.18%	0.18%	0.30%	7.73%	5.57%	471%	3.39%	5.23%
ISLAMIBANK	1.03%	1.05%	0.61%	0.76%	0.54%	1.14%	0.65%	0.27%	0.42%	0.36%	113.23%	6479%	3.36%	296%	270%
JAMUNABANK	0.10%	0.18%	0.08%	0.29%	0.71%	0.30%	0.24%	0.28%	0.15%	0.39%	461%	3.51%	403%	275%	288%
MERCANBANK	0.16%	0.55%	0.49%	0.35%	0.23%	0.53%	0.17%	0.73%	0.34%	0.54%	7.92%	456%	462%	441%	431%
MTB	0.32%	0.40%	0.29%	0.53%	0.45%	0.22%	0.20%	0.13%	0.29%	0.43%	7.47%	472%	5.02%	415%	5.16%
NBL	0.32%	2.06%	0.24%	0.54%	0.77%	0.32%	0.93%	0.45%	0.23%	263%	29.03%	8.22%	9.65%	8.55%	21.67%
NCCBANK	0.53%	6.17%	0.44%	0.61%	0.46%	0.16%	4.99%	0.38%	0.10%	0.29%	7.36%	78.93%	484%	469%	413%
NRBCBANK	0.27%	0.81%	0.24%	1.76%	0.92%	0.49%	0.22%	0.27%	0.09%	0.63%	8.87%	228%	265%	209%	3.50%
ONEBANKLTD	0.44%	1.34%	1.38%	0.63%	0.95%	0.92%	1.18%	1.32%	0.74%	0.29%	1450%	6.54%	9.06%	8.51%	11.40%
PREMIERRBAN	0.15%	1.08%	0.27%	0.25%	0.29%	0.35%	0.27%	0.22%	0.24%	0.17%	411%	3.32%	5.88%	213%	256%
PRIMEBANK	0.67%	0.55%	0.39%	0.52%	0.33%	1.26%	0.14%	0.29%	0.13%	0.19%	418%	5.93%	429%	3.05%	429%
PUBALIBANK	0.24%	0.70%	0.39%	0.46%	0.42%	0.12%	0.14%	0.18%	0.29%	0.14%	3.55%	5.21%	403%	229%	249%
RUPALBANK	0.10%	0.29%	0.26%	1.83%	206%	0.52%	0.48%	0.18%	0.28%	0.55%	311.59%	8233%	6.46%	10.43%	15.31%
SBACBANK	0.40%	1.22%	1.21%	0.40%	0.16%	0.44%	0.60%	0.59%	1.36%	0.68%	6.72%	1.77%	5.95%	5.46%	495%
SHAHJABANK	0.43%	0.33%	0.18%	0.04%	0.70%	0.29%	0.27%	0.23%	0.02%	0.04%	5.15%	6.45%	493%	414%	403%
SIBL	0.28%	0.25%	0.71%	0.22%	0.26%	0.32%	0.11%	0.14%	0.04%	0.12%	6.46%	7.04%	5.89%	5.83%	473%
SOUTEEASTB	0.06%	0.13%	0.10%	0.39%	0.18%	0.14%	0.09%	0.11%	0.37%	0.15%	8.08%	5.27%	449%	298%	465%
STANDBANKL	0.42%	0.26%	0.23%	0.50%	0.59%	0.76%	0.48%	0.48%	0.80%	0.92%	7.80%	7.18%	5.79%	474%	5.82%
TRUSTBANK	0.57%	0.57%	0.26%	0.36%	0.49%	1.09%	0.23%	0.09%	0.27%	0.20%	6.17%	7.39%	5.24%	3.87%	3.14%
UCB	0.35%	0.19%	0.13%	0.07%	0.34%	0.26%	0.08%	0.08%	0.03%	0.07%	8.87%	6.31%	3.33%	223%	3.79%
UNIONBANK	0.36%	1.19%	0.50%	0.77%	0.67%	0.05%	1.49%	1.40%	0.48%	0.33%	467%	1.33%	276%	217%	3.04%
UTTARABANK	0.66%	1.32%	1.02%	1.34%	0.96%	0.51%	1.08%	0.78%	0.35%	1.15%	6.51%	6.03%	7.27%	5.71%	6.84%

Table 37: Sub-standard, doubtful, and bad loans of the listed banks. Source: Credit Information Bureau, Bangladesh Bank

1.5.17 Doubtful loans scenario of listed Banks

ABBANK has shown a consistent decrease in doubtful loans, from 24.86% in 2018 to 13.17% in 2022. This signifies a positive trend in managing and reducing doubtful assets.

ALARABANK experienced fluctuations in doubtful loans, reaching 5.19% in 2019 and decreasing to 3.42% in 2022. The bank needs to continue efforts to stabilize and reduce doubtful assets.

BANKASIA had fluctuations in doubtful loans, reaching 5.82% in 2018 and decreasing to 4.85% in 2022. The bank should focus on strategies to stabilize and reduce these assets.

BRACBANK's doubtful assets fluctuated, reaching 4.44% in 2018 and decreasing to 3.34% in 2022. The bank should aim for stability in managing these assets.

CITYBANK experienced fluctuations in doubtful loans, reaching 4.99% in 2019 and decreasing to 3.92% in 2022. The bank should implement measures to mitigate the risk associated with these assets.

DHAKABANK has shown a consistent decrease in doubtful loans from 6.34% in 2018 to 2.98% in 2022. This reflects positive efforts in risk management.

DUTCHBANGLABANK had fluctuations in doubtful loans, reaching 5.96% in 2018 and decreasing to 3.29% in 2022. The bank should aim for stability in managing these assets.

EBL's doubtful assets fluctuated, reaching 3.30% in 2018 and decreasing to 2.11% in 2022. The bank should continue proactive measures for risk reduction.

EXIMBANK had fluctuations in doubtful loans, reaching 5.28% in 2018 and decreasing to 3.77% in 2022. The bank needs to monitor and manage these assets effectively.

FIRSTSSBANK's doubtful loans fluctuated significantly, reaching 118.59% in 2018 and decreasing to 2.01% in 2022. The bank should focus on maintaining a stable doubtful loan portfolio.

ICBIBANK experienced fluctuations in doubtful loans, reaching 77.33% in 2018 and decreasing to 83.78% in 2022. The bank should adopt strategies to reduce the volatility of these assets.

IFICBANK had fluctuations in doubtful loans, reaching 7.73% in 2018 and decreasing to 5.23% in 2022. Continued efforts are essential for sustained improvement.

ISLAMIBANK had fluctuations in doubtful loans, reaching 113.23% in 2018 and decreasing to 2.70% in 2022. The bank should continue risk management practices.

JAMUNABANK's doubtful loans fluctuated, reaching 4.61% in 2018 and decreasing to 2.88% in 2022. The bank should aim for stability and implement strategies for risk mitigation.

MERCANTLIEBANK's doubtful loans fluctuated, reaching 7.92% in 2018 and decreasing to 4.31% in 2022. The bank needs to focus on maintaining a stable and low level of doubtful assets.

MTB had fluctuations in doubtful loans, reaching 7.47% in 2018 and decreasing to 5.16% in 2022. The bank should continue efforts to manage and reduce these assets.

NBL's doubtful loans fluctuated, reaching 29.03% in 2019 and decreasing to 21.67% in 2022. The bank should focus on strategies for sustained improvement.

NCCBANK had fluctuations in doubtful loans, reaching 78.93% in 2019 and decreasing to 4.13% in 2022. The bank should continue efforts to stabilize and reduce these assets.

NRBCBANK's doubtful loans fluctuated, reaching 8.87% in 2018 and decreasing to 3.50% in 2022. The bank should implement measures to manage and reduce doubtful assets effectively.

ONEBANKLTD's doubtful loans fluctuated, reaching 14.50% in 2018 and decreasing to 11.40% in 2022. The bank should focus on maintaining stability and reducing doubtful assets.

PREMIERBANK's doubtful loans fluctuated, reaching 4.11% in 2018 and decreasing to 2.56% in 2022. The bank should aim for stability and sustained improvement.

PRIMEBANK's doubtful loans fluctuated, reaching 4.18% in 2018 and decreasing to 4.29% in 2022. The bank should focus on strategies for maintaining a stable and low level of doubtful assets.

PUBALIBANK's doubtful loans fluctuated, reaching 5.21% in 2019 and decreasing to 2.49% in 2022. The bank should continue efforts for sustained improvement.

RUPALIBANK's doubtful loans fluctuated, reaching 311.59% in 2018 and decreasing to 15.31% in 2022. The bank should focus on strategies for managing and reducing doubtful assets.

SBACBANK's doubtful loans fluctuated, reaching 6.72% in 2018 and decreasing to 4.95% in 2022. The bank should aim for stability and implement effective measures for risk reduction.

SHAHJABANK's doubtful loans fluctuated, reaching 6.45% in 2019 and decreasing to 4.03% in 2022. The bank should focus on strategies for maintaining a stable and low level of doubtful assets.

SIBL's doubtful loans fluctuated, reaching 6.46% in 2018 and decreasing to 4.73% in 2022. The bank should continue efforts for risk management and reduction.

SOUTHEASTB had fluctuations in doubtful loans, reaching 8.08% in 2018 and decreasing to 4.65% in 2022. The bank should aim for stability and sustained improvement.

STANDBANKL had fluctuations in doubtful loans, reaching 7.80% in 2018 and decreasing to 5.82% in 2022. The bank should continue efforts for sustained improvement.

TRUSTBANK's doubtful loans fluctuated, reaching 6.17% in 2018 and decreasing to 3.14% in 2022. The bank should focus on maintaining a stable and low level of doubtful assets.

UCB had fluctuations in doubtful loans, reaching 8.87% in 2018 and decreasing to 3.79% in 2022. The bank should continue efforts for risk management and maintaining a low level of doubtful assets.

UNIONBANK's doubtful loans fluctuated, reaching 4.67% in 2019 and decreasing to 3.04% in 2022. The bank should focus on strategies for maintaining a stable and low level of doubtful assets.

UTTARABANK's doubtful loans fluctuated, reaching 6.51% in 2019 and decreasing to 6.84% in 2022. The bank should continue efforts for risk management and maintaining a low level of doubtful assets.

1.5.18 Bad/Loss Loans of Listed Banks

ABBANK has shown a consistent decrease in bad/loss loans, from 17.10% in 2018 to 13.17% in 2022. This signifies a positive trend in managing and reducing bad/loss assets.

ALARABANK experienced fluctuations in bad/loss loans, reaching 4.34% in 2019 and decreasing to 3.99% in 2022. The bank needs to continue efforts to stabilize and reduce bad/loss assets.

BANKASIA had fluctuations in bad/loss loans, reaching 4.28% in 2018 and decreasing to 3.02% in 2022. The bank should focus on strategies to stabilize and reduce these assets.

BRACBANK's bad/loss assets fluctuated, reaching 4.30% in 2018 and decreasing to 2.87% in 2022. The bank should aim for stability in managing these assets.

CITYBANK experienced fluctuations in bad/loss loans, reaching 5.31% in 2020 and decreasing to 3.92% in 2022. The bank should implement measures to mitigate the risk associated with these assets.

DHAKABANK has shown a consistent decrease in bad/loss loans from 4.67% in 2019 to 2.98% in 2022. This reflects positive efforts in risk management.

DUTCHBANGL had fluctuations in bad/loss loans, reaching 4.11% in 2018 and decreasing to 3.29% in 2022. The bank should aim for stability in managing these assets.

EBL's bad/loss assets fluctuated, reaching 3.51% in 2018 and decreasing to 2.49% in 2022. The bank should continue proactive measures for risk reduction.

EXIMBANK had fluctuations in bad/loss loans, reaching 3.79% in 2018 and decreasing to 3.51% in 2022. The bank needs to monitor and manage these assets effectively.

FIRSTSBANK's bad/loss loans fluctuated significantly, reaching 118.59% in 2018 and decreasing to 2.01% in 2022. The bank should focus on maintaining a stable bad/loss loan portfolio.

ICBIBANK experienced fluctuations in bad/loss loans, reaching 82.99% in 2020 and decreasing to 83.78% in 2022. The bank should adopt strategies to reduce the volatility of these assets.

IFIC had fluctuations in bad/loss loans, reaching 7.73% in 2018 and decreasing to 5.23% in 2022. Continued efforts are essential for sustained improvement.

ISLAMIBANK had fluctuations in bad/loss loans, reaching 113.23% in 2018 and decreasing to 2.70% in 2022. The bank should continue risk management practices.

JAMUNABANK's bad/loss loans fluctuated, reaching 4.03% in 2021 and decreasing to 2.88% in 2022. The bank should aim for stability and implement strategies for risk mitigation.

MERCANTLIEBANK's bad/loss loans fluctuated, reaching 4.62% in 2019 and decreasing to 4.31% in 2022. The bank needs to focus on maintaining a stable and low level of bad/loss assets.

MTB had fluctuations in bad/loss loans, reaching 5.02% in 2019 and decreasing to 5.16% in 2022. The bank should continue efforts to manage and reduce these assets.

NBL's bad/loss loans fluctuated, reaching 29.03% in 2019 and decreasing to 21.67% in 2022. The bank should focus on strategies for sustained improvement.

NCCBANK had fluctuations in bad/loss loans, reaching 78.93% in 2019 and decreasing to 4.13% in 2022. The bank should continue efforts to stabilize and reduce these assets.

NRBCBANK's bad/loss loans fluctuated, reaching 8.87% in 2018 and decreasing to 3.50% in 2022. The bank should implement measures to manage and reduce bad/loss assets effectively.

ONEBANKLTD's bad/loss loans fluctuated, reaching 14.50% in 2018 and decreasing to 11.40% in 2022. The bank should focus on maintaining stability and reducing bad/loss assets.

PREMIERBAN's bad/loss loans fluctuated, reaching 5.88% in 2019 and decreasing to 2.56% in 2022. The bank should aim for stability and sustained improvement.

PRIMEBANK's bad/loss loans fluctuated, reaching 5.93% in 2019 and decreasing to 4.29% in 2022. The bank should focus on strategies for maintaining a stable and low level of bad/loss assets.

PUBALIBANK's bad/loss loans fluctuated, reaching 5.21% in 2019 and decreasing to 2.49% in 2022. The bank should continue efforts for sustained improvement.

RUPALIBANK's bad/loss loans fluctuated, reaching 311.59% in 2018 and decreasing to 15.31% in 2022. The bank should focus on strategies for managing and reducing bad/loss assets.

SBACBANK's bad/loss loans fluctuated, reaching 6.72% in 2018 and decreasing to 4.95% in 2022. The bank should aim for stability and implement effective measures for risk reduction.

SHAHJALBANK's bad/loss loans fluctuated, reaching 6.45% in 2019 and decreasing to 4.03% in 2022. The bank should focus on strategies for maintaining a stable and low level of bad/loss assets.

SIBL's bad/loss loans fluctuated, reaching 7.04% in 2019 and decreasing to 4.73% in 2022. The bank should continue efforts for risk management and reduction. SOUTHEASTBANK had fluctuations in bad/loss loans, reaching 8.08% in 2018 and decreasing to 4.65% in 2022. The bank should aim for stability and sustained improvement. STANDBANKLTD had fluctuations in bad/loss loans, reaching 7.18% in 2019 and decreasing to 5.82% in 2022. The bank should continue efforts for sustained improvement. TRUSTBANK's bad/loss loans fluctuated, reaching 7.39% in 2019 and decreasing to 3.14% in 2022. The bank should focus on maintaining a stable and low level of bad/loss assets.

UCB had fluctuations in bad/loss loans, reaching 8.87% in 2018 and decreasing to 3.79% in 2022. The bank should continue efforts for risk management and maintaining a low level of bad/loss assets.

UNIONBANK's bad/loss loans fluctuated, reaching 4.67% in 2019 and decreasing to 3.04% in 2022. The bank should focus on strategies for maintaining a stable and low level of bad/loss assets.
UTTARABANK's bad/loss loans fluctuated, reaching 6.51% in 2019 and decreasing to 6.84% in 2022. The bank should continue efforts for risk management and maintaining a low level of bad/loss assets.

1.5.19 NPL or Classified Loans of The Listed Banks and Recent Credit Risk of the Banking Sector

The asset quality of the banking industry as a whole somewhat deteriorated in 2022 as gross nonperforming loans (NPL) worsened marginally, mostly due to an increase in SOCB and SDB NPL ratios. The net NPL ratio also went up, from -0.43 % the year before to -0.08 %. But the listed banks have shown some mixed results which are as follows.
ABBANK exhibited a decreasing trend in NPL percentages from 33.20% in 2018 to 14.18% in 2021, followed by a slight increase to 20.23% in 2022. ALARABANK showed relatively low NPL percentages, with a slight increase from 4.79% in 2018 to 5.41% in 2022. BANKASIA demonstrated fluctuations in NPL percentages, with a peak at 5.14% in 2021. BRACBANK maintained relatively low NPL percentages throughout the period, with a slight increase from 3.38% in 2020 to 4.00% in 2022. CITYBANK showed fluctuations in NPL percentages, with a peak at 5.77% in 2019, followed by a general decrease in subsequent years. DHAKABANK exhibited fluctuations in NPL percentages, with a peak at 5.08% in 2022. DUTCHBANGL showed fluctuations in NPL percentages, with a peak at 4.38% in 2019, followed by a slight increase to 4.29% in 2022. EBL demonstrated fluctuations in NPL percentages, with a peak at 3.84% in 2021, followed by a slight decrease to 2.91% in 2022. EXIMBANK exhibited fluctuations in NPL percentages, with a peak at 5.11% in 2018, followed by a general decrease in subsequent years. FIRSTSBANK displayed a significant decrease in NPL percentages from 67.09% in 2020 to 4.01% in 2022. ICBIBANK showed fluctuations in NPL percentages, with a peak at 84.34% in 2022. IFIC demonstrated fluctuations in NPL percentages, with a peak at 6.16% in 2018, followed by general decreases in subsequent years. ISLAMIBANK exhibited fluctuations in NPL percentages, with a peak at 78.07% in 2018, followed by general decreases in subsequent years. JAMUNABANK showed fluctuations in NPL percentages, with a peak at 5.32% in 2022. MERCANBANK exhibited fluctuations in NPL percentages, with a peak at 7.09% in 2022. MTB showed fluctuations in NPL percentages, with a peak at 5.80% in 2021, followed by a slight decrease to 5.77% in 2022. NBL showed fluctuations in NPL percentages, with a peak at 24.96% in 2022. NCCBANK exhibited fluctuations in NPL percentages, with a peak at 67.39% in 2019, followed by a general decrease in subsequent years. NRBCBANK showed fluctuations in NPL percentages, with a peak at 4.69% in 2022. ONEBANKLTD exhibited fluctuations in NPL percentages, with a peak at

13.97% in 2022. PREMIERBAN demonstrated fluctuations in NPL percentages, with a peak at 6.70% in 2019, followed by general decreases in subsequent years. PRIMEBANK showed fluctuations in NPL percentages, with a peak at 6.16% in 2018, followed by general decreases in subsequent years. PUBALIBANK exhibited fluctuations in NPL percentages, with a peak at 5.52% in 2018, followed by general decreases in subsequent years. RUPALIBANK showed fluctuations in NPL percentages, with a peak at 86.06% in 2018, followed by general decreases in subsequent years. SBACBANK maintained relatively low NPL percentages throughout the period, with a slight increase from 1.97% in 2018 to 5.17% in 2022. SHAHJABANK exhibited fluctuations in NPL percentages, with a peak at 6.84% in 2018, followed by general decreases in subsequent years. SIBL showed fluctuations in NPL percentages, with a peak at 7.82% in 2018, followed by general decreases in subsequent years. SOUTHEASTB exhibited fluctuations in NPL percentages, with a peak at 6.54% in 2022. STANDBANKL showed fluctuations in NPL percentages, with a peak at 7.94% in 2022. TRUSTBANK exhibited fluctuations in NPL percentages, with a peak at 7.90% in 2018, followed by general decreases in subsequent years. UCB exhibited fluctuations in NPL percentages, with a peak at 6.79% in 2018UNIONBANK maintained relatively low NPL percentages throughout the period, with a slight increase from 1.61% in 2018 to 3.54% in 2022. UTTARABANK exhibited fluctuations in NPL percentages, with a peak at 7.81% in 2019, followed by general decreases in subsequent years.

Ticker	**Non-Performing Loans (NPL)**				
Year	**2018**	**2019**	**2020**	**2021**	**2022**
ABBANK	33.20%	18.33%	16.83%	14.18%	20.23%
ALARABANK	4.79%	4.82%	3.80%	4.81%	5.41%
BANKASIA	4.10%	4.61%	3.24%	5.14%	4.87%
BRACBANK	3.61%	4.44%	3.38%	4.27%	4.00%
CITYBANK	5.33%	5.77%	4.05%	4.86%	3.85%
DHAKABANK	4.99%	4.74%	3.13%	3.32%	5.08%
DUTCHBANGL	4.14%	4.38%	2.17%	3.75%	4.29%
EBL	2.32%	3.38%	2.93%	3.84%	2.91%
EXIMBANK	5.11%	4.33%	3.82%	3.98%	3.86%
FIRSTSBANK	3.34%	4.94%	67.09%	68.59%	4.01%
ICBIBANK	82.00%	84.04%	78.37%	80.80%	84.34%
IFIC	6.16%	5.37%	3.97%	6.09%	5-59%
ISLAMIBANK	78.07%	79.68%	3.41%	3.31%	3-70%
JAMUNABANK	3.77%	3.70%	2.95%	2.97%	5-32%
MERCANBANK	4.82%	4.86%	4.72%	4.54%	7.09%
MTB	5.39%	5.39%	4.61%	5.80%	5.77%
NBL	9.41%	10.90%	9.33%	20.66%	24-96%
NCCBANK	5.80%	67-39%	4.98%	4-57%	6.85%
NRBCBANK	2.94%	3.20%	2-93%	4-56%	4.69%
ONEBANKLTD	7.08%	9.28%	8.63%	11.55%	13-97%
PREMIERRBAN	3.99%	6.70%	2-49%	2-71%	2.88%
PRIMEBANK	6.16%	4.66%	3.46%	4.83%	3-42%
PUBALIBANK	5.52%	4.43%	2-76%	3-05%	2-62%
RUPALBANK	86.06%	80.20%	11-79%	17-50%	21.19%
SBACBANK	1.97%	6.09%	6.22%	5.90%	5.17%
SHAHJABANK	6.84%	4.91%	4.57%	4.42%	4.78%
SIBL	7.82%	6.71%	6.12%	5.19%	4.81%
SOUTEEASTB	5.87%	4.87%	3.10%	4.81%	6.54%
STANDBANKL	7.90%	5.84%	4.87%	6.19%	7.94%

Ticker	Non-Performing Loans (NPL)				
Year	2018	2019	2020	2021	2022
TRUSTBANK	7.90%	5.49%	4-51%	3.65%	4.76%
UCB	6.79%	3.69%	2.55%	4.41%	5.99%
UNIONBANK	1.61%	3.15%	2.53%	3.49%	3.54%
UTTARABANK	6.33%	7.81%	6.36%	7.53%	6.83%

Table 38: Non-Performing loans of the listed Banks. Source: Credit Information Bureau, Bangladesh Bank

1.5.20 Prospect and Challenges of Credit Risk Management of Bangladesh

The major challenges in the credit risk management in Bangladesh are the large single borrowers, the fiscal dominance, and policy relaxation, family members in the board, poor corporate governance and extension of tenure of Board of Directors.

Among listed banks, 8 banks (AB Bank, FIRSTBANK, ICBIBANK, NBL, ONEBANKLTD, RUPALIBANK, SIBL, and UNIONBANK) have failed to maintain the minimum CRAR ratio of 12.5% and rest of the banks have been able to maintain the minimum CRAR ratio. Moreover, ABBANK, BRACBANK, CITYBANK, EXIMBANK, FIRSTSBANK, IFIC, MERCANBANK, NBL, NRBCBANK, ONEBANKLTD, PREMIERBAN, RUPALIBANK, SBACBANK, SHAHJABANK, SIBL, SOUTHEASTB, TRUSTBANK, UCB, and UNIONBANK have more than 50% of their loan concentration on top 5 sectors which indicate a less diversity on their loan and credit. On the other hand, BANKASIA, ICBIBANK, NCCBANK, PRIMEBANK, and STANDBANKL reveal a loan concentration of less than 50% on top 5 sectors.

Ticker	Capital to Risk Weighted Assets Ratio (CRAR)				
Year	2018	2019	2020	2021	2022
ABBANK	10.48%	10.59%	11.33%	11.42%	11.00%
ALARABANK	15.70%	16.16%	15.13%	20.42%	19.37%
BANKASIA	14.76%	17.73%	16.93%	15.50%	17.46%
BRACBANK	14.68%	14.58%	15.97%	15.46%	14.17%
CITYBANK	12.19%	13.90%	14.28%	13.38%	13.92%
DHAKABANK	13.87%	16.33%	14.64%	14.66%	14.11%
DUTCHBANGL	15.62%	15.53%	17.23%	16.41%	15.55%
EBL	12.02%	14.55%	15.03%	13.87%	14.43%
EXIMBANK	10.88%	12.55%	13.27%	14.36%	13.86%
FIRSTSBANK	10.34%	11.43%	12.12%	12.34%	12.07%
ICBIBANK	-125.08%	-133.11%	-133.16%	-137.41%	-137.46%
IFIC	12.99%	13.42%	12.96%	13.89%	13.62%
ISLAMIBANK	12.17%	13.04%	13.84%	13.72%	12.71%
JAMUNABANK	13.61%	14.26%	15.43%	16.36%	16.69%
MERCANBANK	13.28%	13.92%	13.61%	14.09%	14.35%
MTB	12.86%	12.91%	12.92%	14.41%	14.50%
NBL	13.95%	13.34%	13.00%	11.75%	8.82%

Ticker	Capital to Risk Weighted Assets Ratio (CRAR)				
Year	**2018**	**2019**	**2020**	**2021**	**2022**
NCCBANK	12.60%	13.33%	13.12%	15.83%	14.86%
NRBCBANK	14.09%	13.50%	12.63%	13.58%	12.60%
ONEBANKLTD	11.98%	12.82%	13.07%	12.08%	11.89%
PREMIERRBAN	12.31%	12.59%	13.62%	13.96%	14.11%
PRIMEBANK	16.59%	17.20%	16.98%	16.86%	16.33%
PUBALIBANK	11.94%	13.65%	14.59%	14.11%	13.90%
RUPALBANK	10.06%	10.25%	7.94%	5.64%	4.99%
SBACBANK	15.85%	14.73%	13.45%	13.91%	13.78%
SHAHJABANK	14.31%	15.30%	13.95%	14.72%	14.11%
SIBL	14.37%	13.88%	13.57%	11.64%	11.89%
SOUTEEASTB	12.38%	11.52%	14.35%	13.86%	12.75%
STANDBANKL	9.97%	11.32%	12.86%	14.12%	13.96%
TRUSTBANK	14.04%	14.38%	14.04%	14.07%	13.57%
UCB	12.83%	14.89%	14.94%	13.47%	13.06%
UNIONBANK	10.24%	12.24%	11.21%	10.47%	11.43%
UTTARABANK	12.46%	13.00%	14.05%	15.24%	15.38%

Table 39: CRAR Ratio for The Listed Banks. Source: Credit Information Bureau, Bangladesh Bank

ABBANK has given 24 clients more than 10% of total loan. ISLAMIBANK had Number of clients with outstanding amount exceeding 10% of total capital of the Bank is 39 which held BDT 5,54,448 million (37.94%) outstanding loan. Number of clients of MERCANBANK with outstanding amount exceeding 10% of total capital of the Bank is 32 which held BDT 162,966,161,079 or (58.02%) outstanding loan. NCCBANK has number of clients 12 with outstanding amount BDT 5,540 crore. NRBCBANK has 29 single borrowers who have more than 10% of bank’s total capital. ONEBANKLTD is 7 clients with outstanding amount and classified loans and advances exceeding 10% of total capital of the Bank. PRIMEBANK has 39 clients with outstanding amount exceeding 10% of total capital of the Bank. PUBALIBANK has 21 clients with outstanding amount exceeding 10% of total capital of the Bank. RUPALIBANK, SIBL, SOUTHEASTB, STANDBANKL, TRUSTBANK, UCB, UNIONBANK, and UTTARABANK have 20, 30, 39, 28, 21, 40, and 22 clients consecutively with outstanding loan amount exceeding 10% of their total capital.

The major threat for the banking sector in the upcoming periods is the rising NPL due to strategic default by the borrowers and policy relaxations by the central bank will encourage the credit defaults.

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Chapter 2: Literature Review

2.1 Introduction

Credit risk management is the prime task of the financial institutions. Factors of the economy often influences the risk management process in the banking industry. demand. This chapter will deal with the findings of the other researchers regarding this topic. The major findings on the issues will be included in this part based on the individual variable analysis. Analyzing a number of literatures provide more insight and the scope of finding new area of study. Under literature review chapter findings and results of other literatures will be presented. Possible research gap and rationale of the study on credit risk management in the listed banks will be covered in this part.

2.2 Review of Capital Adequacy Ratio

Blum, J. and Hellwig, M. (1995) founded out that macroeconomic fluctuations can be reinforced through Capital Adequacy Regulation (CAR) and thus hamper overall financial market.

Hakim, S. and Neaime, S. (2001) found that the profitability of banks in Egypt and Lebanon is significantly influenced by factors like how easily they can access money, their credit practices, and the amount of money they have on hand. The study also showed that the rules and regulations that banks follow are significantly impacted by how well they manage and handle risks.

Fatemi, A and Fooladi, I (2006) discovered that credit risk models primarily concentrate on the identification of counterparty default risk, while some also consider migration risk. Interestingly, the majority of banks rely on in-house models, and only a small portion opt for proprietary or vendor-promoted models. Additionally, there is a stronger force on non-traded credit loan portfolios in contrast to traded bonds.

2.3 Review of Return on Assets

Achou, T. F., & Tenguh, N. C.'s (2008) research discovered a strong connection between how well a bank performs, which is measured using ROA and ROE, and how effectively they manage risk. Richard et al. (2008) found that CRM systems in less developed economies differ from those in developed ones, emphasizing the influence of the operating environment on CRM success. Hosna, A., Manzura, B. and Juanjuan, S. (2009) used Return on Equity (RoE) to measure financial performance in their study. They discovered that RoE is more affected by Non-performing Loans (NPL) rather than the sufficiency of capital. They also noticed that the influence of how banks manage credit risk on their profitability varies between different banks.

Kithinji, A.M. (2010) research revealed that factors other than credit and non-performing loans played a more significant role in determining a bank's profitability.

Psillaki et al. (2010) suggested that any organizations stability, profitability and optical allocation of funds are increased by the effective management of credit risk.

Lang, W.W., Jagtiani, J.A. (2010) discovered that the 2007 financial crisis was caused by the housing market's ups and downs. This situation got worse because companies had too many mortgage-related investments due to problems within their own organizations and issues with how they were managed.

Kithinji, A. M. (2010) has found that profit doesn't get impacted by amount of credit and bad loans.

Aduda, J. and Gitonga, J. (2011) conducted a study in Kenya to investigate how managing credit risk is connected to the profits of different commercial banks. They used both words and numbers to do their research. What they found was that when banks managed their credit risks well, it had a notable positive impact on their profitability.

Adebayo et al. (2011) conducted a study to see how managing money in a smart way relates to making profits. What they found was that when a business handles its cash well, it tends to make more money, showing a positive connection between the two.

2.4 Review of Return on Equity

Aduda, J. and Gitonga, J. (2011) study showed that the Non-Performing Loan Ratio (NPLR), which indicates how well banks manage credit risk, affects profitability, measured by Return on Equity (RoE).

Boahene et al. (2012) studied how a bank's ability to make money is linked to how well they handle credit risks, and what they discovered is that there is a positive connection between these two things.

Poudel, R.P.S. (2012) conducted a study to investigate different aspects of managing credit risks and how they affect a bank's ability to make money. The study found that among these aspects, the rate at which loans are not repaid has the most significant impact on a bank's financial performance.

Musyoki, D. and Kadubo, A.S. (2012) used different factors related to managing credit risks to check how well banks were doing. What they discovered was that all of these factors were causing harm to the banks' financial performance. Specifically, the rate at which loans were not being paid back was the most significant factor affecting the banks' financial performance.

Masood, O. and Ashraf, M.'s (2012) found that banks that are bigger and well-managed tend to do better in terms of Return on Assets (ROA).

Fredrick, O. (2012) proposed that earnings exhibit a robust correlation with Return on Equity (ROE) when considering all the CAMEL components.

Boahene et al. (2012) discovered that a bank's profitability is greatly affected by the risk associated with loans and credit.

Kolapo et al. (2012) proposed that credit risk consistently affects a bank's performance, as measured by Return on Assets (ROA), regardless of the specific situation of individual banks.

Poudel, R. P. S. (2012) has found that Default rate, Cost of per loan assets, CAR as measure of credit risk management have a negative relationship with financial performance as measured by ROA.

Gakure et al. (2012) found the success of unsecured bank loans has been significantly influenced by how well risks are recognized, measured, and supervised, which are key elements of credit risk management.

Weber, O. (2012) suggests that Canadian banks integrate environmental risks into credit management, finding that all major Canadian banks systematically assess environmental risks in credit decisions, highlighting the need for better accounting-related reporting and further research on the cost-benefit aspect.

Kaaya, I. and Pastory, D. (2013) discovered that when credit risk indicators are present, they have an adverse impact on the financial performance of banks.

Ogboi, C. and Unuafe, O.K. (2013) reached the conclusion that when banks have effective credit risk management and sufficient capital, it positively influences their financial performance.

Adeusi et al. (2013) identified that there is an adverse connection between doubtful loans (a measure of credit risk management) and Return on Assets (ROA) and Return on Equity (ROE), which are indicators of a bank's performance. Conversely, Capital Adequacy Ratio (CAR) had a contrary effect.

Kaaya, I., & Pastory, D. (2013) study revealed that measures of credit risk management such as the Ratio of Loan Loss to Net Loan, NPLR, Ratio of Loan Loss to Net Loan, and Ratio of Impaired Loan to Gross Loan are linked to lower Return on Assets (ROA) in a negative way.

Moges et al. (2013) found the growing Data Quality (DQ) issues in companies, proposing a Total Data Quality Management Program (TDQM). This study employs a questionnaire to identify key DQ dimensions, assess credit risk databases, and suggest improvements. It introduces a scorecard index and identifies accuracy and security as crucial DQ dimensions.

Afriyie, H. O., & Akotey, J. O. (2013) study determined how the way credit risk is managed influences the financial performance of rural and community banks in the Brong Ahafo Region of Ghana.

Abiola, I. and Olausi, A.S. (2014) study, looked at commercial banks in Nigeria over a seven-year period from 2005 to 2011. They wanted to see how the way these banks handle credit risk influences their performance. They used Non-Performing Loans and Capital Adequacy Ratio (CAR) to gauge credit risk management and Return on Assets (ROA) and Return on Equity (ROE) to measure bank performance. The results of their research made it evident that credit risk management has a substantial impact on these banks' overall profitability.

Alalade et al. (2014) conducted a study in banks located in Lagos State to examine how credit risk management affects their profitability. Their research revealed a significant connection between how credit risk is managed and the overall profitability and performance of these banks in Lagos State.

Aruwa, S.A. and Musa, A.O. (2014) explored how credit risk management and different risk factors impact the financial performance of banks. Their study unveiled a strong link between these risk elements and how well the banks performed financially.

Kurawa, J.M. and Garba, S. (2014) found that different factors related to managing credit risk, like default rate (DR), cost per loan asset (CLA), and capital adequacy ratio (CAR), have an influence on how profitable banks are.

Li, F., & Zou, Y. (2014) observed that the strategy of managing credit risk, specifically through NPLR, has a noteworthy impact on the measures of performance, Return on Equity (RoE) and Return on Assets (RoA). However, Capital Adequacy Ratio (CAR) didn't show a significant influence in this context.

2.5 Review of Non-Performing Loan

Chirinko, R. S., Guill, G. D., & Hebert, P. (1991) found that spreading out investments to different areas, known as diversification, is a common and effective way to lower risk without extra cost. This idea is widely accepted and followed in risk management practices because it helps minimize potential losses.

Bonini, S., & Caivano, G. (2013) wants to share the outcomes of using survival analysis to figure out how much is lost when a default happens. It does this by studying the risk rates in the portfolio of an Italian retail bank.

Idowu, A. &Awoyemi, S. O. (2014) discovered that non-performing loans have a notable and adverse effect on the profitability of Nigeria's commercial banks.

Idowu Abiola & Awoyemi Samuel Olausi, (2014) found the important role of effective credit risk management in Nigerian commercial banks, especially during ongoing financial challenges. They noted that skillful credit risk management significantly boosts these banks' profitability and plays a vital role in their ability to endure and thrive.

Gizaw, M., Kebede, M., & Selvaraj, S. (2015) practically investigated how credit risk affects the profits of commercial banks in Ethiopia. To do this, information from annual reports of 8 sample banks over 12 years (2003-2014) was collected from both the banks and the National Bank of Ethiopia.

Singh, A. (2015) conducted a study focusing on 12 public-sector banks and 12 private-sector banks in India. The goal was to understand how credit risk management impacts their profitability. The study used multiple regression models and chose Return on Assets (RoA) as the performance metric. Non-performing assets (NPA) and Capital Adequacy Ratio (CAR) were used as indicators for credit risk management. The findings showed a significant reverse relationship between NPA and RoA, indicating that banks with higher interest income tend to have lower NPA, suggesting this as a sound credit management strategy.

Keenan, S. C., & Sobehart, J. R. (1999) aimed to offer advice on testing and comparing credit risk models. Being clear about how models are validated and compared is crucial. Effective models can speed up the credit approval process and ensure consistency in credit assessment. On the other hand, poorly performing models could pose significant problems for credit risk management. The focus is on models that predict defaults, but the methods discussed can be adjusted for models predicting losses or other credit events.

Kisala, P. M. (2014) looked into how managing credit risks affects how well microfinance institutions give out loans in Kenya. The study used a descriptive research design, which means it thoroughly examined how credit risk management is connected to the performance of loans in microfinance institutions.

2.6 Review of Liquidity & Asset Size

Alshatti, A.S.'s (2015) conducted a study involving thirteen commercial banks in Jordan to assess how credit risk management influences their financial performance. They used Return on Assets (ROA) and Return on Equity (ROE) as performance indicators. Factors such as liquidity, capitalization, asset size, capital adequacy, leverage, asset quality, asset structure, and financial structure were considered as indicators of credit risk management.

Gizaw et al. (2015) discovered that indicators related to credit risk management, like NPL, LLP, and CAR, have a significant impact on the profitability of banks, as measured by Return on Equity (RoE).

Uwuigbe, et al. (2015) examined how credit management influences the performance of banks in Nigeria. Their research revealed that higher Non-Performing Loans (NPL) and bad debt ratios have an adverse effect on the banks' performance.

Kodithuwakku, S. (2015) studied the impact of credit risk management on the performance of banks in Sri Lanka. The results indicated that Non-Performing (NP) loans and provisions have a negative effect on the financial performance of Sri Lankan banks, meaning they harm the banks' performance.

Asfaw, A. H. & Veni, P. (2015) observed that four components of Basel's credit risk management principles play a significant role in explaining how banks in Ethiopia practice credit risk management

Ahmed, S. F. & Malik, Q. A. (2015) assessed how credit risk management influences loan performance by examining aspects like credit terms, client evaluation, collection policies, and credit risk control. Their results indicate that credit terms and client appraisal have a positive and significant impact on loan performance, while collection policies and credit risk control have positive effects but these effects are not significant. This study offers insights to help management enhance loan performance through specific credit risk management practices and also suggests areas for future research.

2.7 Review of Net Interest Margin

Adekunle et al. (2015) study, delved into the role of credit risk management in Nigerian commercial banks. They used a conceptual model and panel data to understand this. Their results underscored the substantial influence of credit risk management on financial performance, with a specific emphasis on the importance of effectively handling non-performing loans and provisions.

Iftikhar, M. (2016) conducted a study to understand how credit risk management influences the financial performance of commercial banks in Pakistan listed on the KSE. They used Return on Assets (RoA) and Return on Equity (RoE) to measure financial performance, with Capital Adequacy Ratio and Non-performing Loans as indicators of credit risk management.

Muriithi et al. (2016) discovered that in Kenya, credit risk has a notable and adverse impact on the profitability of banks. Muriithi et al. (2016) observed that in the context of financial performance, credit risk indicators display a meaningful and unfavorable connection. Aykut, E. (2016) did research on Turkish commercial banks which revealed that credit risk has a negative impact, while foreign exchange has a positive influence on the banks' profitability.

Konovalova et al. (2016) concluded that creating a model to assess borrowers' internal credit ratings and improving methods will make credit risk management better for commercial banks.

Apanga et al. (2016) discovered that credit risk management practices in listed banks in Ghana follow good principles, but the key distinction lies in how the board defines the types and durations of loans.

These banks encounter credit risks in corporate and small business loans and depend on collateral to handle these risks.

Ndoka, S., & Islami, M. (2016) looked into the connection between how banks manage credit risks and their profitability. They examined indicators such as ROE, ROA, NPL ratio, and CAR using data from 16 banks spanning from 2005 to 2015. Their goal was to pinpoint the main factors related to credit risk that influence bank profitability and suggest better ways to manage these risks.

Hamza, S.M. (2017) conducted a study to explore how credit risk management affects banks in Pakistan. The study revealed that factors like Capital Adequacy Ratio (CAR), Loan Loss Provision Ratio (LLPR), Liquidity Ratio (LR), and Non-Performing Loan Ratio (NPLR) play a significant role in influencing bank profitability. Among these factors, LLPR, LR, and NPLR have a negative impact, while CAR, loan and advances (LAR), and bank size have a positive impact on a bank's performance, measured by return on assets.

2.8 Review of Economic Growth

Isanzu, J. S. (2017) on his study revealed that financial performance as measured by ROA is affected significantly by non-performing loan ratio and capital adequacy.

Kani, S. (2017) on his study has found a significant negative relationship between credit risk and bank's performance. Annor, E. S., & Obeng, F. S.s' (2017) research indicates that a bank's profitability is positively linked to Capital Adequacy Ratio (CAR), while Non-Performing Loans (NPLs), Loan Loss Provisions Ratio, and Loan to Asset Ratio are negatively and significantly associated with a bank's profitability.

Harcourt, E. E. (2017) has found a significant relationship between credit risk management indicators and the performance of the deposit money banks.

Witzany, J. (2017) suggests that Credit assessment in banks and corporations' hinges on skilled, unbiased assessors. If influenced by sales targets or corruption, even robust models and mathematicians can't mitigate operational risks. Basel standards emphasize organizational structure and independence.

Taiwo et al. (2017) observed the influence of credit risk management on Nigerian Deposit Money Banks (DMBs) and their lending growth. They concluded that effective management builds trust and enhances profitability but doesn't significantly affect the expansion of loans. They suggested that banks should rigorously follow credit assessment policies and allocate funds to borrowers with good credit histories.

Belás et al. (2017) explored how well entrepreneurs' understanding of corporate capital relates to efficient credit risk management. Their results underlined possible financial risks and stressed the significance of having theoretical knowledge in risk management, particularly for bigger businesses, male entrepreneurs, and individuals with higher education. This knowledge contributes to the sustainability of the SME sector.

Serwadda, I. (2018) conducted a study on how credit risk management affected commercial banks in Uganda during the period from 2006 to 2015. The results highlighted the importance of tackling issues related to non-performing loans, loan loss provisions, and the growth of interest earnings to enhance the overall performance of banks. The study recommended improving credit risk management methods and establishing strong credit policies and monitoring systems to reduce risks.

Noor et al. (2018) discovered that a higher Percentage of Classified Loans (POCL) had an adverse effect on Return on Investment (ROI), which is a performance indicator.

2.9 Review of Financial Stability

Kajola et al. (2018) examined three indicators – the ratio of Non-Performing Loans to total Loans (NPLLR), the ratio of Non-Performing Loans to total Deposits (NPLDR), and the Capital Adequacy Ratio (CAR) – to assess credit risk management. They used Return on Assets (ROA) and Return on Equity (ROE) as measures of financial performance. The study's findings showed that all three of these indicators had a noteworthy impact on profitability.

Islam et al. (2019) conducted a study to gauge how credit risk management influenced 23 commercial banks listed on the Dhaka Stock Exchange between 2006 and 2015. They looked at five credit risk measures and two control factors to see how they affected three aspects of bank performance: Return on Assets (RoA), Return on Equity (RoE), and Market to Book Value Ratio (MBR). The research also revealed that the Geographic Focus Index (GFI) had a positive and noteworthy influence on a bank's performance, as indicated by MBR.

Ali, L. and Dhiman, S.'s (2019) conducted a study to explore the real-world connection between how banks manage credit risk and their financial performance. They gathered data spanning from 2010 to 2017 from the top ten commercial banks in terms of total assets and used panel regression analysis. To assess bank performance, they looked at Return on Assets (RoA), while they evaluated credit risk management using seven indicators, including Non-Performing Loans Ratio (NPLR), Loan Loss Provision Ratio (LLPR), Capital Adequacy Ratio (CAR), Asset Quality Ratio (AQ), Management (M), Earnings €, and Liquidity (L).

Olugboyega et al. (2019) found a strong connection between credit risk management indicators like NPLLR, NPLDR, and CAR, and important performance measures such as RoA and RoE.

Bülbül et al. (2019) pinpointed the factors that influence how banks choose to manage risks. They emphasized that competition and sector concentration play crucial roles, and their theory was backed by actual data from German savings banks. Their study revealed that competition motivates banks to adopt more sophisticated risk management practices, while sector concentration promotes the modeling of credit portfolios but makes it harder to transfer credit risks.

Gupta, M., and Sikarwar, T. S. (2020) conducted a study to see how capital adequacy, leverage, and the debt-equity ratio affected the profitability of India's top ten banks over a ten-year period. Surprisingly, the study's findings didn't align with what theory would predict, and this inconsistency was confirmed by the results of a time series analysis.

Misheva et al. (2021) discovered that Artificial Intelligence (AI) is transforming the finance industry, bringing advantages to customers. However, there are difficulties related to being transparent and explaining how AI decisions are made. The paper explores the use of LIME and SHAP methods to improve credit risk models and discusses the outcomes and real-world obstacles.

2.10 Review of Cost-Income Ratio

Al Zaidanin, J. S., and Al Zaidanin, O. J. (2021) light on how factors like capital adequacy, non-performing loans, and cost-income ratios affect a bank's profitability. Their findings revealed that non-performing loans and high cost-income ratios harm profitability, emphasizing the importance of managing credit risks effectively. The study suggests that banks should focus on analyzing loan performance, controlling costs, using assets efficiently, managing liquidity, and maintaining adequate capital to enhance their financial performance. Additionally, they recommend future research should consider more variables and longer study periods for a more comprehensive understanding.

Anvarovich, N. E. (2022) highlighted the significance of improving risk management within commercial banks to tackle the causes of bank risks. The study concentrated on the need for efficient risk management in changing economic and financial environments. It offered information about the objectives, responsibilities, elements, and proposed an ideal organizational setup, as well as strategies to attain successful risk management.

Bachmair, F. F. (2016) proposes a simple four-step process for assessing credit risk: (1) identify important features to decide on an analysis method, (2) examine factors influencing risk, (3) measure the risks, and (4) use the analysis and measurements to create tools for managing risk.

Mogga, J. P., Mwambia, F., & Kithinji, M. M. (2018) made a study aimed to understand how the way banks handle credit risks affects their success in South Sudan. It specifically looked at whether banks in the region effectively identify risks, monitor them, and analyze them, and how these practices influence the overall performance of the banks.

Adamgbo, D. S. L. C., Toby, P. A. J., Momodu, D. A. A., & Imegi, P. J. C. (2019) found that how having enough capital impacts the way credit risks are managed in Nigeria. The study uses a quasi-experimental research design.

Keenan, S. C., & Sobehart, J. R. (1999) aimed to offer advice on testing and comparing credit risk models. Being clear about how models are validated and compared is crucial. Effective models can speed up the credit approval process and ensure consistency in credit assessment. On the other hand, poorly performing models could pose significant problems for credit risk management. The focus is on models that predict defaults, but the methods discussed can be adjusted for models predicting losses or other credit events.

Kisala, P. M. (2014) looked into how managing credit risks affects how well microfinance institutions give out loans in Kenya. The study used a descriptive research design, which means it thoroughly examined how credit risk management is connected to the performance of loans in microfinance institutions.

2.11 Research Gap

The designed study though identifies significant reason to resolve the credit risk related problem in the market still there exists gaps to further work on this issue of the Bangladeshi Market. Non-performing loan has been gradually which covers almost 80% of total credit risk. Most of the researchers worked on the quantitative values and the relation among the performance related factors and macro-economic factors. The significant gap still prevails that seek attention and researchers can work on information asymmetry, rumor, deficiency in credit quality, regulatory issues, governance related issues. Legal resolution regarding the huge amount of loan default might be considered for the research. Empirical evidence in the banking industry related credit risk management process may be the issue of further research. Recent counterparty risk, cybercrime risk, economic slowdown risk, audit quality risk has created the gap for study on credit risk management. The study of the literature reveals that there is strong gap in the impact analysis of the bank specific and macroeconomic factor on the credit risk management in the banking industry. So, does some moment in the credit disbursement influence the credit risk management of the listed commercial banks in Bangladesh? Are macroeconomic factors greatly influence the performance and credit risk management in Bangladesh? Does external credit evaluation system need to revised?

Chapter 3: Methodology

3.1 Introduction of Methodology and Data Analysis

This chapter of methodology will include about the details of the hypotheses and the expected results with econometric techniques. Under this chapter the data set, collection techniques, mathematical specification have been included with clarification. This chapter will guide the direction of the research. The research outline and statistical analysis along with the reason and expectation will be stated in this chapter. Variation and further improvement in the model will be discussed in the statistical analysis part. This topic of research deserves special attention as our credit market has been extending on continuous basis. But default rate of the credit in the market is too much higher over time. Besides, incorporating all the macro and bank specific factors under certain moment condition analysis will expose the results at a greater rate in Bangladesh.

Credit risk management in the listed commercial banks in Bangladesh analysis requires to consider 28 listed commercial banks in DSE. From 2009 to 2020, the values of different variables have been taken in this study. The study here has been conducted by taking multiple determinants of the non-performing loan that are the part of the arising of the credit risk in the market and Loan concentration and Herfindahl Index analysis have been incorporated to see the weakness of the risk management strategy in the banking industry. Both bank specific factors and some macro factors have been considered. Islamic banks have been excluded in this study as in Bangladesh there is sharia index under which Islamic banks are being operated. These shariah based banks may not reveal the true scenario of credit risk management in Bangladesh and this is why these banks have not been considered for the study.

Sample size covers listed 28 commercial banks of Dhaka Stock Exchange. The time frame of the selected topic of the research to collect sample data is from 2009 to 2020. This data has been collected through Dhaka Stock Exchange, Annual Reports of the listed Banks. Besides, primary data through questionaries' have also been collected

3.2 Factors and Variables Specification

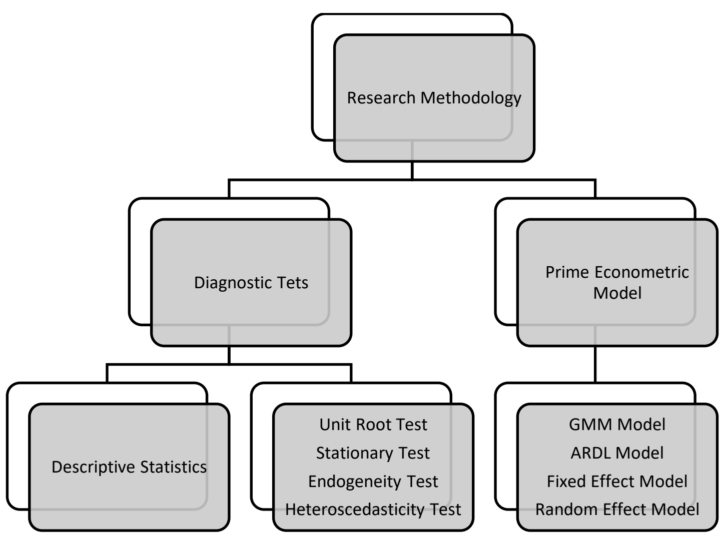
Expected results with the determinants of the credit risk are shown in the graph presented below where Non-Performing Loan is dependent variable:

Name of the Variable	Measurement	Hypothesis Tested	Explanation of Hypothesis	Types of Variables
NIM	Net Interest Income/ Average Earning Assets	Positive	Pro cyclical Credit Policy is positively related with flexible credit policy to earn more interest income	Independent

Name of the Variable	Measurement	Hypothesis Tested	Explanation of Hypothesis	Types of Variables
ROE	Net Income / Total Equity	Negative	Bad Management (ROE is negatively related with bad management)	Independent
LTA	Loan to Asset Ratio	Negative	Diversification (Bank Size Negatively related to NPL)	Independent
ROA	Net Income/ Total Assets	Negative	Skimming problem with less return with lower level of usage of assets	Independent
GDP Growth Rate	Changes in GDP rate	Negative	Lower level of deposit creates higher NPL with Moral Hazard Problem	Independent
LDR	Loan/ Deposit	Positive	Higher LDR tends to increase higher NPL with Adverse Selection Hypothesis	Independent
CAP	Equity/Asset	Negative	Tight control with higher CAP reduces NPL	Independent

Table: List of Determinants of Credit Risk

The conducted statistical analysis and models have been shown in the diagram below:



After finding the results of the econometric model the discussion and recommendation section will cover the explanation and direction for the future research. The selected variables have been taken as bank specific factors mostly influence the credit risk management of the banks while macro factors play crucial role in credit allocation in the banking sector of the economy. These variables are the direct measures of the bank and macro-economic condition.

3.3 Bank-Specific Determinants

It is important to note that the determinants of non-performing loans (NPLs) should not be limited to macroeconomic factors, which are external to the banking sector. The unique characteristics of the banking industry and the policy decisions of banks, especially in terms of efficiency and risk management, should have an impact on NPLs evolution.

A part of the literature that focuses on the relationship between banks and NPLs is the seminal paper "The Relationship Between Loan Quality, Cost Efficiency and Bank Capital and the Flow of Culprits". In this paper, we formulate and test the following eight hypotheses regarding the flow of causality between these variables:

(a) The 'Bad Management':

This hypothesis suggests that low-cost efficiencies are positively correlated with rise in future non-performing loans (NPLs). The proposed rationale links poor management with weak skills in credit scoring, collaterals assessment and monitoring of borrowers.

(b) The 'Minimization' hypothesis:

This study argues that high measured efficiency leads to a rise in NPL, and that there is a balance between resources allocated to underwriting and loan monitoring and measured cost efficiencies. Essentially, banks that put less effort into improving loan quality will become more cost-effective, but will have a higher number of non-performing loans in the long run.

(c) Moral hazard hypothesis:

Low capitalization of banks results in higher Non-Loss Performing Loans (NPLs). The explanation lies in the moral hazard incentives of bank managers to increase the risk of their loan portfolios when their banks are undercapitalized.

It is persistent that the hypothesis of bad management, which implies a causal relationship between cost efficiencies and NPLs (a negative association), and the hypothesis of moral hazard (strong support for the latter. Strong support for the bad management hypothesis seems to exist.

Banks' ability to diversify could also be linked to loan quality. We would expect a negative relationship between diversification and non-performing loans (NPAs) since diversification reduces credit risk. Some people use the size of a bank as a proxy for its ability to diversify. For example, in their research, they find a negative relationship between bank size and NPAs and argue that bigger banks have more opportunities to diversify. However, you can also look at diversification by using non-interest revenue as a percentage of total income. This is because banks rely on other income sources besides loan making, so they need to have diversified income sources.

(d) The Diversification Hypothesis:

The size of the bank and the share of NII as a proportion of total income have a negative correlation with NPLs. The Moral Hazard of Too-Big-To-Fail ('TBTF') Banks: Another channel that links bank-specific characteristics with NPLs is a political concern that TBTF banks are encouraged to take excessive risk because market discipline is not required by its creditors, who expect government bailouts in the event of a bank failure. Large banks may increase leverage too much and lend to lower quality borrowers.

The empirical evidence for a difference in performance and risk orientation among TBTF banks is not conclusive. Increasing size of the banks empowers to provide credit to the less profitable company and thus reduces the strength.

(e) The Too big to fail (TBTF) hypothesis:

It states that large banks take too much risk by increasing their leverage according to the TBTF presumption, resulting in higher non-performing loans (NPLs). We expect leverage to have a positive impact on NPLs regardless of the bank's size. The relationship between lagged performance measures and problem loans is unclear. One argument is that worse performance may reflect a lower quality of lending skills (similar to the bad management hypothesis). This suggests a negative correlation between past earnings and problem loans.

(f) The Bad management II hypothesis:

The Bad management II hypothesis is similar to the bad management hypothesis in that performance is negatively correlated with an increase in future Non-Performing Loans (NPLs).

This effect can also be reversed, which seeks to elucidate the relationship between credit policy changes and demand-side conditions. This equation suggests that credit policy is not only driven by the maximization of banks' earnings, but also by short-term reputation-related concerns of rational banks' management. As a result, banks may seek to manipulate current earnings by resorting to a 'liberal credit policy', which is defined as a 'negatively net present value extension of credit'. In this way, banks may attempt to persuade the market that they are profitable by artificially increasing current earnings at the cost of future problem loans. Additionally, banks may use loan loss provisions to increase current earnings. Consequently, past earnings may be positively linked to future NPL.

(g) The 'Procyclical Credit Policy:

The 'Procyclical Credit Policy' hypothesis suggests that a bank's performance is positively correlated with the rise in Non-Performing Loans (NPLs) in the long run, as it reflects a liberal lending policy on the bank's part (i.e., a negative net present value extension of credit). Furthermore, the influence of ownership dispersion on NPLs is also considered. A lack of ownership of corporate equity can lead to a decrease in a firm's performance, as shareholders' incentive to monitor the management weakens. On the other hand, an efficient capital market can impose discipline on a firm's management, thus eliminating the need for dispersed ownership.

Sharing control can have a negative impact on loan quality up to a certain point, but if there's a big controlling owner, the bank's management can be more efficient, which can lead to lower loan non-performing loans (NPLs). They also found that if there's a lot of ownership concentration, it can be good for the bank's bottom line and efficiency.

(h) "Tight control" hypothesis:

higher ownership tends to encourage more risk-taking through tighter control of the bank's management, so it's not good for NPLs if there's too much ownership concentration. Debt to equity ratio here measures the level of ownership in the industry.

The above hypotheses have been selected to oversee the impact of factors on credit risk management in the banking industry. Multiple researches have focused on the hypotheses aforesaid as the changes in these factors or hypotheses directly impact on credit risk management in Bangladeshi BANKING industry.

3.4 Econometric Model Specification

3.4.1 Linear Regression Model

Started with the linear model

$$y = \beta_0 + \ x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots \ldots . + \beta_k x_k + u,$$

Where, $\beta_0 = Constant \beta_1$

$\beta_1 = Coefficients$

$u = error\ term$

3.4.2 Heteroscedasticity

The null hypothesis of the test is variance of the random error term is equal to the variance of the model whereas alternative hypothesis indicates variance of the random error term is not zero.

It is estimated that the initial four assumptions of Gauss-Markov hold. If errors include heteroskedasticity, then

$$Var(u_i | x_i) = \sigma_i^2$$

Where we put an i subscript on σ^2 to indicate that the variance of the error relies on the particular value of x_i.

Write the OLS estimator as

$$\hat{\beta}_1 = \beta_1 + \frac{\sum_{i=1}^{n} (x_i - \bar{x}) u_i}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

Except assumption of homoskedasticity and building condition in x_i value in sample, the practice of similar argument demonstrate that

$$Var(\hat{\beta}_1) = \frac{\sum_{i=1}^{n} (x_i - \bar{x}) \sigma_i^2}{SST_x^2}$$

Where $SST_x^2 = \sum_{i=1}^{n} (x_i - \bar{x})$ is the total sum square of the x_i, when $\sigma_i^2 = \sigma^2$ for each i, the formula shortens to the usual form $\sigma^2 \backslash SST_x$. For a case of simple regression, it shows that the variance formula which is derived from homoskedasticity is invalid in the presence of heteroskedasticity.

As the standard form of error of $\hat{\beta}_1$assumes of $Var(\hat{\beta}_1)$, a way is needed to assume OLS in the presence of heteroskedasticity. Let $(\hat{u}_1)$ denote the OLS residuals from the initial regression of y on x.

Then a valid estimator of $Var(\hat{\beta}_1)$, for heteroskedasticity of any form (including homoskedasticity), is

$$\frac{\sum_{i=1}^{n}(x_i - \bar{x})\,\hat{u}_i^2}{SST_x^2}$$

That can easily be computed from the data after the OLS regression. It is estimated that E(u|$x_1, x_2, \ldots\ldots x_k$) = 0, so that it can generate an unbiased and stable OLS

We considered the null hypothesis to be that assumption is true:

$$H_0\text{: Var(u}|x_1, x_2, \ldots\ldots x_k) = \sigma^2$$

It is estimated that ideal homoskedasticity assumption is held and there is a requirement of data which express otherwise. If it is unable to reject at a small significance level which is sufficient, a conclusion may draw that heteroskedasticity doesn't indicate a problem. However, H_0 cannot be accepted and cannot be rejected as well. Because it is being estimated that u variable has zero conditional anticipation, $Var(u|x) = E(u^2|x)$, and the null hypothesis is correspondent to

$$H_0\text{: E(u}|x_1, x_2, \ldots\ldots x_k) = \text{E}(u^2) = \sigma^2$$

This demonstrates that, to test the violation of the assumption of homoskedasticity, it requires a test whether u^2 is connected (in expected value) to one or more of the descriptive variables. If H_0 becomes false, the expected value of u^2, assumed the independent variables, can accept any function which is near to x_j.

3.4.3 Auto Regressive Distributed Lag (ARDL)& Fixed Effect Model

The null and alternative hypothesis of the ARDL model is given below:

$$H_0 = Determined\ variables\ have\ no\ cointegration$$

$$H_1 = Determined\ variables\ have\ cointegration$$

Basic ARDL model is states below:

$$y_i = \beta_0 + \beta_1 y_{t-1} + u_t$$

Where the error u_t has a zero expected value, shown all past value of y:

$$\text{E}(u_t|y_{t-1}, y_{t-2} \ldots) = 0$$

Integrally these two equations hold that

$$\text{E}(y_t|y_{t-1}, y_{t-2} \ldots) = \text{E}(y_t|y_{t-1}) = \beta_0 + \beta_1 y_{t-1}.$$

It firstly indicates that, if y is lagged once, one period is controlled and another lags of y can't be outcome of y_t. The relationship is linear.

Since x_t contains y_{t-1} connotes that assumption holds. In the contrary, exogeneity assumption required for unbiasedness. Excluding the last $(y_0, y_{1,\ldots\ldots} y_{n-1})$, all the values on y are included by this set of descriptive variables.

For t, u_t is not correlated with each of $(y_0, y_{1,\ldots\ldots} y_{n-1})$. This is false since u_t uncorrelated with y_{t-1}, u_t and y_t have to be correlated. Hence, it can be easily observed that $Cov(u_t, y_t) = Var(u_t) > 0$. Furthermore, a dependent variable model which is lagged can't satisfy the strict erogeneity estimation. For holding weak dependent condition, it considers $|\beta_1| < 1$, if this is the condition then theorem conveys that OLS from the regression of y_t on y_{t-1} will generate consistent estimators of β_0 and β_1.

Using differencing with more than two time period is also an option. For N individual and T = 3 phases for each of the individuals. A general fixed model is

$$y_{it} = \delta_1 + \delta_2 d2_t + \delta_3 d3_t + \beta_1 x_{it1} + \cdots + \beta_k x_{itk} + a_i + u_{it}$$

For value of t=1, 2 and 3 (the total number of observations is 3N). It is noticed here that in addition to the intercept, two time-period dummies have been added. Allowing a separate intercept for each phase is a smart move, especially when there are few of them. The base period is t=1 and the intercept for second time period is $\delta_1 + \delta_2$, and so on. Primarily, we are concentrating on $\beta_1, \beta_2, \ldots . \beta_k$. If the unconsidered impact a_i is correlated with any descriptive variables, then using OLS, the data end with an estimation which is biased and unreliable. The fundamental estimation is that, for each time period, the descriptive variable is not correlated with the idiosyncratic errors:

$$\mathrm{Cov}(x_{itj}, u_{is}) = 0, \quad \text{for all t, s and j}$$

It is clear that the explanatory variables are strictly exogenous when we exclude unobserved effect, a_i Since x_{itj} must be a lagged dependent variable, assumption eliminates scenarios in which future explanatory variable respond to changes in these idiosyncratic errors. If we failed to include a crucial time-varying factor. Then frequently violates the variable, Inaccuracy in measurement for one or more explanatory variable in credit risk measurement model can be failed to include the future uncertainty in the market.

If a_1 and x_{itj} are associated then x_{itj} and the composite error will also be correlated, $v_{it} = a_i + u_{it}$. Differentiating adjacent period, elimination of $a_i$can be possible. First time period is subtracted from second time period and second time period is deducted from third time period. This gives:

$$\Delta y_{it} = \delta_2 \Delta d2_t + \delta_3 \Delta d3_t + \beta_1 \Delta x_{it1} + \cdots + \beta_k \Delta x_{itk} + \Delta u_{it}$$

For t=2 and 3, there is different equation for t=1 since there is nothing which can be deducted from t=1. The normal t and F indicators are valid for testing if this equation satisfies the conditions of the traditional linear model and OLS provides estimators which are unbiased. we can also make use of asymptotic outcomes. The crucial prerequisite for OLS consistently, for every j and t=2,3 to be consistent where u_{it} is uncorrelated with Δx_{itj}. It is called natural expansion from two phases. Here, the equation contains the difference in year dummies $d2_t$ and $d3_t$. $\Delta d2_t = 1$ and $\Delta d3_t = 0$ for $t = 2$ as a result, does not contain an intercept. Including the calculation of R-squared, this may appear as inconvenient for certain purpose. This phase intersects in the original model which is derived by direct interest and better to assume the first equation with an intercept and first time period dummy in the need of third period. in other way, the equation is-

$$\Delta y_{it} = \alpha_0 + \alpha_3 d3_t + \beta_1 \Delta x_{it1} + \cdots + \beta_k \Delta x_{itk} + \Delta u_{it} \quad for\ t = 2\ and\ 3.$$

In both formulation, estimation of β_j are identical.

To observe the involve items in this method, assume a model which is a single descriptive: in case of each i

$y_{it} = \beta_1 x_{it} + a_i + u_{it}, \qquad t = 1,2, \dots \dots \dots, T$

Now, calculating average of this equation over time and it is found that

$\bar{y}_i = \beta_1 \bar{x}_i + a_i + \bar{u}_i,$

In which, $\bar{y}_i = T^{-1} \sum_{t=1}^{T} y_{it}$ and so on. Because of the fixation of a_i in both the equation above. If we deduct 14.2 from 14.1 for each t. we will remain with

$$y_{it} - \bar{y}_i = \beta_1 (x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i, \quad t = 1,2, \dots \dots, T,$$

Or

$\ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it}, \quad t = 1,2, \dots, T,$

Here, $\ddot{y}_{it} = y_{it} - \bar{y}_i$ refers to time-demeaned data on y, and similarly refers in case of $\ddot{x}_{it}$ and $\ddot{u}_{it}$. The unobserved effect a_i is disappeared which is the important aspect about this equation. Accordingly, it should be estimated using pooled OLS. The fixed estimator is a pooled OLS estimator that is based on time-demeaned variables. Due to the fact that OLS considers the time variation in variable y and x within each observation, the latter designation was given. The OLS estimator on the cross-sectional equation is used to calculate the between estimator (that include an intercept β_0 Here, it is utilized the temporal averages for both y and x and then perform a cross-sectional regression. It will not investigate the between estimator in depth because it is biased a_i when is associated with $\bar{x}_i$. If it is believed that $a_i$is uncorrelated with x_{it}, it should apply the random effects estimator. The between estimator disregards critical information about how the variables vary over time. Adding more descriptive variables (credit risk management related determinants) to the equation results in minor changes. The real unnoticed model is-

$$y_{it} = \beta_1 x_{it1} + \beta_2 x_{it2} + \cdots + \beta_k x_{itk} + a_i + u_{it}, \quad t = 1,2, \dots\dots T$$

Here, it applies time demeaning for each descriptive variable, including time period dummies, and run a pooled OLS regression by using all time demeaned variables. The overall time-demeaned equation for all i is given in the following way:

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it1} + \beta_2 \ddot{x}_{it2} + \cdots + \beta_k \ddot{x}_{itk} + u_{it}, \quad t = 1,2, \dots\dots T$$

Which is pooled OLS estimate here. The fixed effects estimator is not biased under a stringent exogeneity assumption on the explanatory factors; idiosyncratic error u_{it} should not be correlated with each descriptive variable of the study over all time periods. Similar to first differencing, here the fixed estimator permits any amount of correlation between a_i and the explanatory variables over any time period. The fixed effects transformation therefore eliminates any explanatory variable that is consistent across time for all i: $\ddot{x}_{it} = 0\ for\ all\ i\ and\ t,$ if x_{it} remains constant over time.

First differencing is merely one method to eliminate the fixed effect. The fixed effects transformation is an alternate approach that, under specific conditions, performs better. Think about a model with a single descriptive variable to illustrate what this approach entails. Due to each i:

$$y_{it} = \beta_1 x_{it} + a_i + u_{it}, \quad t = 1,2, \dots\dots T$$

Considering for all i and find average of the equation over time where here it found that,

$$\bar{y}_i = \beta_1 \bar{x}_i + a_i + \bar{u}_i,$$

In this case $\bar{y}_i = T^{-1} \sum_{t=1}^{T} y_{it}$ and many more. a_i appears in both equation because it is fixed over time and if we subtract the from above equation in case of each t, then the below equation can be that

$$y_{it} - \bar{y}_i = \beta_1 (x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i), \quad t = 1,2, \dots\dots T$$

Or

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it}\ , \quad t = 1,2, \dots\dots T$$

Here $\ddot{y}_{it} = y_{it} - \bar{y}_i$ suggests that it is a time-demeaned data on y and similarly imply for $\ddot{x}_{it}$ and $\ddot{u}_{it}$. The other name of fixed effect transformation is the within transformation. This is also important in the equation above that the unobserved effect a_i has been disappeared which indicates that we should estimate with the help of pooled OLS. As OLS estimator the between estimator is obtained on the equation which is cross-sectional. In that case the use of time average for both variable y and x and conduct a cross-sectional regression. Because of the biasness of a_i when it correlates with $\bar{x}_{it}$, we are not studying between estimator in detail. Hence, the between estimator ignores significant information on how these variables change over time.

By attaching more descriptive variable to that equation shows fewer changes. The original unnoticed model is

$y_{it} = \beta_1 x_{it1} + \beta_2 x_{it2} + \cdots + \beta_k x_{itk} + a_i + u_{it}, \quad t = 1,2, \ldots\ldots T$

We have basically applied the time-demeaning to all determinants and then perform the pooled OLS regression applying all the time-demeaned variables. The initial time-demeaning equation for all i is

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it1} + \beta_2 \ddot{x}_{it2} + \cdots + \beta_k \ddot{x}_{itk} + u_{it}, \quad t = 1,2, \ldots\ldots T$$

It can instantly rule out one scenario when $T = 2$ the FE and FD estimations, as well as all test statistics, are identical. Naturally, we must estimate the same model in each case in order for the FE and FD estimates to be equivalent. The FD equation naturally includes an intercept, which is the intercept for the second time period in the original model that was developed for the two time periods. As a result, for the second time period, the FE estimation must include a dummy variable in order to be equivalent to the FD estimates with an intercept. FD has the benefit of being simple to apply in any econometrics or statistical package that allows for basic data manipulation, and it is simple to compute heteroskedasticity-robust statistics following First Difference (FD) estimation (because when T = 2, FD estimation is just a cross-sectional regression). The Fixed Effect (FE) and First Difference (FD) estimators differ when$T \geq 3$. We cannot use unbiasedness as a criterion because both are not biased under FE.1 through FE.4. Furthermore, both hold true under both entity and time variant FE. through FE. (with T fixed as N →0). The decision between Fixed Effect (FE) and First Difference (FD) for big N and small T depends on the estimators' relative efficiency, which is dictated through a serial correlation in these idiosyncratic errors, u_{it} Since efficiency comparisons demand homoskedastic mistakes, we shall presume that the u_{it} is homoskedastic.

The Fixed Effect (FE) estimator is more often employed than the First Difference (FD) estimator because the unnoticed effects model is naturally described with successively uncorrelated idiosyncratic errors. But keep in mind that this assumption might not be accurate. We might assume that the unseen variables that vary over time in many applications will be serially associated. If u_{it} exhibits a random walk, which denotes a strong positive serial correlation, then first differencing is preferable since u_{it}

is serially uncorrelated. The uit frequently show some positive serial connection, yet possibly not to the same extent as a random walk. As a result, it is difficult to compare the effectiveness of the Fixed Effect (FE) and First Difference estimators.

When the value of T is large and N is small (for example, N=20 and T=30), there must be a caution in employing the fixed effects estimator. When the value of T is large and N is small, implication can be particularly sensitive to estimations being broken, even though exact distributional outcomes apply for any value of N and T under the traditional fixed effects (FE) assumptions. The spurious regression issue can happen, particularly if we use unit root processes. A combined time series process can be converted into a weak dependent process with the help of first differencing. As a result, even when T is greater than N, central limit theorem can still be used provided that first differencing is used. Heteroskedasticity and serial correlation don't need to be considered, and the idiosyncratic errors don't need to be normal. Further sensitive to nonnormality, serial correlation and heteroskedasticity in the idiosyncratic errors are implicated with fixed effects (FE) estimator.

The fixed effects (FE) estimator can extremely be sensitive to traditional measurement error in one or more descriptive variables, just like the first difference estimator. The rigorous exogeneity assumption is violated even if each $x_{itj}$is uncorrelated with u_{it}. for instance, unless T=2, the FE estimator is expected to be significantly less biased than the first difference (FD) estimator when, a lagged dependent variable exists among the regressors. The crucial theoretical distinction between the two estimators is that bias in the first difference (FD) estimator does not depend on variable T, but the bias in the fixed effects (FE) estimator inclines to zero at a rate 1/T.

In general, choosing between fixed effects (FE) and first difference (FD) when they produce significantly different outcomes can be challenging. It is reasonable to present both sets of findings and understand their differences. The null hypothesis of the fixed effect model is that there is zero effect in the study.

3.4.4 Testing for Endogeneity

The OLS estimator is comparatively more efficient than the 2SLS when explanatory variables are exogenous. It is quite clear that 2SLS estimates might shows standard error which is large. So, it is important to run a test for endogeneity of a descriptive variable that demonstrates whether 2SLS is even essential. The null hypothesis is random error term is correlated with the instrumental variables and alternative hypothesis indicates to correlation of error term with the independent variables.

Here, endogenous variable is considered which is single and suspected as well,

$y_1 = \beta_0 + \beta_1 y_2 + \beta_2 z_1 + \beta_3 z_2 + u_1,$

Here, $z_1$and z_2 both of them are exogenous. There are also two supplementary exogenous variables z_3 and z_4 which are not included in the equation. We should estimate above equation by OLS when y_2 is uncorrelated with u_1. It is proposed to compare the OLS and 2SLS directly to see whether the differences are significant. Because all of the variables must be exogenous, OLS and 2SLS are both consistent. We find that y_2 must be endogenous if 2SLS and OLS diverge greatly (while still assuming that the $z_j$are exogenous A regression test makes it simpler to figure out whether those differences are significant. On prediction of the reduced form for y_2, this is predicated, which in this case is

$y_2 = \pi_0 + \pi_1 z_1 + \pi_2 z_2 + \pi_3 z_3 + \pi_4 z_4 + v_2,$

To test whether y_2 is uncorrelated with u_1 if and only if v_2 is uncorrelated with u_1 because each z_j is now uncorrelated with u_1. Write $u_1 = \delta_1 v_2 + e_1$ Where e_1 has a zero mean and is not correlated with v_2. Then, if, $\delta_1 = 0$, $u_1$and v_2 are uncorrelated. Include v_2 as a supplementary regressor in the above equation and perform a t test to test this in the simplest manner possible. The only issue with applying this is that $v_2$is not detected since the error term is present in the formula. It is acquired that the shortened form residuals, $\hat{v}_2$, since it can be estimated that the shortened form for y_2 using the OLS. Therefore, it is estimated that,

$y_1 = \beta_0 + \beta_1 y_2 + \beta_2 z_1 + \beta_3 z_2 + \delta_1 \hat{v}_2 + error$

by OLS and test $H_0: \delta_1 = 0$, using a *t* statistic. When we reject H_0 at a low level of significance, we conclude that y_2 is endogenous since $v_2$and u_1 are associated.

In this study residual OPEX has been found endogenous by considering all the factors in the model.

3.4.5 Random Effect Model

The null hypothesis of the study under random effect model expresses that individual unobserved heterogeneity is uncorrelated with the credit risk related factors. For this study, we have a regression as followed (1) and we are intended to estimate the β_1:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it}$$

Here, Y is the outcome variable

X is the variable we are intended in calculating the causal effect on Y

Z is those unobserved variables

U is the error term

I is the notation of entity

T is the notation of time

Due to unobserved variables which is constant over but varies from entity to entity, having Z_i only one subscript i instead of two. Here, time variant and entity variant remain variable from bank to bank by banks specific factors.

Adding β_0 and $\beta_2 Z_i$as α_i, and α_i is the fixed effect for entity i, we can consider the equation mention below:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}$$

Or by a set of bunches of dummy variables, we can replace $\beta_2 Z_i$

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \gamma_2 D2 + \gamma_3 D3 + \cdots + \gamma_n Dn + u_{it}$$

To be the 2^{nd}, 3^{rd} and nth identity, D2, D3 and Dn are the dummy variables. D1 is omitted, because considering it will introduce perfect multicollinearity (1), (2) and (3) are the same.

3.4.6 Dynamic Panel Data Estimator

We're using a dynamic panel data estimator to figure out how long the NPL structure will last. It's based on what's been studied in panel data studies, like

A dynamic panel data specification is generally given by:

$$y_{it} = \alpha y_{it-1} + \beta(L) X_{it} + \eta_i \varepsilon_{it}, |\alpha| < 1 \quad i = 1,2,3 \ldots \ldots N \quad t = 1\ 2 \ldots \ldots T \quad \ldots\ldots (1)$$

The both subscripts i and t indicate the cross sectional and time dimension of the panel sample where y_{it} is the change in the NPL and $\beta(L)$ is the $1 \times k$ lag polynomial vector, X_{it} is the $k \times 1$ polynomial vector of explanatory variables other than y_{it-1}, η_i are the unobserved individual bank specific) effects and ε_{it} is the error term. On a consistent basis, we use the generalized method of moments (GMMs) as proposed in Arellano& Bond (1991), GMMs are based on Arellano's (1991) first difference transformation and Bond's (2000) elimination of the bank specific effect:

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \beta(L) \Delta X_{it} + \Delta \varepsilon_{it}, \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Here, Δ is the first operator. The Eq. (2) the lagged depended variable, by composition, y_{it-1} is correlated with the error term $\Delta\varepsilon_{it}$ which is for imposing a bias in the model. Nonetheless, y_{it-2} which is supposed to correlated with y_{it-1} but not with $\Delta\varepsilon_{it}$ for $t = 3, \ldots \ldots, T$ can be used as a tool in the

Eq (2) showing that $\Delta\varepsilon_{it}$ is not continuously correlated. This indicates that order two and higher lags of the dependent variable meet the next moment conditions:

$$E[y_{it-s}\Delta\varepsilon_{it}] = 0 \quad t = 3, \dots, T \quad and\ S \geq 2 \quad \dots\dots\dots (3)$$

Another reason for bias is that the explanatory variables may not be the same as the error term and the correlation between them. For example, if the variables are purely external, all the past values and all the future values for the variable are not correlated with the error, which means that the next moment conditions are going to be different:

$$E[X_{it-s}\Delta\varepsilon_{it}] = 0 \quad t = 3, \dots, T \quad and\ for\ all\ S \quad \dots\dots (4)$$

In the case of reverse causation, the strict exogeneity principle is restrictive and cannot be applied, when $E[x_{is}\varepsilon_{it}] \neq 0\ for\ t < S$. Furthermore, only current and lagged values of X_{it} are valid instrument for a body of weakly exogenous or predetermined explanatory variables. the following moment conditions can be used:

$$E[X_{it-s}\Delta\varepsilon_{it}] = 0 \quad t = 3, \dots, T \quad and\ for\ S \geq 2 \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

The constraints on orthogonality described in Eq. (3) to (5) provide the basis for the one step GMM estimation that produces consistent parameter estimates assuming independent residuals (cross sectional or homoscedastic) and consistent residuals (over time). The two step GMM estimator, which uses estimated residuals to construct a uniform matrix of variance and covariance of moment conditions, may, due to its dependency on estimated residuals, cause a downward bias in standard errors (t-statistics). This can result in inconclusive asymptotic results; particularly in cross sectioned data (Arellano & Bond (1991).

Furthermore, we measure the core and basic assumption of serially uncorrelated errors, ε_{it}, showing the hypothesis that the $\Delta\varepsilon_{it}$ are not second order autocorrelated. The null hypothesis that the difference errors do not automatically correlate with each other is rejected, which suggests that there is a serial correlation for a level error term, thus resulting in inconsistent GMM estimates.

3.5 Economic Specification

Eq. (1) takes the following form in the Baseline Model:

$$\Delta \boldsymbol{NPL^h}_{it} = \boldsymbol{\alpha}\Delta \boldsymbol{NPL^h}_{it-1} + \sum_{j=1}^{2} \boldsymbol{\beta^h}_{1j}\,\Delta \boldsymbol{OPEX}_{t-j} + \sum_{j=1}^{2} \boldsymbol{\beta^h}_{2j}\,\Delta \boldsymbol{CAP}_{t-j} + \sum_{j=1}^{2} \boldsymbol{\beta^h}_{3j}\,\Delta \boldsymbol{CAR}_{t-j} + \sum_{j=1}^{2} \boldsymbol{\beta^h}_{4j}\,\Delta \boldsymbol{NII}_{t-j} + \boldsymbol{\eta^h}_i + \boldsymbol{\varepsilon^h}_{it}$$

With $|a| < 1, i = 1, \dots\dots, 28\ and\ t = 1, \dots\dots.., 12$ …………… (1)

In the equation, the superscript h indicates the type of NPLs, where it is shown that $\Delta NPL^{h}{}_{it}$ is the first difference of the non-performing loans ratio, ΔOpex changes in expense ratio, ΔCAP is the changes in the equity to asset ratio, Δ CAR is the change in capital adequacy ratio, ΔNII is the change in non-interest income.

By estimate the Baseline Model equation, we examine the Bad Management Hypothesis as follows:

$$\boldsymbol{\Delta NPL^{h}{}_{it} = \alpha \Delta NPL^{h}{}_{it-1} + \sum_{j=1}^{2} \beta^{h}{}_{1j}\, \Delta OPEX_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{2j}\, \Delta CAP_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{3j}\, \Delta CAR_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{4j}\, \Delta NII_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{5j}\, \Delta ROE_{t-j} + \eta^{h}{}_{i} + \varepsilon^{h}{}_{it}} \quad \text{……………………….. (2)}$$

We consider the lag order of the ROE variable after a general to specific exercise that resulted in retaining only in case of the fourth lag of the NPL.

To test the baseline model's additive explanatory ability, we next link each of the bank-specific indicators in table 1 to the baseline model. The number of cross-sectional units limits the types of instruments that may be employed in the estimation and, as a result, the types of exogenous variables that can be incorporated into the baseline model equation. In order to reduce the requirement for additional instruments, we devised a constrained GMM process (i.e., we utilise only a small number of lagged regressions as instruments and further, as it was already said, we add just one bank specific variable at a time. The quantity of instruments is chosen such that it does not surpass the entire number of cross-sections. As a result, we expand the baseline model in the previous equation to include more macroeconomic information.

$$\boldsymbol{\Delta NPL^{h}{}_{it} = \alpha \Delta NPL^{h}{}_{it-1} + \sum_{j=1}^{2} \beta^{h}{}_{1j}\, \Delta OPEX_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{2j}\, \Delta CAP_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{3j}\, \Delta CAR_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{4j}\, \Delta NII_{t-j} + \sum_{j=1}^{2} \beta^{h}{}_{5j}\, \Delta ROE_{t-j} + \sum_{j=1}^{4} \beta^{h}{}_{4j} X^{h}_{it-j} + \eta^{h}{}_{i} + \varepsilon^{h}{}_{it}}$$

Where X^{h}_{it} denotes the bank-specific variables of table 1For the bank-specific regressor, we follow Berger and De Young (1997) by using four lags to represent the dynamics of the explanatory variables throughout the prior year. Here, we assume that the current level of bank-specific factors has no impact on the NPL ratios' present level. The type of accounting data and the lag time between management decisions changes can both be used to explain this.

3.6 Z-Score:(ROAA)

Z-Score calculates the number of standard deviations that each listed commercial bank in Bangladesh bank's return on average assets (ROAA) must deviate from its mean before equity is exhausted and the bank becomes insolvent. This is dependent variable under this model of financial stability.

$$Z = \frac{K + \mu}{\sigma}$$

Where, k means equity capital and reserve as a percent of asset

μ means 5-year moving average of return on Average Asset (ROAA)

σ means 5-years moving standard deviation of ROAA

Z-score is affiliated with a bank's insolvency risk in a negative way. The risk of insolvency happens at the state when a bank's asset value falls short of its debt level. The probability of insolvency can be written as $\mathrm{P(ROAA} < -\mathrm{k)}$. The probability value will be $\mathrm{P}\left(\frac{\mathrm{ROAA}-\mu}{\mu} < -\mathrm{Z}\right)$ or $\mathrm{P}\left(\frac{\mu-\mathrm{ROAA}}{\mu} < \mathrm{Z}\right)$. Consequently, Z-Score estimates the number of standard deviations which a bank's return (ROAA) must decline below its mean value level in order to vacate equity and drive the bank towards insolvency. The higher the Z-Score, the greater the financial stability of each listed commercial bank.

3.7 Z-Score:(CAR)

In this calculation, instead of equity-asset ratio we use CAR (Capital Adequacy Ratio) by modifying Z-Score. The argument is that CAR is more reliable estimate of the equity position of bank compared to the equity-asset ratio. This idea has been implicated in empirical literature for listed commercial bank in Bangladesh. This is dependent variable under this model of financial stability.

$$Z = \frac{K + \mu}{\sigma}$$

Here, k stands for Capital Adequacy ratio (CAR)

μ stands for 5-years moving average of Return on Average Asset (ROAA)

σ stans for 5-years moving average standard deviation of ROAA

3.8 Z-Score:(IR)

We displayed a Z-score based on Infection Ratio (IR) which is articulated as:

Infection Ratio, $IR = \frac{Net\ NPL + Cumulative\ Loan\ written\ off}{Total\ Loans + Cumulative\ Loan\ written\ off}$

This is dependent variable under this model of financial stability. Since loans makeup over 70% of the assets held by banks in Bangladesh, the risk of the loan portfolio is anticipated to play a major role in the financial stability of the banks. Effectively, infection ratio has significance in the estimation of quality of a bank's loan portfolio by adjusting the NPL ratio with significant reduction of cumulative specific provision and considering the cumulative amount of loans written off from the bank's balance sheet. By doing so, the aggregated condition of the bad assets existing in banks' loan portfolio is reflected in IR. Therefore, we composed a Z-Score that incorporates infection ratio.

The argument for the Z-Score based on IR is thus occurs insolvent when and where,

$$K = \frac{Regulatory\ capital, RC}{Total\ Loans + Cumulative\ Loan\ written\ off}$$

After standardizing IR and K, the probability takes the shape like P $\left(\frac{\mathrm{IR}-\mu}{\sigma} > \frac{K-\mu}{\sigma}\right)$

Where,

$\mu =$ 5-years of moving average of Infection Ratio (IR)

$\sigma =$ 5-years of moving average standard deviation of IR

$$Z = \frac{K + \mu}{\sigma}$$

Consequently, the Z-Score based on IR helps to estimate the number of standard deviations that a bank's infection ratio must surpass its mean value to vacate Regulatory Capital and drive the banks toward insolvency. In this scenario too, the higher the Score, the grater the financial stability of a bank.

Chapter 4: Results and Discussion

4.0 Introduction

The study pays attention on the emergence of the sustainable and potential growth and the impact of the macro variables on the credit risk management in banking sector of Bangladesh. The study made on revealing the constraints of non-performing loan has got some statistical outcomes those might be discussed in this chapter. Statistical analysis part outlined in the methodology section will be brought into light under this chapter. The possible outcomes and the fluctuation in expected results will be explained in the results and discussion chapter. This chapter will include all the analysis and impact of the bank specific and macro-economic factors on the credit risk management in Bangladesh.

4.1 Descriptive Statistics

Credit risk management process in Bangladesh most often influenced by multiple factors and the level of impact of different factors are not same. Characteristics of the factor's analysis of credit risk management process bring insightful meaning in the forecasting of the study of the outcome. However, adopting descriptive analysis of the influential factors of the study is depicted below:

Variable	Mean	Skewness	Kurtosis	Jerque Bera Probability
OPEX	0.47	0.16	4.29	0.00
ROA	0.01	1.82	8.86	0.00
ROE	0.13	1.06	4.72	0.00
NIM	0.02	0.02	2.81	0.08
NII	0.01	2.63	15.65	0.00
LTA	0.71	17.30	311.30	0.00
LDR	0.84	-1.73	7.95	0.00
Interest Rate Spread	4.54	0.63	5.14	0.00
GDP Growth Rate	6.21	0.99	3.19	0.00

Table 1: Descriptive Statistics of the Study

The characteristics of the multiple credit risk related macro and micro factors above exposes the reliability of the analysis. Frequently instable and factors suffered from biasness and skewness problem create disturbance in the expected outcome of the analysis. The mean analysis of the study represents that all the factors have positive mean over time. Skewness of the study reveals that skewness level is positive but pretty low for operating expense ratio whereas loan to deposit ratio is negatively skewed. Loan to asset ratio is highly positively skewed. Return on Equity, Return on Assets, Net interest margin, non-interest income is positively skewed that shows instrumental factors are not normally distributed over time in the banking industry. Interest Rate Spread and GDP growth have positive skewness but the degree of skewness is low. It is possible, can be concluded that, the factors selected for the study are close to normally distribution. Kurtosis measures the tendency of the values of the factors cluster around the center and tail. Kurtosis value is higher for non-interest income, loan to deposit ratio, GDP growth rate and these have skewness issue that shows not normally distributed all the values. Jerque Bera probability in the aforesaid factor's distribution analysis finds that values of the factors are suffering form not normally distributed related criteria as probability value is less than 5% for all the cases. Although all the factors are not normally distributed, most of the prudent variables don't have skewness problem and normally distributed that will bring results of the study. Skewness is higher for Loan to Assets which is 1.7 and for Return on Assets it is 1.82. Kurtosis value is also high for loan to assets ratio. Under different value analysis, descriptive stats show skewness of the variables.

4.2 Correlation Matrix

Degree of relationship among the factors of credit risk management needs to be specified to see the impact on the non-performing loan in the financial market. The following result explains the level of correlation among the variables in this study.

	OPEX	**ROA**	**ROE**	**NIM**	**NII**	**LTA**	**LDR**	**INTEREST…**	**GDP Growth**
OPEX	1	-0.223	-0.203	0.040	-0.051	0.003	0.097	0.037	0.043
ROA	-0.223	1	0.857	0.322	0.348	-0.024	0.067	0.046	-0.161
ROE	-0.203	0.857	1	0.333	0.230	-0.028	0.064	0.064	-0.1660
NIM	0.040	0.322	0.333	1	-0.016	0.069	0.186	0.446	0.165
NII	-0.051	0.348	0.230	-0.016	1	-0.041	0.214	-0.149	-0.266
LTA	0.003	-0.024	-0.028	0.069	-0.041	1	0.172	-0.035	0.031
LDR	0.097	0.067	0.064	0.186	0.214	0.172	1	-0.118	-0.079
INTEREST…	0.037	0.036	0.064	0.446	-0.149	-0.035	-0.118	1	0.238
GDP Growth	0.043	-0.161	-0.160	0.165	-0.266	0.031	-0.079	0.238	1

Table2: Correlation Matrix Results

Relationship between operating expenditure and return on assets is negative and directs to the increase in the expense will lead to the decrease in the return on assets of the banking industry and vice versa. Expense and return on equity are negatively correlated over time by 20% that implies on the increase in expense will reduce the return on equity. However, net interest margin and expense is positively correlated as most of the banks try to meet the expense with massive increase in the net interest margin and this is represented by the level of correlation of 40% between these expense and net interest margin and expense. One the other side, it is persistent that non-interest income is negatively correlated with expense by 5% and increase in the expense lessen the level of non-interest income slightly. Operating expense and loan to assets ratio even though positively influenced each other but the level of influence is close to the zero. Loan to deposit ratio is significantly influenced by the operating expense in the positive direction by 9.7% and increase in the loan level will increase the operating expense. It is identified that interest and gross domestic product growth rate positively influence the operating expense as it paves the way of increasing earnings with increasing level of interest income and economic positive pattern with higher growth rate. Correlation among the explanatory factors might lead to the direction to understand the pattern and impact on the credit risk management.

4.3 Diagnostic Tests

4.3.1 Unit Root Test Results

Name of Variables	**P Value Summary Test ***	**Statistic Value****	**Level of Test**	**Decision of Summary Test of Unit Root**	**Probability Value of ADF and Im, Pesaran and Chin w-stat**
CAP	0.00	-10.65	Level & Intercept	As P< 5%, Unit Root of data does not exist	0.0001
					0.0005
CAR	0.40	-0.24	Level & Intercept	As P> 5%, Unit Root of data exists	0.71
					0.78
BS	0.00	-7.99	Level & Intercept	As P< 5%, Unit Root of data does not exist	0.0.05
					0.0.10
DUMMY VARIABLE	0.85	1.07	Level & Intercept	As P> 5%, Unit Root of data exists	1.00
					0.99

Name of Variables	P Value Summary Test *	Statistic Value**	Level of Test	Decision of Summary Test of Unit Root	Probability Value of ADF and Im, Pesaran and Chin w-stat
GDP Growth rate	0.99	3.44	Level & Intercept	As P> 5%, Unit Root of data exist	0.00 0.00
Interest Rate Spread	0.95	1.74	Trend & Intercept	As P> 5%, Unit Root of data exist	0.95 0.98
LTA	0.00	-6.21	Trend & Intercept	As P< 5%, Unit Root of data does not exist	0.00 0.00
LDR	0.22	-0.76	Trend & Intercept	As P> 5%, Unit Root of data exist	0.69 0.52
NII	0.00	-12.25	Trend & Intercept	As P< 5%, Unit Root of data does not exist	0.04 0.17
NPL	0.00	-5.50	Trend & Intercept	As P< 5%, Unit Root of data does not exist	0.07 0.03
OPEX	0.00	-6.85	Trend & Intercept	As P< 5%, Unit Root of data does not exist	0.00 0.00
ROA	0.00	-22.94	Trend & Intercept	As P< 5%, Unit Root of data does not exist	0.00 0.00
ROE	0.00	-17.53	Trend & Intercept	As P< 5%, Unit Root of data does not exist	0.00 0.00

Table3: Note- Levin, Lin and Chu T* Probability Value and Statistic Value have been indicated by * and **; P value of ADF is represented by * and P value of PP is indicated by **** sign. All the outcome is significant at 5% level of significance.**

Pattern of the data series over time tends to random walk and create disturbance in the study. Root test analysis confirms that smooth trend or stable data must be ensured to get the optimum results or reliable outcome to reach in the forecasting that is sustainable or bring meaning to the study. The designed model of the analysis needs to ensure the stability of the values. In this root test analysis results, it is seen that augmented dicky duller test and pesaran test ensures about the presence of the unit root in the values incorporated in the study. Equity to Assets ratio, Total Assets, Total Loan to Assets Ratio, Non-Interest Income, Non-Performing Loan. Return on Assets, Return on Equity don't exist unit root problems and these factors' values are normally distributed bearing no tardiness or instable movement over time. Capital Adequacy Ratio, GDP growth rate, Loan to Deposit Ratio have unit root biasness at level and intercept point as probability value is greater than 5% confirming the presence of unit root process through the acceptance of the hypothesis resulting in unit root problem.

4.3.2 Stationary Test

Stationary test of variables and conversion to stationary of the data is required to run regression in order to make the model effective and compliance to all the variables. Unit root test has been done at level of intercept, trend and intercept, no trend& no intercept, but only trend and intercept output has been shown the stationarity at 1% & 5% level of significance.

Name of Variables	**P Value**	**Statistic Value**	**Level of Test**	**Decision**	**Probability value of ADF and Im, Pesaran and Chin w-stat**
D(CAR)	0.09	-1.31	Trend and Intercept at 1^{st} Difference	P >5%, Data is not Stationary	0.00*** 0.00****
D(CAR,2)	0.00	-8.86	Trend and Intercept at 2^{nd} Difference	P <5%, Data is Stationary	0.00*** 0.00****
DUMMY VARIABLE	0.00	-2.48	Trend and intercept at 1^{st} Difference	P <5%, Data is Stationary	0.66*** 0.95****
D (GDP Growth Rate)	1.00	22.79	Trend and intercept at 1^{st} Difference	P >5%, Data is not Stationary	0.00*** 0.00****
D (GDP Growth Rate,2)	1.00	10.47	Trend and Intercept at 2^{nd} Difference	P >5%, Data is not Stationary	0.00*** 0.00****

Name of Variables	P Value	Statistic Value	Level of Test	Decision	Probability value of ADF and Im, Pesaran and Chin w-stat
GDP Growth Rate (at level and none)	0.06	-1.53	Trend and Intercept at level and none	P >5%, Data is not Stationary	0.99***
D (interest rate spread)	0.00	-2.78	Trend and intercept at 1^{st} Difference	P <5%, Data is Stationary	0.01***
					0.04****
D(LDR)	0.00	-5.12	Trend and intercept at 1^{st} Difference	P <5%, Data is Stationary	0.00***
					0.00****
D(NIM)	0.02	-2.05	Trend and intercept at 1^{st} Difference	P <5%, Data is Stationary	0.00***
					0.00****

Table 4: Note- Levin, Lin and Chu T* Probability value and Statistic Value have been indicated by * and **; P value of ADF is represented by * and P value of PP is indicated by **** sign. All the outcome is significant at 5% level of significance.**

The variables of the study here are stationary at level and first difference for all the credit risk related factors including GDP growth rate. The projected values of multiple variables of 28 banks are significant at 5% level of significance under Augmented Dicky Fuller test and Pesaran test which signifies making the variable stationary. Capital Adequacy Ratio is stationary at 2^{nd} difference level while Loan to Deposit Ratio, Net Interest Margin and interest rate spread are stationary at first difference level with trend and intercept point. Besides, GDP growth rate is stationary at level and none point. It is consistent that stationary values or trend without random pattern might lead to the insightful outcome that can bring conclusion for the designed model of the study.

4.3.3 Panel Cross Section Heteroscedasticity Results

Multiple factors generate large scale variance in the results of the analysis. Heteroscedasticity needs to be checked that variance of the model is constant over time or not. The results of the test are depicted below:

Test Statistic Name	Value	Degree of Freedom	P-Value
Likelihood ratio	226.60	28	0.00
Restricted Log L	213.77	323	
Unrestricted Log L	327.07	323	

Table 5: Test Statistic Value is significant at 5% level

Due to the number of too much explanatory variables in the variables in credit risk management, standard errors might enhance. The variance of error term is not constant over time. In credit risk management variance of the interest rate spread, NIM, non-interest income, capital and capital adequacy ratio are not constant as at 5% level. Here it is visualized that residuals of the study factors are not homoscedastic. With heteroscedasticity, all the instrumental factors receive equal weight in OLS regressive test and expose biased and distorted estimates around coefficients. All the instrumentals' variables such as NIM, NII, CAP, CAR, ROA, ROE don't impact on the non-performing loan at the same level and over time it changes the direction with error term. Likelihood ratio of the variance non-constancy can influence the forecasted model that is required to find the reliable values of the factors.

4.3.4 Cross sectional Dependence Test

Cross sectional dependence test results that ensure about the dependency of the several instrumental variables of credit risk management analysis are presented below:

Test	**Statistic**	**D.F**	**P value**
Breusch-Pagan LM	949.50	378	0.00
Pesaran scaled LM	20.78		0.00

Table 6: Cross Sectional Dependence Results at 5% level of Significance

Listed commercial banks in Dhaka Stock Exchange have been selected for the study and for a certain period of time these banks have several factors that cave impact on each other. All the factors including GDP growth rate, Net Interest Margin, Non-Interest Income, Capital Adequacy Ratio, Loan to Deposit Ratio, Loan to Asset Ratio is dependent and might have impact on the values confirmed by Breusch-Pagan LM test at 5% level of significance. Cross sectional dependency influences the credit disburse and risk management procedure as change in the one factor like interest rate spread can change the overall credit scenario in the market. In 2020, changes in GDP growth rate and loan to deposit ratio helped to meet the liquidity crisis scenario. Besides, policy rate changes also can change the performance of the banks as all the banks compete in the same industry. So, cross sectional dependency is persistent in the study but must be squeezed.

4.3.5 Normality Test

Distribution of the model signifies on the expected results of the model analysis. If all the variables of the study are normally distributed or close to the normal distribution then explanation or forecasting based on the data set can be reliable for the future movement of the credit risk management in the banking industry. Mean, Mode, Median analysis with Jerque Bera probability distribution analysis in this study are shown to see the tendency of the distribution:

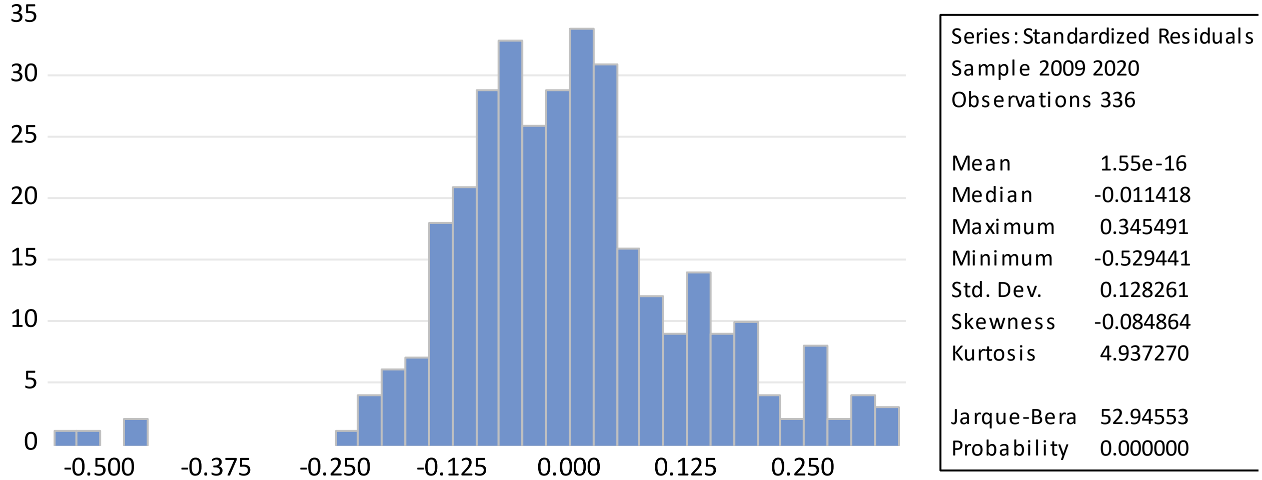


Figure 1: Normal Distribution Graphical Presentation

The graphical scenario of the normality check aforesaid mention reveals that most of the values regarding the factors of the credit risk management are positively skewed but the level of skewness is lower and tends to the normal distribution. Kurtosis value analysis prioritizes on the presence of the skewness and Jarque Bera probability at 5% level of significance also finds that the distribution of the credit risk related factors is not normally distributed and in the long run volatility seem to exist in the movement of the factors that will change the risk management style of the industry. It is satisfactory that level of skewness is lower and negligible.

4.3.6 Endogeneity Test

In this study several factors have been selected and the instrumental variables can have impact on the credit risk measurement point and correlated with the error term of the analysis. Endogeneity analysis considers omitted factors that leads to the bias. Results of the endogeneity problem is stated below:

Variable	Coefficient	P value
OPEX	0.29	0.00*
RES_OPEX	-0.25	0.00*
CAP	-0.07	0.00*
CAR	-0.02	0.18
NII	-0.50	0.01*
C	-0.07	0.00*

Table 7: Note-R-squared value is 0.38 and Durbin-Watson stat is 0.93. Probability value is significant at 5% level and denoted by *.

Alternative Hypothesis of these factors influencing the non-performing loan level shows that only Residual OPEX, CAP& NII are endogenous because these instrumental variables have probability value less than 5% Level of significance and that may disturb the study. Due to endogeneity problem OPEX, CAP and CAR may be correlated with each other that increases the standardized error. Here, Durbin-Wu- Hausman Test has been conducted to see the endogeneity presence in the study. It is not reasonable to make decision based on the influence of the macro and bank specific factors as omitted variables make bias on the credit risk management process in the industry over the time with the changes in the policy rates. All the coefficients negatively impact on the credit risk level of the banking industry.

4.3.7 Lagrange Multiplier Test: (Random Effect)

Lagrange multiplier finds the satisfactory equation for the taken factors. For credit risk management, quality and efficiency related factors including the economic growth rate. Consistency of the random effect in analysis is checked by the Lagrange multiplier test. Breusch-Pagan test for Lagrange multiplier is shown below:

	Test Hypothesis		
	Cross-section	**Time**	**Both**
Breusch-Pagan	530.00 (0.00) *	3.788 (0.50)	533.79 (0.00) *
King-Wu	23.03 (0.00)	-1.94 (0.97)	10.74 (0.00)

Table 8: Lagrange Multiplier Outcome significance level is 5% and denoted by *

Both cross section and Time-based multiplier analysis instead of using dummy factors cross section and time relied are intensified to include the cross section and time specific factors as error term. Error components approach in this analysis confirms about the legacy of the presence of the random effects in the credit risk management process.

4.3.8 Panel Regression on Raw Data

Both cross section and time-based values of the bank specific and macro-economic factors have been incorporated in the basic analysis. The least square analysis based on the primary values of the factors is shown below:

Variable	Coefficient	P value
OPEX	0.02	0.03*
ROA	1.67	0.00*
ROE	-0.28	0.00*
NIM	-0.36	0.08
NII	-0.18	0.41
LTA	-0.005	0.14
LDR	-0.03	0.04*
Interest Rate Spread	0.00	0.06
GDP Growth Rate	-2.66E	0.98
Dummy Variable	0.01	0.00*
CAR	-0.06	0.03*
CAP	-0.03	0.15
BS	-0.004	0.18
C	0.21	0.01*

Table 9: Note: R-squared value is 0.24. Panel regression results for the data is significant at 5% level denoted by *

Least square analysis of the credit risk related factors in then above table expresses that Operating Expense Ratio, Return on Assets, Return on Equity, Loan to Deposit Ratio, Financial Policy Impact (Dummy Variable), Capital Adequacy Ratio are found significant at 5% level of significance. It can be said that in the preliminary data analysis with 95% confidence interval the major factors of the credit risk management are influential in market determination of risk level of existing banking industry. Operating expense positively impacts on the non-performing loan indicating that increasing rate of operating expense over time increases the non-performing loan. Return on assets is also has the positive relation with the NPL rate by 1.67. Meanwhile, return on equity decreases the non-performing loan by 28% and vice versa. However, Net Interest Margin has the tendency of negative association with the credit risk measurement measured by non-performing loan by 37%. When non-interest income is increased by 1% non-performing loan is decreased by 18%. Loan to Asset ratio is negatively associated with non-performing loan but not significant to the analysis. Loan to Deposit Ratio is negatively associated with credit risk level measured by 3% and this is significant at 5% level of significance. Interest rate spread is significant at 5% level and it creases with respect to increasing rate of non-performing loan. GDP growth rate is negatively related implying that higher growth rate reduces the credit risk in the industry. Financial policy implementation does not comply with the existing level of the credit risk in the market found significant in the industry through dummy factor. Besides, Capital Adequacy Ratio tends to reduces the non-performing loan by 6% for each percentage increases in the CAR and it is significant at 5% level. CAP and BS are negatively related with the non-performing loan but these are not significant at 5% level.

4.3.9 Panel Regression Fixed Effect on Row Data

Under least square dummy variable test hypothesis along with the unobserved individual influences the following results have been found. Operating expense ratio, Return on Equity Non-interest Income, Financial Policy Impact have been found crucial for the explanation of the movement of the factors.

Variable	Coefficient	P value
OPEX	0.03	0.02*
ROA	0.09	0.88
ROE	-0.13	0.03*
NIM	-0.39	0.16
NII	-0.46	0.03*
LTA	-0.004	0.24
LDR	0.00	0.98
Interest Rate Spread	0.00	0.60
GDP Growth Rate	0.00	0.69
Dummy Variable	0.01	0.01*
CAR	-0.01	0.57
CAP	-0.05	0.04*
BS	-0.005	0.21
C	0.21	0.08**

Table 10: Note- R-squared value is 0.41. Panel regression results for the fixed effect is significant at 5% level denoted by *

Under the least square dummy variable test of regression with unobserved individual causes correlated with the independent variable, OPEX, Capital, CAR, and Non-Interest Income are found significant. Under fixed effect, the LSDV test of regression controls the mean differences among variables of the banks. The threat of bias from the left variables has been greatly reduced which is reflected in the coefficient of the variables. The factors in different banks about OPEX, Capital, CAR, and Non-interest

Income should have an impact on the significant variables. Policy implications in this sector can also affect the level of effect on the NPL of the Bangladesh economy. While LSDV regression grants for the variation in the coefficients of the variables for the NPL with fixed effect. The effect of individuals that can influence the NPL over time is estimated to see the dimension of change in the expected coefficients of the factors selected. The individual effect considered is uncorrelated with the NPL of the Banks.

4.3.10 Panel Regression Random Effect on Row Data

Random effect model in the analysis deals with the heterogeneous factors that are correlated with the instrumental variables (Bank specific factors). The table following is the presentation of the results of the random effect. Unobserved or foreseeable factors can have an impact on the NPL by different levels of influence. The random effect allows seeing the time-variant and individual effect so that disturbance from the random value or unpredictable movement can be included and thus appropriate explanation about the NPL and OPEX, Capital, CAR, and Non-Interest Income can be extracted.

Variable	Coefficient	P value
OPEX	0.02	0.03*
ROA	0.84	0.16
ROE	-0.20	0.00*
NIM	-0.40	0.08**
NII	-0.33	0.11
LTA	-0.004	0.18
LDR	-0.01	0.47
Interest Rate Spread	0.00	0.23
GDP Growth Rate	0.00	0.81
Dummy Variable	0.01	0.00*
CAR	-0.01	0.36
CAP	-0.05	0.04*
BS	-0.005	0.19
C	0.20	0.04*

Table 11: Note- R-squared value is 0.24. Panel regression results for the random effect is significant at 5% level denoted by *.

In random effect model statistical significance found for operating expense ratio and the coefficient is positive in line with the results under fixed effect model that assumes that the qualitative unknown factors influence is fixed. Return on Assets is positively associated with non-performing loan and not statistically significant. Return on equity is negatively associated with non-performing loan and statistically significant and complies with the fixed effect model. Net Interest Margin has negative coefficient in both fixed and random effect model but significant only in the case of random effect model indicating that unobserved factors such as market policy, risk grading style vary with NIM, ROE, ROA, NII. Non-Interest Income has negative coefficient in both fixed and random model but significant for fixed effect model with least square dummy consideration. Loan to assets is the vital factor for credit policy measuring but not statistically significant. Loan to Deposit ratio is positively related with NPL under fixed effect implies that with the rising rate of LDR, credit risk rises at a greater rate but this is no considerable under random effect as statistical significance does not exist. However, Interest Rate Spread and Gross Domestic Product growth rate have positive coefficient with NPL but not considerable under statistical range. After implementing financial policy, NPL does not reduce rather it raise but at a tinny rate which is meaningful under 5% statistical significance level in fixed effect model. CAR reduces the NPL BY 1% for each percentage rises in the CAR. CAP reduces the credit risk measured by proxy NPL by 5% that is statistically significant. BS is not statistically significant in the credit risk management procedure.

4.3.11 Hausman Test on Row Data

Analysis of the Hausman test prevails on the uses of the appropriateness of the fixed or random model in the study. The following table shows the results of Hausman test.

Test Summary	Chi-Sq, Statistic	P value
Cross-section Random	0.00	1.00

Variable	Var (Diff.)	P value
OPEX	0.00	0.44
ROA	0.08	0.00*
ROE	-0.13	0.01*
NIM	-0.39	0.93
NII	-0.46	0.02*
LTA	-0.004	0.41
LDR	0.00	0.10**
Interest Rate Spread	0.00	0.44
GDP Growth Rate	0.00	0.59
Dummy Variable	0.01	0.34
CAR	-0.01	0.06*
CAP	-0.05	0.53
BS	-0.005	0.78

Table 12: Note- Hausman Test results for the effect is significant at 5% level denoted by * and 10% level denoted by **

The deviation between least square dummy coefficients and estimated generalized last square coefficients of variables are statistically insignificant for Net Interest Margin, Loan to Asset Ratio, Interest Rate Spread GDP growth rate, financial policy adaptation through dummy and CAP. Difference for Return on Assets and Return on Equity are significant and changes in these bank factors largely influence the credit risk level. Random effect model that covers impact of unobserved factors including macro factors and other specific issues is more appropriate for credit risk forecasting and management. Random factors will move based on the movement of the factors of credit risk included in this study.

4.3.12 Panel Regression on Stationary Data

Random variation of the values in the variables reduces the accuracy of the expectation of the outcome. By root test analysis, stationary data-based results of the panel least square is shown below:

Variable	Coefficient	P value
CAP	-0.10	0.00*
BS	-0.005	0.15
LTA	-0.008	0.04*
NII	-0.65	0.03*
OPEX	0.02	0.03*
ROA	2.72	0.00*
ROE	-0.43	0.00*
D(CAR,2)	-0.007	0.74
Dummy Variable	0.01	0.00*
D (GDP Growth Rate,2)	0.00	0.54
D (Interest Rate Spread,2)	-0.001	0.44
D (LDR)	-0.001	0.95
D(NIM)	0.17	0.61
C	0.23	0.03

Table 13: Note- R-squared value is 0.21. Panel regression results is significant at 5% level denoted by * and 10% level denoted by **

Least square analysis of the credit risk related factors in then above table expresses that Operating Expense Ratio, Return on Assets, Return on Equity, Loan to Deposit Ratio, Financial Policy Impact (Dummy Variable), CAP is found significant at 5% level of significance. It can be said that in the preliminary data analysis with 95% confidence interval the major factors of the credit risk management are influential in market determination of risk level of existing banking industry under stationary measurement. Operating expense positively impacts on the non-performing loan indicating that increasing rate of operating expense over time increases the non-performing loan. Return on assets is also has the positive relation with the NPL rate by 2.72. Meanwhile, return on equity decreases the non-performing loan by 43% and vice versa. However, Net Interest Margin has the tendency of positive association with the credit risk measurement measured by non-performing loan by 17%. When non-interest income is increased by 100% non-performing loan is decreased by 65%. Loan to Asset ratio is negatively associated with non-performing loan and significant to the analysis. Loan to Deposit Ratio is negatively associated with credit risk level measured by 1% and this is statistically insignificant at 5% level of significance. Interest rate spread is insignificant at 5% level and it decreases with respect to increasing rate of non-performing loan. GDP growth rate is positively related implying that higher growth rate increases the credit risk in the industry that prevalent in the market now. Financial policy implementation does not comply with the existing level of the credit risk in the market found significant in the industry through dummy factor. Besides, Capital Adequacy Ratio tends to reduces the non-performing loan by 1% for each percentage increases in the CAR and it is significant at 5% level. CAP and BS are negatively related with the non-performing loan but BS is not significant at 5% level and meanwhile CAP is statistically found significant.

4.3.13 Panel Regression Fixed Effect on Stationary Data

Under least square dummy variable test hypothesis along with the unobserved individual influences on the stationary values of the instrumental variables the following results have been found. Operating expense ratio, Return on Equity Non-interest Income, CAP Impact have been found crucial for the explanation of the movement of the factors.

Variable	**Coefficient**	**P value**
CAP	-0.08	0.01*
BS	0.00	0.96
LTA	-0.005	0.17
NII	-0.86	0.00*
OPEX	0.04	0.01*
ROA	0.68	0.58
ROE	-0.21	0.05*
D(CAR,2)	0.00	0.79
DUMMY VARIABLE	0.00	0.12
D (GDP GROWTH RATE,2)	0.00	0.61
D (INTERESTRATE SPREAD,2)	-0.001	0.46
D (LDR)	0.00	0.85
D(NIM)	0.18	0.57
C	0.05	0.77

Table 14: Note- R-squared value is 0.40. Panel regression results of fixed effect is significant at 5% level denoted by * and 10% level denoted by **

Under the least square dummy variable test of regression with unobserved individual causes correlated with the independent variable, operating expense ratio, return on Equity Non-Interest Income, CAP is found significant. Under fixed effect, the LSDV test of regression controls the mean differences among variables of the banks. CAP is found significant both on stationary and non-stationary values in the factors. The threat of bias from the left variables has been greatly reduced which is reflected in the coefficient of the variables. The factors in different banks about OPEX, ROA, CAR, and Non-Interest Income should have an impact on the significant variables. Policy implications in this sector can also affect the level of effect on the NPL of the Bangladesh economy. While LSDV regression grants for the variation in the coefficients of the variables for the NPL with fixed effect. The effect of individuals that can influence the NPL over time is estimated to see the dimension of change in the expected coefficients of the factors selected. The individual effect considered is uncorrelated with the NPL of the Banks. In fixed effect consideration, changes in the predictor through coefficient will consider common effect like bank specific policy, industry standards change and law for all the banks by controlling individual bank related heterogeneity. Fixed effect model in this case avoids the biasness of the qualitative factors including loan quality, character, management quality, reputation and social recognition of the borrowers. The factors behind the changes in the NPL size in bank to bank is the main concern found through fixed effect model by observing the different results of predictor through stationary and non-stationary based fixed effect results.

4.3.14 Panel Regression Random Effect on Stationary Data

Random effect model in the analysis deals with the heterogeneous factors that are correlated with the instrumental variables (Bank specific factors). The table following is the presentation of the results of the random effect. Unobserved or foreseeable factors can have an impact on the NPL by different levels of influence. The random effect allows seeing the time-variant and individual effect so that disturbance from the random value or unpredictable movement can be included and thus appropriate explanation about the NPL and OPEX, Capital, CAR, and Non-Interest Income can be extracted. The variance among the bank specific and macro factors for listed banks are considered as random in this random factor results.

Variable	Coefficient	P value
CAP	-0.10	0.00*
BS	-0.004	0.36
LTA	-0.006	0.06*
NII	-0.70	0.01*

Variable	Coefficient	P value
OPEX	0.02	0.02*
ROA	2.24	0.01*
ROE	-0.38	0.00*
D(CAR,2)	-0.001	0.93
Dummy Variable	0.01	0.00*
D (GDP GROWTH RATE,2)	0.00	0.55
D (Interest rate Spread,2)	-0.001	0.45
D (LDR)	0.00	0.95
D(NIM)	0.17	0.59
C	0.18	0.13

Table 15: Note- Panel regression results for the random effect is significant at 5% level denoted by * 10% level denoted by **

In random effect model statistical significance found for operating expense ratio and the coefficient is positive in line with the results under random effect model that assumes that the qualitative unknown factors influence is variable. Return on Assets is positively associated with non-performing loan and statistically significant. Return on equity is negatively associated with non-performing loan and statistically significant and complies with the random effect model. Net Interest Margin has positive coefficient in both fixed and random effect model but not significant in the case of random effect model indicating that unobserved factors such as market policy, risk grading style vary with NIM, ROE, ROA, NII. Non-Interest Income has negative coefficient in both fixed and random model but significant for random effect model with least square dummy consideration. Loan to assets is the vital factor for credit policy measuring and statistically significant at 10% level. Loan to Deposit ratio is positively related with NPL under random effect implies that with the rising rate of LDR, credit risk rises at a greater rate but this is no considerable under random effect as statistical significance does not exist. However, Interest Rate Spread has negative association and Gross Domestic Product growth rate has positive coefficient with NPL but not considerable under statistical range. After implementing financial policy, NPL does not reduce rather it raise but at a tinny rate which is meaningful under 5% statistical significance level in random effect model. CAR reduces the NPL BY 1% for each percentage rises in the CAR. CAP reduces the credit risk measured by proxy NPL by 5% that is statistically significant. BS is not statistically significant in the credit risk management procedure. In different years and different banks based on asset size are reflected in the random effect model.

4.3.15 Hausman Test on Stationary Data

Analysis of the Hausman test prevails on the uses of the appropriateness of the fixed or random model in the study. The following table shows the results of Hausman test.

Test Summary	Chi-Sq, Statistic	P value
Cross-section Random	0.00	1.00

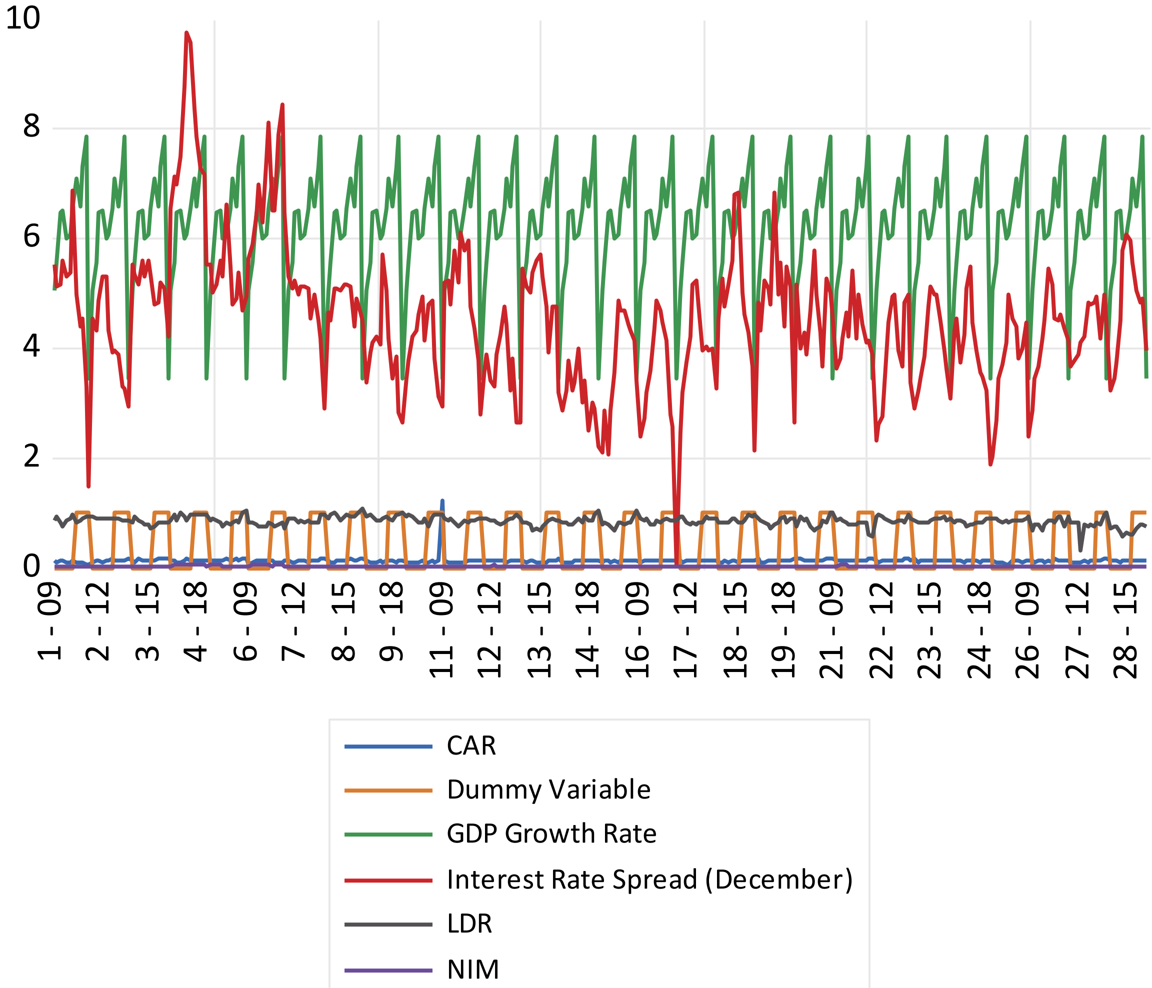
Variable	Coefficient	P value
CAP	-0.08	0.29
BS	0.00	0.42
LTA	-0.005	0.13
NII	-0.86	0.07**
OPEX	0.04	0.23
ROA	0.68	0.06*
ROE	-0.21	0.02*
D(CAR,2)	0.00	0.10
DUMMY VARIABLE	0.00	0.08**
D (GDP GROWTH RATE,2)	0.00	0.62
D (INTERESTRATE SPREAD,2)	-0.001	0.97
D (LDR)	0.00	0.48
D(NIM)	0.18	0.87

Table 16: Note- Panel regression results for the Hausman test is significant at 5% level denoted by * 10% level denoted by **. R square 41%

The deviation between least square dummy coefficients and estimated generalized last square coefficients of variables are statistically insignificant for Net Interest Margin, Loan to Asset Ratio, Interest Rate Spread GDP growth rate, CAP but financial policy adaptation through dummy is significant at 10% statistically significant point. Difference for Return on Assets and Return on Equity are significant and changes in these bank factors largely influence the credit risk level. Random effect model that covers impact of unobserved factors including macro factors and other specific issues is more appropriate for credit risk forecasting and management. Random factors will move based on the movement of the factors of credit risk included in this study. The hypothesis confirms that bank specific factors have different scale of influence on the credit risk management of Banking Industry. Under this preferred theory of random effect, Return on Assets, Return on Equity and Non-Interest Income are predictive factors on risk management in the bank credit appraisal.

4.3.16 Presentation on Non-Stationary Data

Banking sector of Bangladesh is thriving with number of banks in the industry. Challenges in this industry are mostly related with credit risk management process as well as adapting with the increasing rate of demand for development. Banks are providing loan and investment has been increasing over time. As a result, economic growth and other factors are facing volatility with trend derived from the development of the financial market. A graphical capture of the below presentation directs the movement of the values of industry specific factors of the Bangladesh's banking industry.

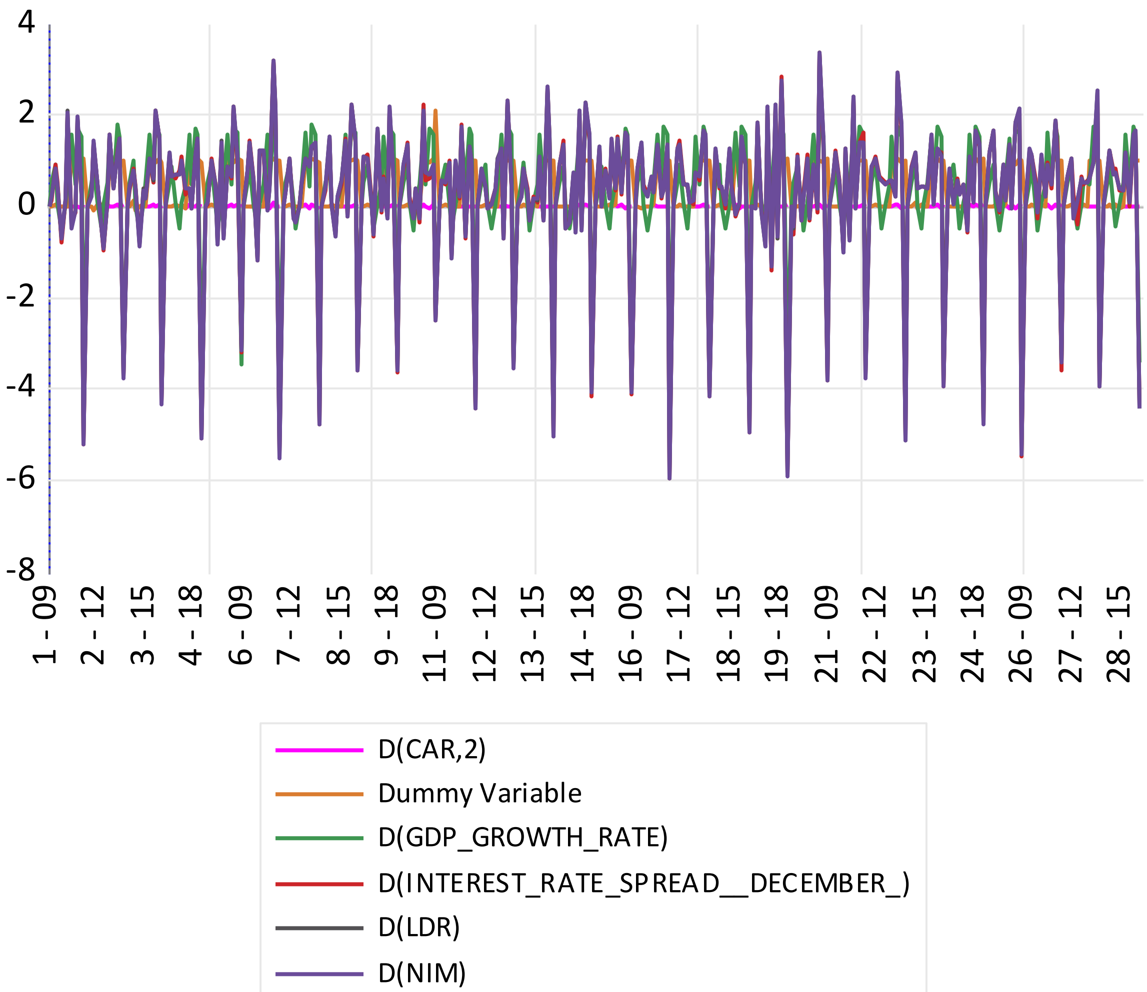


Graph 2: Non-stationary Movement of the Bank Specific & Macro Factors

The movement of the bank specific factors and macro-economic variables are being observed from the above graph. From 2009 to 2020, Loan to Deposit Ratio, Loan to Assets, Return on Equity, Return on Equity, Capital Adequacy Ratio, Net Interest Margin seem to have smooth walk over time. No abnormality or disruption in the movement has been sight in the graph. But GDP growth rate and interest rate spread are not stable over time. Fluctuation or random walk in the dispersion on the economic growth rate and interest rate spread are overseen in the graph. Peak and trough on the growth rate and interest rate spread take time to come back to the balance point but random walk in these two factors can influence the other factors and results of the analysis of the credit risk management. Instability of the values needs to make stable before making conclusion on the future direction of the findings.

4.3.17 Presentation on Stationary Data

Distorted values or random walk in the data of credit risk management might mislead the direction of the findings of the analysis. Before making forecasting based on the market data of the listed banks on different risk management procedural strategy. Government and industry control the banking sectors with huge competition and their decision seriously impact on the movement of the growth and other factors. Stationary results of the bank specific factors and economic growth are presented below:

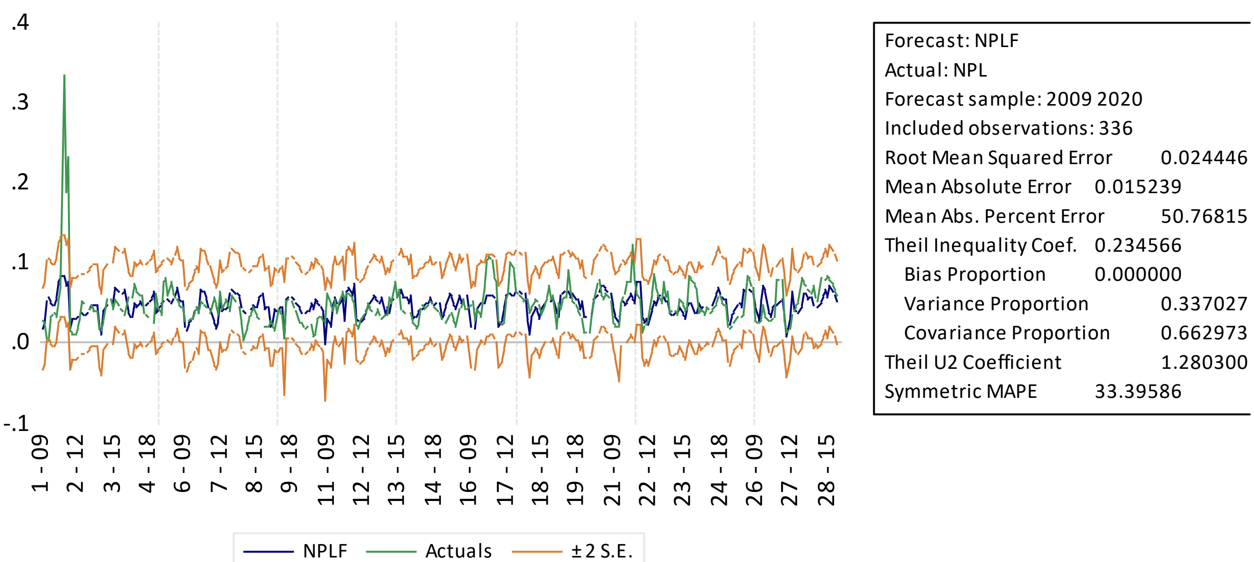


Graph 3: Stationary Movement of the Bank Specific & Macro Factors

However, under diagnostic test of hypothesis it has been confirmed that Capital Adequacy Ratio, Financial Policy Implementation, Economic Growth Rate, Interest Rate Spread and Net Interest Rate Margin are stationary at different level of difference for the values of bank industry credit-based values. Aforementioned picture shows that Capital Adequacy Ratio is stationary at second difference level under trend and intercept point and all the other mentioned values are stationary at first difference level. Finding the stationary point of the movement of the industry related values of bank related factors conclusive decision or direction on the credit market of the banking industry is possible from the findings of the statistical outcome. To get the stable and prudent decision based on the findings of the analysis, it is wise to make all the bank specific factors stationary so that forecasting and the prediction on the future credit market can be inferred rightly. Anomaly and discrepancy in the policies and management in the market of Bangladesh make it bound to stable all the factors of the analysis to find maximum results of the findings.

4.3.18 Predictive Analysis of Future Credit Risk in Bangladesh

Non-performing loan as measurement of most of the part of credit risk prevails in the market of Bangladeshi Banking Industry at a greater rate. Over the last couple of years, it has risen at its peak with 1 lac 36 thousand crore that creates a concern in the banking industry. Banking industry with high NPL rate has been suppressing for the long-time frame. As this is crucial for the future credit management in the industry, the below presented graph expresses the direction of the Non-performing loan in Bangladesh for next couple of years.



Graph 4: Forecast of the NPL

The graph above shows that forecasted Non-Performing Loan is less volatile comparing to the actual Non-Performing Loan for last 12 years. Root Mean Square Error is lower with 0.02 and this is closes to the standard deviation of the sample of the study. Mean Absolute Error and Mean Absolute Percent Error do not depend on the movement of Non-Performing Loan in the banking sector. Theil inequality coefficient is not one and this movement of non-performing loan in future is not perfect estimation. Bias proportion is 0 and this directs that mean of forecasted NPL is equals to the mean of the actual values of the NPL. None the less, variance proportion is not 0 and actual values and forecasted values for NPL vary significantly. Remaining un asymmetric variance is 0.66. In this forecasting, bias and variance are low and forecasted NPL is close to the best fitted for the long run in the industry. This forecasted NPL implies that about 95% of the residuals of the values lies within 2 standard error. In some years, NPL moved at a greater rate than that of the forecasted. In last 5 years NPL was higher than predicted rate.

4.3.19 GMM on Baseline Model

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of NPL on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of NPL in the long run performance analysis.

Variable	Coefficient	P value
NPL (-1)	0.37	0.00*
OPEX	0.09	0.00*
CAP	-0.08	0.05*
CAR	0.04	0.58
NII	-0.74	0.00*

Table 16: GMM baseline test is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Operating Expense Ratio, Equity to Asset Ratio (CAP), Capital Adequacy Ratio, Non-Interest Income as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-

Performing Loan is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 9%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 8%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 4% and this is not significant. Non-interest income is negatively associated with NPL for each percentage non-interest income will reduce the NPL by 0.74% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan.

4.3.20 GMM on Baseline Model: +NIM

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Net Interest Margin is mention below:

Variable	Coefficient	P value
NPL (-1)	0.34	0.00*
OPEX	0.06	0.13
CAP	-0.07	0.09**
CAR	0.05	0.69
NII	-0.92	0.00*
NIM	-1.01	0.00*

Table 17: GMM on Baseline Model: +NIM test is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Operating Expense Ratio, Equity to Asset Ratio (CAP), Capital Adequacy Ratio, Non-Interest Income as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically not significant exposing that while cost increases non-performing loan also increases with 6%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 7%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 5% and this is not significant. Non-interest income is negatively associated with NPL for each percentage non-interest income will reduce the NPL by 0.92% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Net Interest Margin decreases the NPL as higher earnings covers the positive impact on the bank's reputation and recovery of the loan. In baseline and with NIM addition, CAR is not statistically significant in both of the case.

4.3.21 GMM on Baseline Model: +BS

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Asset Size (BS) is mention below:

Variable	Coefficient	P value
NPL (-1)	0.37	0.00*
OPEX	0.09	0.00*
CAP	-0.08	0.05*
CAR	0.04	0.64
NII	-0.76	0.00*
BS	0.00	0.78

Table 18: GMM on Baseline Model: +BS test is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Operating Expense Ratio, Equity to Asset Ratio (CAP), Capital Adequacy Ratio, Non-Interest Income as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 9%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 8%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 4% and this is not significant. Non-interest income is negatively associated with NPL for each percentage rise in non-interest income will reduce the NPL by 0.76% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Financial strength measured by higher asset size improves the lending capacity. Positive coefficient of asset size expresses that loan of the banking sector is not well diversified. In baseline and with BS addition, CAR is not statistically significant even this moment.

4.3.22 GMM on Baseline Model: +Dummy Variable

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Financial Policy Implementation is mentioned below:

Variable	Coefficient	P Value
NPL (-1)	0.37	0.00*
OPEX	0.09	0.00*
CAP	-0.08	0.15
CAR	0.05	0.60
NII	-0.72	0.00*
Dummy Variable	-0.00	0.93

Table 19: GMM on Baseline Model: + Dummy Variable test is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Operating Expense Ratio, Equity to Asset Ratio (CAP), Capital Adequacy Ratio, Non-Interest Income as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 9%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically insignificant. When CAP increases at 1% NPL decreases at 8%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 5% and this is not significant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.72% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Financial policy impact reduces the NPL through negative impact on the NPL but this not found significant in the study. In baseline and with dummy factor addition, CAR is not statistically significant even this moment.

4.3.23 GMM on Baseline Model: +GDP Growth Rate

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Gross Domestic Product Growth Rate is mentioned below:

Variable	Coefficient	P value
NPL (-1)	0.39	0.00*
OPEX	0.09	0.00*
CAP	-0.08	0.04*
CAR	0.02	0.77
NII	-0.84	0.00*
GDP Growth Rate	-0.0007	0.48

Table 20: GMM on Baseline Model: + GDP Growth Rate test is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Operating Expense Ratio, Equity to Asset Ratio (CAP), Capital Adequacy Ratio, Non-Interest Income as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 9%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 8%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 5% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.84% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Increases in economic growth rate (GDP) reduces the NPL through negative impact on the NPL but this not found significant in the study. In baseline and with GDP growth rate addition, CAR is not statistically significant even this moment.

4.3.24 GMM on Baseline Model: +Interest Rate Spread

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Interest Rate Spread is mentioned below:

Variable	Coefficient	P Value
NPL (-1)	0.35	0.00*
OPEX	0.10	0.00*
CAP	-0.07	0.05*
CAR	0.01	0.83
NII	-1.00	0.00*
Interest Rate Spread	-0.003	0.00*

Table 21: GMM on Baseline Model: + Interest Rate Spread test is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Operating Expense Ratio, Equity to Asset Ratio (CAP), Capital Adequacy Ratio, Non-Interest Income as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 10%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 7%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 1% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 1% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Increases in interest rate spread reduces the NPL through negative impact on the NPL and this is found significant in the study. In baseline and with interest rate spread spread addition, CAR is not statistically significant even this moment. Volatile spread or large gap affects the earnings of the banks and investment tendency of the banks by concentrating on the sector that provides more interest but less stable or security of then loan.

4.3.25 GMM on Baseline Model: +LDR

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Loan to Deposit Ratio is mentioned below:

Variable	Coefficient	P value
NPL (-1)	0.42	0.00*
OPEX	0.09	0.00*
CAP	-0.08	0.03*
CAR	0.03	0.62
NII	-0.57	0.02*
LDR	-0.02	0.35

Table 22: GMM on Baseline Model: + LDR test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 9%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 8%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 8% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.57% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Increases in interest rate spread reduces the NPL through negative impact on the NPL and this is found significant in the study. In baseline and with loan to deposit ratio, CAR is not statistically significant even this moment. Volatile deposit ratio to loan affects the earnings of the banks and investment tendency of the banks by concentrating on the sector that provides more interest but less stable or security of then loan. Good management practice boosts the earnings by extending LDR. Thus reduces the NPL.

4.3.26 GMM on Baseline Model: +LTA

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Loan to Asset Ratio is mentioned below:

Variable	Coefficient	P value
NPL (-1)	0.37	0.00*
OPEX	0.09	0.00*
CAP	-0.08	0.04*
CAR	0.04	0.58
NII	-0.74	0.08**
LTA	-0.006	0.05*

Table22: GMM on Baseline Model: + LTA test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 9%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 8%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 4% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.74% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Increases in interest rate spread reduces the NPL through negative impact on the NPL and this is found significant in the study. In baseline and with loan to asset ratio, CAR is not statistically significant even this moment. Volatile deposit ratio to loan affects the earnings of the banks and investment tendency of the banks by concentrating on the sector that provides more interest but less stable or security of then loan. Good management practice boosts the earnings by extending LTA. If the asset size of the banks in listed banks of Bangladesh extends, risk of failure increases as larger loan from asset size creates extra pressure and cyclical credit policy creates burden in the industry.

4.3.27 GMM on Baseline Model: +ROA

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Return on Asset Ratio is mentioned below:

Variable	Coefficient	P value
NPL (-1)	0.37	0.00*
OPEX	0.08	0.00*
CAP	-0.07	0.06**
CAR	0.02	0.77
NII	-0.66	0.02*
ROA	-0.45	0.00*

Table 23: GMM on Baseline Model: + ROA test is significant at 5% level denoted by * 10% level denoted by **.

The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 8%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 7%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 2% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.66% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Increases in interest rate spread reduces the NPL through negative impact on the NPL and this is found significant in the study. In baseline and with return on asset ratio, CAR is not statistically significant even this moment. Return on asset measures the management quality of the banking performance. Higher ROA tends to reduces the NPL of the banking sector. Performance here is negatively related to the credit risk of the banking sector.

4.3.28 GMM on Baseline Model: +ROE

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. GMM with one bank specific factor Return on Equity Ratio is mentioned below:

Variable	Coefficient	P value
NPL (-1)	0.37	0.00*
OPEX	0.07	0.00*
CAP	-0.09	0.06**
CAR	0.04	0.69
NII	-0.55	0.08**
ROE	-0.06	0.00*

Table 24: GMM on Baseline Model: + ROE test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 7%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 9%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 4% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.55% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Increases in interest rate spread reduces the NPL through negative impact on the NPL and this is found significant in the study. In baseline and with return on equity ratio, CAR is not statistically significant even this moment. Return on equity measures the management quality of the banking performance. Higher ROE tends to reduces the NPL of the banking sector. Performance here is negatively related to the credit risk of the banking sector. It is rather than expected hypothesis of procyclical credit policy that influences positive impact on the NPL by cyclical credit policy in the market.

4.3.29 GMM on Baseline Model: Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.32	0.00*
NPL (-2)	0.13	0.00*
OPEX	0.06	0.00*
CAP	-0.12	0.00*
CAR	0.05	0.52
NII	-0.76	0.00*

Table25: GMM on Baseline Model: Lag 2 test is significant at 5% level denoted by * 10% level denoted by **.

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 6%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 12%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 5% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.76% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan.

4.3.30 GMM on Baseline Model: Lag 2+NIM

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Net Interest Margin under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.30	0.00*
NPL (-2)	0.12	0.00*
OPEX	0.06	0.02*
CAP	-0.14	0.00*
CAR	0.01	0.90
NII	-0.88	0.00*
NIM	-0.84	0.02*

Table 26: GMM on Baseline Model: Lag 2+NIM test is significant at 5% level denoted by * 10% level denoted by **.

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 6%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 14%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 1% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.88% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Net interest margin reduces the NPL by 84% for 100% rise in NIM. The rise in NIM implies on the skimping hypothesis disclosing that earnings pressure put force to disburse loan at low monitoring cost that increases the credit risk in banking sector.

4.3.31 GMM on Baseline Model: Lag 2+BS

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Log Asset Size under 2^{nd} difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.31	0.00*
NPL (-2)	0.15	0.00*
OPEX	0.07	0.00*
CAP	-0.24	0.00*
CAR	0.07	0.37
NII	-0.64	0.02*
BS	-0.008	0.03*

Table 27: GMM on Baseline Model: Lag 2+ BS test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 7%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 24%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 7% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.64% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Asset size provokes the banks to concentrate the loan in two or three sectors at a large rate. This increases the probability of being failed but in this analysis negative coefficient shows that higher banks size in industry lessens the NPL and credit facility or capacity improves in the financial market.

4.3.32 GMM on Baseline Model: Lag 2+Dummy Variable (Financial Act Adoption)

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with dummy variable under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.26	0.00*
NPL (-2)	0.14	0.00*
OPEX	0.07	0.01*
CAP	-0.25	0.00*
CAR	0.02	0.79
NII	-0.57	0.11
DUMMY VARIABLE	-0.004	0.08**

Table 28: GMM on Baseline Model: Lag 2+ Dummy Variable test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 7%. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 25%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 2% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.57% that is statistically not significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Financial act implementation is inversely related to the credit risk. After adopting financial act in the market NPL has been decreasing but at a very tinny rate that is statistically significant in the results at 10% level. Enact of financial policy focuses on the good governance in credit market.

4.3.33 GMM on Baseline Model: Lag 2+GDP Growth Rate

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with GDP Growth Rate under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.29	0.00*
NPL (-2)	0.13	0.00*
OPEX	0.06	0.00*
CAP	-0.18	0.00*
CAR	0.04	0.62
NII	-0.85	0.00*
GDP Growth Rate	-0.001	0.32*

Table29: GMM on Baseline Model: Lag 2+ GDP Growth Rate test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 6%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 18%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 4% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.85% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. GDP growth rate under lag 2 consideration in GMM analysis finds that growth rate increases but NPL decreases that is positive for the credit market as with development phase more credit is disbursed in the market but probability of the defaults being minimized that is statistically insignificant indicating this does not prevail in Bangladeshi Banking sector.

4.3.34 GMM on Baseline Model: Lag 2+Interest Rate Spread

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Interest Rate Spread under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.30	0.00*
NPL (-2)	0.12	0.00*
OPEX	0.07	0.00*
CAP	-0.10	0.02*
CAR	0.05	0.52
NII	-0.90	0.00*
Interest Rate Spread	-0.001	0.30

Table30: GMM on Baseline Model: Lag 2+ Interest Rate Spread test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 7%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 10%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 5% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.90% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Volatility in the interest rate creates market disruption in the banking credit. Banks become interested to provide more loan with higher spread and thus performance is improved that decreases the NPL amount in the market. But this is not sustenance in the listed commercial banks in Bangladesh as more spread intensifies the size of Non-Performing Loan in the industry.

4.3.35 GMM on Baseline Model: Lag 2+Loan to Deposit Ratio

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Loan to Deposit Ratio under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.34	0.00*
NPL (-2)	0.15	0.00*
OPEX	0.06	0.00*
CAP	-0.20	0.00*
CAR	-0.004	0.95
NII	-0.50	0.09**
LDR	-0.03	0.10*

Table31: GMM on Baseline Model: Lag 2+ LDR test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 6%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 20%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might decrease the credit risk measured by (NPL) by 1% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.50% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Loan to deposit ratio is suppressing the credit market. For 1% increase in the LDR 3% decreases in the Non-Performing Loan expresses that LDR more credit reduces the default rate and this is statistically significant under 2nd difference consideration. In Bangladesh, more LDR weakens the base of the banks in real market with higher defaults rate.

4.3.36 GMM on Baseline Model: Lag 2+Loan to Asset Ratio

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Loan to Deposit Ratio under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.29	0.00*
NPL (-2)	0.13	0.00*
OPEX	0.08	0.00*
CAP	-0.15	0.00*
CAR	0.02	0.77
NII	-0.56	0.18
LTA	0.00	0.78

Table32: GMM on Baseline Model: Lag 2+ LTA test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well by 29%. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 8%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically significant. When CAP increases at 1% NPL decreases at 15%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 2% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.56% that is statistically not significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Loan to asset ratio increases the default rate in the banking sector as more credit with market controlling share position of banks maximize the failure situation. But this is not statistically significant. Financial strength of the banks mostly measured by asset size play significant role in loan disburse decision.

4.3.37 GMM on Baseline Model: Lag 2+Return on Assets

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Return on Assets under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.30	0.00*
NPL (-2)	0.13	0.00*
OPEX	0.05	0.03*
CAP	0.04	0.30
CAR	0.02	0.86
NII	-0.87	0.00*
ROA	-1.65	0.00*

Table 33: GMM on Baseline Model: Lag 2+ Return on Assets test is significant at 5% level denoted by * 10% level denoted by **.

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well by 29%. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 5%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is positively associated with non-performing loan and statistically not significant. When CAP increases at 1% NPL increases at 2%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 2% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.87% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Return on assets is negatively associated NPL. While return on assets increases, NPL is decreased and this is similar to skimping hypothesis that exposes on generating higher return with low cost. This is statistically significant.

4.3.37 GMM on Baseline Model: Lag 2+ROE

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model with Return on Equity under 2nd difference or Lag 2 is expressed below:

Variable	Coefficient	P value
NPL (-1)	0.30	0.00*
NPL (-2)	0.13	0.00*
OPEX	0.06	0.04*
CAP	-0.06	0.22
CAR	0.00	0.94
NII	-0.83	0.00*
ROE	-0.14	0.00*

Table 33: GMM on Baseline Model: Lag 2+ ROE test is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next year as it increased in the last year as well by 30%. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Both lag 1 and lag 2 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 6%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector. Equity to asset ratio (CAP) is negatively associated with non-performing loan and statistically not significant. When CAP increases at 1% NPL increases at 6%. If this ratio increases, pressures on deposit has been reduced and improves the financial stability with more liquidity but lessens the interest income. Capital adequacy ratio increases with 1% might increase the credit risk measured by (NPL) by 0.01% and this is insignificant. Non-interest income is negatively associated with NPL for each percentage increase in non-interest income will reduce the NPL by 0.83% that is statistically significant. In diversification benefit banks can diversify the income by investment alternatives and credit risk decreases at a greater rate. Though the mainstream income sources of the banks are interest income from lending, well diversified loan distribution or investment can minimize the non-performing loan. Return on equity has negative coefficient this implies that more ROE reduces the credit risk. This finding is statistically significant well diversified credit generates more return on equity. It improves the lending capacity and risk absorption ability of the listed commercial banks.

4.3.38 ARDL on Baseline Model

Autoregressive Distributed Lag model mostly recovers dependency of NPL on its own past values and dependency on past and present values of factors of the model of credit risk. ARDL measures here long run and short run relationship among NPL and other bank specific factors. The table below shows the long and short run relationship of the credit risk management related factors:

Variable	Coefficient	P value
Long Run Equation		
OPEX	-0.08	0.00*
CAP	0.97	0.00*
CAR	-0.10	0.07**
NII	-1.24	0.00*
Short Run Equation		
COINTEQ01	-0.63	0.00*
D (OPEX)	0.08	0.00*
D(CAP)	-0.32	0.01*

Variable	Coefficient	P value
D(CAR)	-0.14	0.34
D(NII)	-0.53	0.15
C	-0.005	0.41
@TREND	0.00	0.00*

Table 34: ARDL test on baseline is significant at 5% level denoted by * 10% level denoted by **

Long run estimation finds significant impact of operating expense ratio on NPL by increasing NPL at 0.8% for 1% decrease in operating expense ratio. Equity to asset ratio positively influences the NPL that is under lag consideration at 5% significance level. When CAR increases by 1% NPL decreases by 0.10% that is significant at 10% level. In the long run auto-regressive distributed lag assumption here explains that negative impact of credit risk in the market for some bank specific factor presumed to exist that considers all the current and past values of credit market. Non-interest income increased reduces the NPL by 1.24% that is found statistically significant. In the short run, OPEX is just alternative influence imposer of long run situation at 5% significance level. In the short run, expense ratio increases the credit risk that is feasible in the real market. CAP has negative relationship with NPL in the short run and the statistically significant. CAP increases the bank health to survive in the market with owner capital. Well-equipped CAP reduces the NPL amount. CAR has same impact on NPL both in short and long run but in the short run this is not significant. In the long run regulatory influence with higher CAR rate creates discipline in the credit supply and financial stability is inspired. Non-interest income is also influencing the NPL level with negative influence but not statistically significant in the short run. Cointegration equation implies that speed of adjustment for market volatility in the short run for policy changes or economic or industry standard changes is 0.63% and this is statistically significant. Trend is equal for all the banking and macro factors in the short run and significant.

4.3.39 ARDL on Other Factors Model

Autoregressive Distributed Lag model mostly recovers dependency of NPL on its own past values and dependency on past and present values of factors of the model of credit risk. ARDL measures here long run and short run relationship among NPL and other bank specific factors. The table below shows the long and short run relationship of the credit risk management related factors other than baseline model:

Variable	Coefficient	P value
Long Run Equation		
GDP Growth Rate	-0.004	0.00*
Dummy Variable	0.01	0.00*
Interest Rate Spread	0.00	0.50
Roa	-1.03	0.00*
Short Run Equation		
Cointeq01	-0.43	0.00*
D (Gdp Growth Rate)	0.00	0.07**
D (Dummy Variable)	-0.006	0.11
D (Interest Rate Spread)	7.50E	0.96
D (ROA)	-0.62	0.10
C	0.034	0.00*

Table 35: ARDL test on another factor is significant at 5% level denoted by * 10% level denoted by.**

Long run estimation finds significant impact of operating expense ratio on NPL by increasing NPL at 0.8% for 1% decrease in GDP growth rate. Financial policy initiation positively influences the NPL that is under lag consideration at 5% significance level. When interest rate spread increases by 1% NPL increases by 0.00% that is not statistically significant at 10% level. In the long run auto-regressive distributed lag assumption here explains that negative impact of credit risk in the market for some bank specific factor presumed to exist that considers all the current and past values of credit market. Return on assets increased reduces the NPL by 1.03% that is found statistically significant. In the short run, GDP growth rate is just alternative influence imposer of long run situation at 5% significance level. In the short run GDP growth increases the credit risk that is feasible in the real market. Financial policy has negative relationship with NPL in the short run and the statistically insignificant. Financial direction by regulatory authority increases the bank health to survive in the market with owner capital. Better policy direction reduces the NPL amount. Interest rate spread has same impact on NPL both in short and long run but in the short run this is not significant. In the long run higher interest rate spread rate creates more NPL in the credit supply and financial stability is bounced with credit risk volatility. Return on assets is also influencing the NPL level with negative influence but not statistically significant in the short run. Cointegration equation implies that speed of adjustment for market volatility in the short run for policy changes or economic or industry standard changes is 0.43% and this is statistically significant. Trend is equal for all the banking and macro factors in the short run and significant.

4.3.40 Panel Regression: Log Z(ROA)

Random variation of the values in the variables reduces the accuracy of the expectation of the outcome. By root test analysis, stationary data-based results of the panel least square based on financial stability measurement by Log Z(ROA) is shown below:

Variable	Coefficient	P value
Of_Woman_In_Board	-0.93	0.00*
Cost Efficiency Ratio	-0.45	0.16
Log Assets	0.06	0.14
LTA	0.03	0.70
Non- Interest Income	9.48	0.20
C	1.92	0.10

Table36: Panel regression log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **.

Least square analysis of the credit risk related factors in then above table expresses that Governance through participation of woman in board, Operating Expense Ratio, Log Assets, Loan to Assets, Non-Interest Income are found statistically insignificant at 5% level of significance except governance. It can be said that in the preliminary data analysis with 95% confidence interval the major factors of the credit risk management are influential in market determination of risk level of existing banking industry under stationary measurement. Participation of woman in board of the banks inversely impacts on the financial stability indicating that increasing rate of woman in the board of governance over time decreases the financial stability. Cost efficiency ratio has inverse relation with the financial stability rate by 0.45%. Meanwhile, bank size increases the financial stability by 0.6% and vice versa. However, Loan to Assets has the tendency of positive association with the credit risk measurement measured by financial stability by 3%. When non-interest income is increased by 1% financial stability is decreased by 9.48% is not significant. Expected results though found for same market factors in the banking industry, only governance issue is more relevant to maintain significance in the industry. Good governance in the body by women participation ensures stability in the performance.

4.3.41 Panel Regression Fixed Effect: Log Z(ROA)

Under least square dummy variable test hypothesis along with the unobserved individual influences on the stationary values of the instrumental variables the following results have been found. Women in board, Bank Size, Non-Interest Income Impact have been found crucial for the explanation of the movement of the factors. Fixed Effect results for financial stability through Log Z(ROA)is shown below:

Variable	Coefficient	P value
Of_Woman_In_Board	-1.51	0.00*
Cost Efficiency Ratio	0.26	0.51
Log Assets	0.08	0.04*
LTA	0.07	0.35
Non- Interest Income	16.54	0.01*
C	1.09	0.30

Table 37: Panel regression fixed effect log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **

Least square analysis of the credit risk related factors in then above table expresses that Governance through participation of woman in board is significant, Operating Expense Ratio is not significant, Log Assets, Loan to Assets is insignificant, Non-Interest Income is found statistically insignificant at 5% level of significance. Under the least square dummy variable test of regression with unobserved individual causes correlated with the independent variable, Women in board, Bank Size, Non-Interest Income are found statistically significant. Under fixed effect, the LSDV test of regression controls the mean differences among variables of the banks. The threat of bias from the left variables has been greatly reduced which is reflected in the coefficient of the variables. The factors in different banks about Governance, Cost Efficiency, Bank Size, and Non-Interest Income should have an impact on the significant variables. Policy implications in this sector can also affect the level of effect on the financial stability of the Bangladesh economy. While LSDV regression grants for the variation in the coefficients of the variables for the financial stability with fixed effect. The effect of individuals that can influence the financial stability over time is estimated to see the dimension of change in the expected coefficients of the factors selected. The individual effect considered is uncorrelated with the financial stability of the Banks. In fixed effect consideration, changes in the predictor through coefficient will consider common effect like bank specific policy, industry standards change and law for all the banks by controlling individual bank related heterogeneity. Fixed effect model in this case avoids the biasness of the qualitative factors including loan quality, character, management quality, reputation and social recognition of the borrowers. The factors behind the changes in the financial stability in bank to bank is the main concern found through fixed effect model by observing the different results of predictor through stationary and non-stationary based fixed effect results. Diversification and governance are two important factors that are greatly influencing the credit risk in the market with common effect.

4.3.42 Panel Regression Random Effect: Log Z(ROA)

Random effect model in the analysis deals with the heterogeneous factors that are correlated with the instrumental variables (Bank specific factors). The table following is the presentation of the results of the random effect. Unobserved or foreseeable factors can have an impact on the financial stability by different levels of influence. The random effect allows seeing the time-variant and individual effect so that disturbance from the random value or unpredictable movement can be included and thus appropriate explanation about the Women in board, Bank Size, Non-Interest Income, Cost Efficiency, Loan to Assets can be extracted. The variance among the bank specific and macro factors for listed banks are considered as random in this random factor result. Random effect results under financial stability assumption with Log Z(ROA) is stated below:

Variable	Coefficient	P value
Of_Woman_In_Board	-1.26	0.00*
Cost Efficiency Ratio	0.02	0.94
Log Assets	0.08	0.04*
LTA	0.07	0.39
Non- Interest Income	15.23	0.02*
C	1.27	0.22

Table 38: Panel regression random effect log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **

In random effect model statistical significance found for Governance through participation of woman in board and the coefficient is negative in line with the results under fixed effect model that assumes that the qualitative unknown factors influence is variable. Cost efficiency ratio positively associated with financial stability and statistically insignificant. Bank size is positively associated with financial stability and statistically significant and complies with the random effect model. Loan to Assets has positive coefficient in both fixed and random effect model but not significant in the case of random effect and fixed effect model indicating that unobserved factors such as market policy, risk grading style vary with NIM, ROE, ROA, NII. Non-Interest Income has positive coefficient in both fixed and random model and significant for random effect and fixed effect model with least square dummy consideration. In different years and different banks based on asset size are reflected in the random effect model. In this model, without changes in any factor, credit risk will be increased by 1.27% but this impact is not statistically significant. Influences of the bank specific factors, especially governance and bank size impact vary over time confirmed by the random effect model. Procyclical credit policy and weak management are the finding of random effect model through positive coefficient in non-interest income in both of the fixed and random effect results.

4.3.43 Hauseman Test: Log Z(ROA)

Analysis of the Hausman test prevails on the uses of the appropriateness of the fixed or random model in the study. The following table shows the results of Hausman test found under financial stability consideration measured through Log Z(ROA):

Test Summary	Chi-Sq. Statistic	P value
Cross-section Random	4.60	0.46

Variable	VAR(DIFF.)	P value
Of_Woman_in_Board	0.10	0.44
Cost Efficiency Ratio	0.03	0.17
Log Assets	0.00	0.73
LTA	0.00	0.55

Table 39 Hauseman test: log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **

The deviation between least square dummy coefficients and estimated generalized last square coefficients of variables are statistically insignificant for Loan to Asset Ratio, Women in board, Bank Size, Non-Interest Income are not statistically significant at 5% statistically significant point. Differences under both of the model is positive that simultaneously influences the industry with qualitative changes with policy rates and regulatory changes in the market and Random effect model that covers impact of unobserved factors including macro factors and other specific issues is more appropriate for credit risk forecasting and management. Random factors will move based on the movement of the factors of credit risk included in this study. The hypothesis confirms that bank specific factors have different scale of influence on the credit risk management of Banking Industry. Under this preferred theory of Random effect, Return on Assets, Return on Equity and Non-Interest Income are predictive factors on risk management in the bank credit appraisal. This test implies that random impact from different bank and macro factors are relevant to predict future condition of the credit risk of the listed banks.

4.3.44 GMM On Baseline: Log Z (ROA Based)

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z(ROA) is presented below:

Variable	Coefficient	P value
Log_Z_Roa (-1)	0.69	0.00*
Log Asset	-0.01	0.61
Cost Efficiency Ratio	1.15	0.01*
Of_Woman_In_Board	1.59	0.31

Table40: GMM on baseline: log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis works in baseline study of results as it reduces the financial stability by 0.01% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability increases at 1.59%. If this ratio increases, governance increases. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it slightly increases stability.

4.3.45 GMM On Baseline+ LTA: Log Z (ROA Based)

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. Baseline model for Financial Stability consideration with Log Z(ROA)+ LTA is presented below:

Variable	Coefficient	P value
Log_Z_Roa (-1)	0.73	0.00*
Log Asset	-0.02	0.49
Cost Efficiency Ratio	0.94	0.00*
Of_Woman_In_Board	1.93	0.27
LTA	0.17	0.09**

Table 41: GMM on Baseline+LTA: log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector becomes weaken and performance is not extended. But too big to fail hypothesis works in the study of results as it reduces the financial stability by 0.02% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 1.93%. If this ratio increases, governance improves. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it increases stability at a point. When loan to asset increases, credit risk also increases that happens due to banking sectoral inefficiency. This is not statistically significant.

4.3.46 GMM On Baseline+ Non-Interest Income: Log Z (ROA Based)

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. Baseline model for Financial Stability consideration with Log Z(ROA)+ NII is presented below:

Variables	Coefficient	P value
Log_Z_Roa (-1)	0.71	0.00*
Log Asset	-0.03	0.47
Cost Efficiency Ratio	1.43	0.07**
Of_Woman_In_Board	2.17	0.20
Non-Interest Income	6.44	0.25

Table 42: GMM on Baseline+Non-Interest Income: Log Z(ROA) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis seems feasible in the study of results as it reduces the financial stability by 0.03% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 2.17%. If this ratio increases, governance improves. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market but financial stability is increasing at a rate as well. Non-interest Income is positively associated with the financial stability by 6.44%. It focuses on the diversity income generation impact the improves the financial strength in the industry for the listed commercial banks and signs of the good management hypothesis's existence.

4.3.47 GMM On Baseline: Log Z (ROA Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z(ROA) as financial stability is expressed below:

Variable	Coefficient	P value
Log_Z_ROA (-1)	0.47	0.00*
Log_Z_ROA (-2)	-0.05	0.32
Log Asset	-0.04	0.48
Cost Efficiency Ratio	0.25	0.49
Of_Woman_In_Board	1.86	0.34

Table 43: GMM on baseline: log Z(ROA) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has negative coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.04%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is insignificant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 1.86%. If this ratio increases, governance increases in the bank performance. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases.

4.3.48 GMM on Baseline + LTA: Log Z (ROA Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z(ROA) as financial stability with LTA is expressed below:

Variable	Coefficient	P value
Log_Z_Roa (-1)	0.47	0.00*
Log_Z_Roa (-2)	-0.09	0.13
Log Asset	-0.03	0.54
Cost Efficiency Ratio	0.16	0.67
Of_Woman_In_Board	2.30	0.26
LTA	0.05	0.00*

Table 44: GMM on Baseline+LTA: log Z(ROA) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has negative coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.03%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is insignificant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 2.30%. If this ratio increases, governance increases in the bank performance. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Loan to asset increases the financial stability as more revenue comes from more disbursement. This is statistically significant and complies with the good management.

4.3.49 GMM On Baseline + Non-Interest Income: Log Z (ROA Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z(ROA) as financial stability with NII is expressed below:

Variable	Coefficient	P value
Log_Z_Roa (-1)	0.41	0.00*
Log_Z_Roa (-2)	-0.05	0.26
Log Asset	-0.04	0.47
Cost Efficiency Ratio	0.46	0.28
Of_Woman_In_Board	1.42	0.32
Non-Interest Income	3.45	0.51

Table 45: GMM on baseline+ Non-Interest Income: log Z(ROA) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generate positive coefficient for financial stability and this is statistically significant at 5% level. It shows that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as the size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has negative coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.46%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is insignificant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 1.42%. If this ratio increases, governance increases in the bank performance. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Non-interest Income is positively associated with the financial stability by 6.44%. It focuses on the diversity income generation impact the improves the financial strength in the industry for the listed commercial banks and signs of the good management hypothesis's exultancy.

4.3.50 Panel Regression: Log Z (CAR) Based

Random variation of the values in the variables reduces the accuracy of the expectation of the outcome. By root test analysis, stationary data-based results of the panel least square based on financial stability measurement by Log Z(CAR) is shown below:

Variable	Coefficient	P value
Log Asset	0.08	0.10*
Cost Efficiency Ratio	-0.29	0.45
Of_Woman_In_Board	-0.74	0.04*
LTA	0.04	0.70
Non-Interest Income	15.5	0.08**
C	1.64	0.24

Table 46: Panel regression: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **.

Least square analysis of the credit risk related factors in then above table expresses that Governance through participation of woman in board, Operating Expense Ratio, Log Assets, Loan to Assets, Non-Interest Income are found statistically insignificant at 5% level of significance except governance. It can be said that in the preliminary data analysis with 95% confidence interval the major factors of the credit risk management are influential in market determination of risk level of existing banking industry under stationary measurement. Participation of woman in board of the banks inversely impacts on the non-performing loan indicating that increasing rate of woman in the board of governance over time decreases the financial stability. Cost efficiency ratio has inverse relation with the financial stability rate by 0.29%. Meanwhile, bank size increases the non-performing loan by 0.08% and vice versa. However, Loan to Assets has the tendency of positive association with the credit risk measurement measured by financial stability by 4%. When non-interest income is increased by 1% financial stability is decreased by 15.5% is significant. Expected results though found for same market factors in the banking industry, only governance issue is more relevant to maintain significance in the industry. Good governance in the body by women participation ensures stability in the performance. Without any change in the market factors stability sustains at 1.64%.

4.3.51 Panel Regression Fixed Effect: Log Z (CAR) Based

Under least square dummy variable test hypothesis along with the unobserved individual influences on the stationary values of the instrumental variables the following results have been found. Women in board, Bank Size, Non-Interest Income Impact have been found crucial for the explanation of the movement of the factors. Fixed Effect results for financial stability through Log Z(CAR)is shown below:

Variable	Coefficient	P value
Log Asset	0.10	0.03*
Cost Efficiency Ratio	0.37	0.44
Of_Woman_In_Board	-1.47	0.02*
LTA	0.08	0.41
Non-Interest Income	35.13	0.00*
C	0.81	0.52

Table47: Panel regression fixed effect: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **

Least square analysis of the credit risk related factors in then above table expresses that Governance through participation of woman in board is significant, Operating Expense Ratio is not significant, Log Assets is statistically significant, Loan to Assets is insignificant, Non-Interest Income is found statistically significant at 5% level of significance. Under the least square dummy variable test of regression with unobserved individual causes correlated with the independent variable, Women in board, Bank Size, Non-Interest Income are found statistically significant. Under fixed effect, the LSDV test of regression controls the mean differences among variables of the banks. The threat of bias from the left variables has been greatly reduced which is reflected in the coefficient of the variables. The factors in different banks about Governance, Cost Efficiency, Bank Size, and Non-Interest Income should have an impact on the significant variables. Policy implications in this sector can also affect the level of effect on the financial stability of the Bangladesh economy. While LSDV regression grants for the variation in the coefficients of the variables for the financial stability with fixed effect. The effect of individuals that can influence financial stability over time is estimated to see the dimension of change in the expected coefficients of the factors selected. The individual effect considered is uncorrelated with the financial stability of the Banks. In fixed effect consideration, changes in the predictor through coefficient will consider common effect like bank specific policy, industry standards change and law for all the banks by controlling individual bank related heterogeneity. Fixed effect model in this case avoids the biasness of the qualitative factors including loan quality, character, management quality, reputation and social recognition of the borrowers. The factors behind the changes in the financial stability size in bank to bank is the main concern found through fixed effect model by observing the different results of predictor through stationary and non-stationary based fixed effect results. Diversification and governance are two important factors that are greatly influencing the credit risk in the market with common effect.

4.3.52 Panel Regression Random Effect: Log Z (CAR) Based

Random effect model in the analysis deals with the heterogeneous factors that are correlated with the instrumental variables (Bank specific factors). The table following is the presentation of the results of the random effect. Unobserved or foreseeable factors can have an impact on the financial stability by different levels of influence. The random effect allows seeing the time-variant and individual effect so that disturbance from the random value or unpredictable movement can be included and thus appropriate explanation about the Women participation in board, Bank Size, Non-Interest Income, Cost Efficiency, Loan to Assets can be extracted. The variance among the bank specific and macro factors for listed banks are considered as random in this random factor result. Random effect results under financial stability assumption with Log Z(CAR) is stated below:

Variable	Coefficient	P value
Log Asset	0.09	0.03*
Cost Efficiency Ratio	0.09	0.82
Of_Woman_In_Board	-1.11	0.02*
LTA	0.07	0.45
Non-Interest Income	30.31	0.00*
C	1.00	0.41

Table 48: Panel regression random effect: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **.

In random effect model statistical significance found for Governance through participation of woman in board and the coefficient is negative in line with the results under fixed effect model that assumes that the qualitative unknown factors influence is variable. Cost efficiency ratio positively associated with financial stability and statistically insignificant. Bank size is positively associated with financial stability and statistically significant and complies with the random effect model. Loan to Assets has positive coefficient in both fixed and random effect model but not significant in the case of random effect and fixed effect model indicating that unobserved factors such as market policy, risk grading style vary with NIM, ROE, ROA, NII. Non-Interest Income has positive coefficient in both fixed and random model and significant for random effect and fixed effect model with least square dummy consideration. In different years and different banks based on asset size are reflected in the random effect model. In this model, without changes in any factor, credit risk will be increased by 1% but this impact is not statistically significant. Influences of the bank specific factors. Procyclical credit policy and weak management are the finding of random effect model through positive coefficient in non-interest income in both of the fixed and random effect results.

4.3.53 Hauseman Test: Log Z(CAR)

Analysis of the Hausman test prevails on the uses of the appropriateness of the fixed or random model in the study. The following table shows the results of Hausman test found under financial stability consideration measured through Log Z(CAR):

Test Summary	Chi-Sq. Statistic	P value
Cross-section Random	10.69	0.05*

Variable	VAR (DIFF.)	P value
Log Asset	0.10	0.88
Cost Efficiency Ratio	0.37	0.22
Of_Woman_In_Board	-1.47	0.39
LTA	0.08	0.63
Non-Interest Income	35.13	0.02*

Table 49: Hauseman test: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **.

The deviation between least square dummy coefficients and estimated generalized last square coefficients of variables are statistically insignificant for Loan to Asset Ratio, Women in board, Bank Size, are not statistically significant at 5% statistically significant point. Differences under both of the model is positive that simultaneously influences the industry with qualitative changes with policy rates and regulatory changes in the market and Random effect model that covers impact of unobserved factors including macro factors and other specific issues is more appropriate for credit risk forecasting and management. Random factors will move based on the movement of the factors of credit risk included in this study. The hypothesis confirms that bank specific factors have different scale of influence on the credit risk management of Banking Industry. Under this preferred theory of random effect, return on Assets, Return on Equity and Non-Interest Income are predictive factors on risk management in the bank credit appraisal. This test implies that random impact from different bank and macro factors are relevant to predict future condition of the credit risk of the listed banks. Non-interest income increases the financial stability that statistically significant and profound on random effect.

4.3.54 GMM on Baseline: Log Z (CAR Based)

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z(CAR) is presented below:

Variable	COEFFICIENT	P value
Log Z CAR (-1)	0.95	0.00*
Log Asset	-0.13	0.24
Cost Efficiency Ratio	3.58	0.00*
Of_Woman_In_Board	3.82	0.02*

Table 50: GMM on Baseline: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis works in baseline study of results as it reduces the financial stability by 0.01% for 0.13% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability increases at 3.82%. If this ratio increases, governance increases. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it slightly increases stability.

4.3.55 GMM On Baseline+Lta: Log Z (CAR Based)

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. Baseline model for Financial Stability consideration with Log Z(CAR)+ LTA is presented below:

Variable	COEFFICIENT	P value
Log Z CAR (-1)	0.96	0.00*
Log Asset	-0.11	0.29
Cost Efficiency Ratio	3.52	0.00*
Of_Woman_In_Board	4.09	0.01*
LTA	0.22	0.00*

Table 51: GMM on Baseline+ LTA: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector becomes weaken and performance is not extended. But too big to fail hypothesis works in the study of results as it reduces the financial stability by 0.11% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability increases at 4.09%. If this ratio increases, governance improves. This is statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it increases stability at a point. When loan to asset increases, credit risk also increases that happens due to banking sectoral inefficiency. This statistically significant.

4.3.56 GMM On Baseline+Non- Interest Income: Log Z (CAR Based)

Generalized Method of Moment analysis on the bank specific factors and economic factors under two step method determines the variation with specific moment changes due to the addition of new factors in the base line model. Baseline model for Financial Stability consideration with Log Z(CAR)+ NII is presented below:

Variable	COEFFICIENT	P value
Log Z CAR (-1)	0.89	0.00*
Log Asset	-0.13	0.22
Cost Efficiency Ratio	3.71	0.00*
Of_Woman_In_Board	3.74	0.02*
Non-Interest Income	8.81	0.19

Table 52: GMM on baseline+ non-interest income: log Z(CAR) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis seems feasible in the study of results as it reduces the financial stability by 0.13% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability increases at 3.74%. If this ratio increases, governance improves. This is statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market but financial stability is increasing at a rate as well. Non-interest Income is positively associated with the financial stability by 8.81%. It focuses on the diversity income generation impact the improves the financial strength in the industry for the listed commercial banks and signs of the good management hypothesis's existence.

1.3.57 GMM On Baseline: Log Z (CAR Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z(CAR) as financial stability is expressed below:

Variable	Coefficient	P value
Log Z CAR (-1)	0.81	0.00*
Log Z CAR (-2)	-0.11	0.11
Log Asset	-0.03	0.75
Cost Efficiency Ratio	2.25	0.00*
Of_Woman_In_Board	4.75	0.02*

Table 53: GMM on baseline: log Z(CAR) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has negative coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.03%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability increases at 4.75%. If this ratio increases, governance increases in the bank performance. This is statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases.

4.3.58 GMM On Baseline + LTA: Log Z (CAR Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z(CAR) as financial stability with LTA is expressed below:

Variable	Coefficient	P value
Log Z CAR (-1)	0.58	0.00*
Log Z CAR (-2)	-0.03	0.62
Log Asset	-0.20	0.23
Cost Efficiency Ratio	2.12	0.00*
Of_Woman_In_Board	2.83	0.08**
LTA	-0.92	0.04*

Table 54: GMM on Baseline+ LTA: log Z(CAR) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level for lag 1. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has negative coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.20%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability increases at 2.83%. If this ratio increases, governance increases in the bank performance. This is statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Loan to asset increases the financial stability as more revenue comes from more disbursement. This is statistically significant and complies with the good management.

4.3.59 GMM On Baseline+Non-Interest Income: Log Z (CAR Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z(CAR) as financial stability with NII is expressed below:

Variable	Coefficient	P value
Log Z CAR (-1)	0.82	0.00*
Log Z CAR (-2)	-0.13	0.04*
Log Asset	-0.06	0.50
Cost Efficiency Ratio	2.22	0.00*
Of_Woman_In_Board	5.81	0.00*
Non-Interest Income	7.85	0.31

Table 55: GMM on baseline+ non-interest income: log Z(CAR) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has negative coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.06%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 5.81%. If this ratio increases, governance increases in the bank performance. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Non-interest Income is positively associated with the financial stability by 7.85%. It focuses on the diversity income generation impact the improves the financial strength in the industry for the listed commercial banks and signs of the good management hypothesis's existence.

4.3.60 Panel Regression: Log Z (Infection Ratio Based)

Random variation of the values in the variables reduces the accuracy of the expectation of the outcome. By root test analysis, stationary data-based results of the panel least square based on financial stability measurement by Log Z (Infection Ratio) is shown below:

Variable	Coefficient	P value
Of_Woman_In_Board	-0.05	0.91
Cost Efficiency Ratio	-0.69	0.16
Log Assets	-0.07	0.24
LTA	0.03	0.80
Voice And Accountability Index	2.79	0.51
Non-Interest Income	-15.51	0.19
Regulatory Quality Index	1.29	0.33
C	3.44	0.11

Table 56: Panel Regression: log Z (Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **

Least square analysis of the credit risk related factors in then above table expresses that Governance through participation of woman in board, Operating Expense Ratio, Log Assets, Loan to Assets, Non-Interest Income, Voice and Accountability Index, Regulatory Quality Index are found statistically insignificant at 5% level of significance except. It can be said that in the preliminary data analysis with 95% confidence interval the major factors of the credit risk management are influential in market determination of risk level of existing banking industry under stationary measurement. Participation of woman in board of the banks inversely impacts on the financial stability indicating that increasing rate of woman in the board of governance over time decreases the financial stability. Cost efficiency ratio has inverse relation with the financial stability rate by 0.69%. Meanwhile, bank size decreases the financial stability by 0.07% and vice versa. However, Loan to Assets has the tendency of positive association with the credit risk measurement measured by financial stability by 3%. When non-interest income is increased by 1% financial stability is decreased by 15.5% is insignificant. Expected results though found for same market factors in the banking industry, only governance issue is more relevant to maintain significance in the industry. Good governance in the body by women participation ensures stability in the performance. Without any change in the market factors stability sustains at 3.44%.

4.3.61 Panel Regression Fixed Effect: Log Z (Infection Ratio Based)

Under least square dummy variable test hypothesis along with the unobserved individual influences on the stationary values of the instrumental variables the following results have been found. Women in board, Bank Size, Non-Interest Income Impact have been found crucial for the explanation of the movement of the factors. Fixed Effect results for financial stability through Log Z (Infection Ratio) is shown below:

Variable	COEFFICIENT	P value
Of_Woman_In_Board	0.66	0.51
Cost Efficiency Ratio	-1.30	0.10**
Log Assets	-0.11	0.12
LTA	-0.05	0.74
Voice and Accountability Index	-1.13	0.86
Non-Interest Income	-12.01	0.38
Regulatory Quality Index	1.58	0.25
C	5.34	0.03*

Table 57: Panel Regression: log Z ((Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **.

Least square analysis of the credit risk related factors in then above table expresses that Governance through participation of woman in board is insignificant, Cost Efficiency Ratio is significant, Log Assets is statistically insignificant, Loan to Assets is insignificant, Non-Interest Income is found statistically insignificant at 5% level of significance. Under the least square dummy variable test of regression with unobserved individual causes correlated with the independent variable, Women in board, Bank Size, Non-Interest Income are found statistically insignificant. Under fixed effect, the LSDV test of regression controls the mean differences among variables of the banks. The threat of bias from the left variables has been greatly reduced which is reflected in the coefficient of the variables. The factors in different banks about Governance, Cost Efficiency, Bank Size, and Non-Interest Income should have an impact on the significant variables. Policy implications in this sector can also affect the level of effect on the financial stability of the Bangladesh economy. While LSDV regression grants for the variation in the coefficients of the variables for the financial stability with fixed effect. The effect of individuals that can influence financial stability over time is estimated to see the dimension of change in the expected coefficients of the factors selected. The individual effect considered is uncorrelated with the financial stability of the Banks. In fixed effect consideration, changes in the predictor through coefficient will consider common effect like bank specific policy, industry standards change and law for all the banks by controlling individual bank related heterogeneity. Fixed effect model in this case avoids the biasness of the qualitative factors including loan quality, character, management quality, reputation and social recognition of the borrowers. The factors behind the changes in the financial stability in bank to bank is the main concern found through fixed effect model by observing the different results of predictor through stationary and non-stationary based fixed effect results. Diversification and governance are two important factors that are greatly influencing the credit risk in the market with common effect. Changes in the economic policy or banking industry guideline impacts all the listed banks at a constant rate.

4.3.62 Panel Regression Random Effect: Log Z (Infection Ratio Based)

Random effect model in the analysis deals with the heterogeneous factors that are correlated with the instrumental variables (Bank specific factors). The table following is the presentation of the results of the random effect. Unobserved or foreseeable factors can have an impact on the financial stability by different levels of influence. The random effect allows seeing the time-variant and individual effect so that disturbance from the random value or unpredictable movement can be included and thus appropriate explanation about the Women participation in board, Bank Size, Non-Interest Income, Cost Efficiency, Loan to Assets can be extracted.

Variable	Coefficient	P value
Of_Woman_In_Board	-0.05	0.91
Cost Efficiency Ratio	-0.69	0.17
Log Assets	-0.07	0.25
LTA	-0.03	0.80
Voice And Accountability Index	2.79	0.51
Non-Interest Income	-15.51	0.20
Regulatory Quality Index	1.29	0.34
C	3.44	0.11

Table 58: Panel Regression Random Effect: Log Z ((Infection Ratio Based) lag 2 is significant at 5% level denoted by * 10% level denoted by **

In random effect model statistical insignificance found for Governance through participation of woman in board and the coefficient is negative in line with the results under fixed effect model that assumes that the qualitative unknown factors influence is variable. Cost efficiency ratio negatively associated with stability and statistically insignificant. Bank size is inversely associated with financial stability and statistically significant and complies with the random effect model. Loan to Assets has negative coefficient in both fixed and random effect model but not significant in the case of random effect and fixed effect model indicating that unobserved factors such as market policy, risk grading style vary with NIM, ROE, ROA, NII. Non-Interest Income has negative coefficient in both fixed and random model and insignificant for random effect and fixed effect model with least square dummy consideration. In different years and different banks based on asset size are reflected in the random effect model. In this model, without changes in any factor, financial stability will be increased by 3.44% but this impact is not statistically significant. Influences of the bank specific factors, especially governance and bank size impact vary over time confirmed by the random effect model. Procyclical credit policy and weak management are the finding of random effect model through negative coefficient in non-interest income in both of the fixed and random effect results.

4.3.63 Hausman Test: Log Z (Infection Ratio Based)

Analysis of the Hausman test prevails on the uses of the appropriateness of the fixed or random model in the study. The following table shows the results of Hausman test found under financial stability consideration measured through Log Z (Infection Ratio):

Test Summary	Chi-Sq. Statistic	P value
Cross-section Random	5.38	0.61

Variable	Coefficient	P value
Of_Woman_In_Board	0.66	0.41
Cost Efficiency Ratio	-1.30	0.31
Log Assets	-0.11	0.22
LTA	-0.05	0.14
Voice and Accountability Index	-1.13	0.46
Non-Interest Income	-12.01	0.58
Regulatory Quality Index	1.58	0.27

Table 59: Hausman test: log Z ((Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **

The deviation between least square dummy coefficients and estimated generalized last square coefficients of variables are statistically insignificant for Loan to Asset Ratio, Women in board, Bank

Size, are not statistically significant at 5% statistically significant point. Differences under both of the model is positive that simultaneously influences the industry with qualitative changes with policy rates and regulatory changes in the market and Random effect model that covers impact of unobserved factors including macro factors and other specific issues is more appropriate for credit risk forecasting and management. Random factors will move based on the movement of the factors of credit risk included in this study. The hypothesis confirms that bank specific factors have different scale of influence on the credit risk management of Banking Industry. Under this preferred theory of random effect, return on Assets, Return on Equity and Non-Interest Income are predictive factors on risk management in the bank credit appraisal. This test implies that random impact from different bank and macro factors are relevant to predict future condition of the credit risk of the listed banks. Non-interest income decreases the financial stability that statistically insignificant and profound on random effect. Less diversification makes the banking industry risker for the credit.

4.3.64 GMM on Baseline Model: Log Z (Infection Ratio Based)

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z (Infection Ratio) is presented below:

Variable	Coefficient	P Value
Log Z IR (-1)	0.04	0.35
Of_Woman_In_Board	-1.54	0.21
Cost Efficiency Ratio	-2.64	0.00*
Log Assets	-0.04	0.76
LTA	0.26	0.64

Table 60: GMM on baseline model: log Z ((Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically insignificant at 5% level except cost efficiency ratio. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical insignificance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis works in baseline study of results as it reduces the financial stability by 0.04% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum and declines the financial stability. Entrance of the women in board of the directors of the commercial listed banks inversely associated with financial stability and statistically not significant. When women participation in board increases at 1% financial stability decreases at 1.54%. If this ratio increases, governance declines. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director’s board it sometimes failed to achieve the risk reduction in the market though it slightly increases stability.

4.3.65 GMM On Baseline Model+ Regulatory Index: Log Z (Infection Ratio Based)

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z (Infection Ratio) is presented below:

Variable	Coefficient	P Value
Log Z IR (-1)	0.03	0.62
_Of_Woman_In_Board	-1.38	0.30
Cost Efficiency Ratio	-3.85	0.04*
Log Assets	0.03	0.83
LTA	0.10	0.84
Regulatory Quality Index	2.59	0.07**

Table 61: GMM on Baseline Model + Regularity Index: log Z ((Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically insignificant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has positive coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis works in baseline study of results as it improves the financial stability by 0.01% for 0.03% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks inversely associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability decreases at 1.38%. If this ratio increases, governance decreases. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it slightly increases stability. Regulatory quality index positively increases the financial stability in the listed banking in the industry. This is statistically significant and regulatory direction creates discipline in the market. Loan defaulters and frauds become aware and implementation of guidelines forces the banks to comply with the direction.

4.3.66 GMM on Baseline Model+ Voice and Accountability: Log Z (Infection Ratio Based)

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z(Infection Ratio) is presented below:

Variable	Coefficient	P value
Log Z IR (-1)	0.04	0.37
Of_Woman_In_Board	-1.39	0.24
Cost Efficiency Ratio	-2.65	0.04*
Log Assets	-0.03	0.81
LTA	0.23	0.68
Voice And Accountability	-3.35	0.87

Table 62: GMM on Baseline model + Voice and Accountability: Log Z ((Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically insignificant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis works in baseline study of results as it reduces the financial stability by 0.03% for 1% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board decreases at 1% financial stability increases at 1.39%. If this ratio increases, governance decreases. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it slightly increases stability. Voice and accountability index reduce the financial stability but not significant at level of 5%. This occurs due to the moral hazard and market inefficiency in the banking sector.

4.3.67 GMM On Baseline Model+ Non-Interest Income: Log Z (Infection Ratio Based)

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z (Infection Ratio) is presented below:

Variable	Coefficient	P value
Log Z IR (-1)	-0.01	0.84
Of_Woman_In_Board	-0.49	0.75
Cost Efficiency Ratio	-4.06	0.05*
Log Assets	-0.02	0.92
LTA	0.43	0.55
Non-Interest Income	-36.69	0.09**

Table63: GMM on baseline model +non-interest income: log Z ((Infection Ratio Based) is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Log Asset (Bank Size), Cost Efficiency Ratio, Participation of Women in board are the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates negative coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to decrease in the next as it increased in the last year. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related strength with absence of strong of governance has paved the way for weakening of credit risk by reducing the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Log Asset has inverse coefficient and statistically insignificancy exposing that while bank size increases, capability of the banks and financial strength of the banking sector falls and performance is not extended. But too big to fail hypothesis works in baseline study of results as it reduces the financial stability by 1% for 0.02% increases in bank size. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant to realize in the market momentum. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically significant. When women participation in board increases at 1% financial stability decreases at 0.49%. If this ratio increases, governance decreases. This is not statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though it slightly increases stability. Non-interest income has negative coefficient with stability. Diversification here reduces stability that is statistically significant.

4.3.68 GMM On Baseline: Log Z (Infection Ratio Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z (Infection Ratio) as financial stability is expressed below:

Variable	Coefficient	P value
Log Z IR (-1)	-0.07	0.23
Log Z IR (-1)	-0.02	0.64
Of_Woman_In_Board	1.35	0.45
Cost Efficiency Ratio	-2.45	0.08**
Log Assets	0.07	0.62
LTA	1.16	0.31

Table 64: GMM on baseline model: log Z ((Infection Ratio Based) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates negative coefficient for financial stability and this is statistically insignificant at 5% level. It expresses that financial stability is likely to decrease in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline absence related strength with weakness of governance has paved the way for increasing of credit risk by declining the financial stability over time. Lag 1 provides negative coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has positive coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability increases 0.07%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 1.35%. If this ratio increases, governance increases in the bank performance. This is statistically significant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Loan to asset ratio positively influence the stability in the long run but statistically not significant.

4.3.69 GMM On Baseline+ Regulatory Index: Log Z (Infection Ratio Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z (Infection Ratio) as financial stability with RI is expressed below:

Variable	Coefficient	P value
Log Z IR (-1)	-0.14	0.09**
Log Z IR (-1)	-0.005	0.94
Of_Woman_In_Board	2.03	0.40
Cost Efficiency Ratio	-3.67	0.07**
Log Assets	0.48	0.32
LTA	1.80	0.09**
Regulatory Index	5.06	0.00*

Table65: GMM on Baseline Model + Regulatory Index: log Z ((Infection Ratio Based) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates negative coefficient for financial stability and this is statistically insignificant at 5% level. It expresses that financial stability is likely to decrease in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline absence related strength with weakness of governance has paved the way for increasing of credit risk by declining the financial stability over time. Lag 1 provides negative coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has positive coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability increases 0.48%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Cost efficiency must increase the stability in the banking sector. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 2.03%. If this ratio increases, governance increases in the bank performance. This is statistically insignificant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market and though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Loan to asset ratio positively influence the stability in the long run but statistically not significant. Regulatory quality index is positively associated with the financial stability measured by infection ratio. Strong regulatory supervision creates discipline and financial stability is improved with the changes in polices over time and this is statistically significant.

4.3.70 GMM On Baseline+Non-Interest Income: Log Z (Infection Ratio Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z (Infection Ratio) as financial stability with NII is expressed below:

Variable	Coefficient	P value
Log Z IR (-1)	-0.10	0.18
Log Z IR (-1)	-0.01	0.86
Of_Woman_In_Board	1.79	0.36
Cost Efficiency Ratio	-3.14	0.19
Log Assets	0.31	0.32
LTA	0.96	0.44
Non-Interest Income	-51.34	0.01*

Table 66: GMM on Baseline Model+ non-Interest income: log Z (Infection Ratio Based) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates negative coefficient for financial stability and this is statistically insignificant at 5% level. It expresses that financial stability is likely to decrease in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline absence related strength with weakness of governance has paved the way for increasing of credit risk by declining the financial stability over time. Lag 1 provides negative coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has positive coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability increases 0.31%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is insignificant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Cost efficiency must increase the stability in the banking sector. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 1.79%. If this ratio increases, governance increases in the bank performance. This is statistically insignificant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market and though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Loan to asset ratio positively influence the stability in the long run but statistically not significant. Increase in non-interest income reduces the stability that is not relevant to the diversification hypothesis.

4.3.71 GMM on Baseline+ Voice and Accountability: Log Z (Infection Ratio Based) Lag 2

Generalized method of moments for identifying significant influence different difference level has been applied to reach its peak. The following results of the baseline model under 2nd difference or Lag 2 is for Log Z (Infection Ratio) as financial stability with Voice and Accountability is expressed below:

Variable	Coefficient	P value
Log Z IR (-1)	-0.09	0.17
Log Z IR (-1)	-0.02	0.71
Of_Woman_In_Board	1.31	0.48
Cost Efficiency Ratio	-3.02	0.12
Log Assets	0.13	0.47
LTA	1.69	0.14
Voice And Accountability	27.12	0.43

Table 67: GMM on baseline Model+ Voice and Accountability: log Z (Infection Ratio Based) lag 2 is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. But under lag 2 negative coefficient is found for financial stability that implies on the financial stability increases in the last year gradually declines in the present year. In some point decreasing rate is higher than stability increased in then last year. Bank size with log assets has positive coefficient and statistically insignificant exposing that while bank's financial strength increases by 1%, financial stability decreases 0.03%. In order to meet the excessive operating cost for the banks, they provide loan skimping the higher risk level to receive more interest. This increases the credit risk for the banking sector that is significant. This complies with the bad management hypothesis as higher cost forces to generate more income that motivates to make loan concentration with bad governance. Entrance of the women in board of the directors of the commercial listed banks positively associated with financial stability and statistically insignificant. When women participation in board increases at 1% financial stability increases at 1.31%. If this ratio increases, governance increases in the bank performance. This is statistically insignificant. More financial stability depends on the market discipline with governance issue but due to the family member woman acceptance in the director's board it sometimes failed to achieve the risk reduction in the market though financial stability is improving with woman participation. Woman in the board is sometimes risk averse to provide risk credit that saves from defaulters and the financial stability increases. Accountability is closely related to the financial stability of the banking sector.

4.4 Financial Stability Analysis

4.4.1 GMM Analysis: Lag 1 Financial Stability

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z (CAR) is presented below:

Variable	Coefficient	P Value
Z_ CAR(-1)	1.44	0.00*
NPL	-514.30	0.00*
Inflation	-4515.03	0.00*
GDP Growth Rate	-29.01	0.00*

Table 68: GMM analysis: lag 1 financial stability is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers NPL, Inflation, GDP growth Rate imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. NPL is negatively related to the performance or stability of the banks and statistically significant at 5% level. In the last decade, NPL has risen at a higher rate and the financial condition of some banks has declined including state own commercial banks. It has become threat for the listed banks to survive facing large loss in loan recovery. Inflation also reduces financial stability as no immediate market interest rate is adjusted to recover the loan and interest. With increasing trend of inflation, financial distress is observing in the market. This is statistically significant. Economic growth rate improves but stability has been declining and significant at 5% level. From 2009 growth is increasing but credit loss by banks has been expanding and thus financial stability declines.

4.4.2 GMM Analysis: Lag 2 Financial Stability

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of financial stability on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of financial stability in the long run performance analysis. Baseline model for Financial Stability consideration with Log Z (CAR) is presented below:

Variable	Coefficient	P value
Z_ CAR_(-1)	1.55	0.00*
Z_ CAR_(-2)	0.45	0.00*
NPL	-1906.47	0.00*
Inflation	-3102.27	0.00*
GDP Growth Rate	-24.45	0.00*

Table 69: GMM analysis: lag 2 financial stability is significant at 5% level denoted by * 10% level denoted by **

The base line model of GMM here considers NPL, Inflation, GDP growth Rate imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Lag 2 for financial stability provides the same results of increasing stability each year at statistically significant. NPL is negatively related to the performance or stability of the banks and statistically significant at 5% level. In the last decade, NPL has risen at a higher rate and the financial condition of some banks has declined including state own commercial banks. It has become threat for the listed banks to survive facing large loss in loan recovery. Inflation also reduces financial stability as no immediate market interest rate is adjusted to recover the loan and interest. With increasing trend of inflation, financial distress is observing in the market. This is statistically significant. Economic growth rate improves but stability has been declining and significant at 5% level. From 2009 growth is increasing but credit loss by banks has been expanding and thus financial stability declines. In spite of higher economic growth with trend to higher inflation financial market is facing instability for the long time in Bangladesh as the tendency of the borrowers did not improve and the quality of the loan receivers has been crashed.

4.5 Management Efficient Analysis

4.5.1 GMM Analysis Lag 1: Management Efficiency

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of NPL on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of NPL in the long run performance analysis.

Variable	Coefficient	P value
NPL (-1)	0.35	0.00*
Operating Expense Ratio	0.23	0.00*
Tobins Q Mv Equity Total A…..	-7.45E	0.85

Table 70: GMM analysis lag 1: management efficiency is significant at 5% level denoted by * 10% level denoted by **.

The base line model of GMM here considers Operating Expense Ratio, NPL, Tobin's Q as the baseline factors for imparting specific moment condition. The above two step GMM findings with lag 1 consideration generates positive coefficient for Non-Performing Loan and this is statistically significant at 5% level. It expresses that Non-Performing Loan is likely to increase in the next as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection and market discipline related weakness with shortage of governance has paved the way for extending of credit risk by boosting the NPL rate over time. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 0.23%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. This supports the bad management hypothesis. Higher cost exposes the weakness in the quality of management to control cost so that bad loan write off can be made from the profit. This is significant for the banking sector. Tobin's Q measures the performance of the management, it implies in the market that improvement in the Tobin's Q ratio reduces the credit risk in the long and short run in the market. Market value of the banks with higher Q ratio increases the ability sustain in the shock. Good management quality take right polices to generate more Q ratio.

4.5.2 GMM Analysis Lag 2: Management Efficiency

Generalized Method of Moment (GMM) model has been used to see the impact of moment on the study so that the influence of the moments on the selected factors of the study can be observed. Besides that, it produces small number of the standard errors than that of least square method. Independent moment condition can give the real outcome happened in the market. Under one step GMM model asymmetric variance is too high to capture the impact of moment in the study. But the two step GMM model reduces this burden largely and shows the impact of NPL on the banking sectors stability. Under this method of two step GMM model every hypothesis is not correlated and statistically sound for explanation to forecast the changes in the factors of NPL in the long run performance analysis.

Variable	Coefficient	P value
NPL (-1)	0.29	0.00*
NPL (-2)	0.11	0.00*
OPERATING EXPENSE RATIO	0.17	0.00*
TOBINS Q MV EQUITY TOTAL A…..	-0.0004	0.00*

Table 71: GMM analysis lag 2: management efficiency is significant at 5% level denoted by * 10% level denoted by **

The above two step GMM findings with lag 2 consideration generates positive coefficient for financial stability and this is statistically significant at 5% level. It expresses that financial stability is likely to increase in the next year as it increased in the last year as well. This happens as size of credit has been expanding for development of the country. Private sector credit growth along with the public sector credit growth has been increasing in the last decade. Adverse selection reduction and market discipline related strength with strong of governance has paved the way for weakening of credit risk by boosting the financial stability over time. Lag 1 provides positive coefficient and statistical significance for the credit risk and it has been happening in Bangladesh for last couple of years with minimum stability. Lag 2 positive coefficient is found for financial stability that implies on the financial stability increases in the last year gradually increased in the present year. In some point decreasing rate is lower than stability increased in then last year. Operating expense ratio has positive coefficient and statistically significant exposing that while cost increases non-performing loan also increases with 0.17%. In order to meet the excessive operating cost for the banks, they provide loan skimming the higher risk level to receive more interest. This increases the credit risk for the banking sector. This supports the bad management hypothesis. Higher cost exposes the weakness in the quality of management to control cost so that bad loan write off can be made from the profit. This is significant for the banking sector. Tobin's Q measures the performance of the management, it implies in the market that improvement in the Tobin's Q ratio reduces the credit risk in the long and short run in the market. Market value of the banks with higher Q ratio increases the ability sustain in the shock. Good management quality take right polices to generate more Q ratio.

4.5.3 ARDL For Management Efficiency

Autoregressive Distributed Lag model mostly recovers dependency of NPL on its own past values and dependency on past and present values of factors of the model of credit risk. ARDL measures here long run and short run relationship among NPL and other bank specific factors. The table below shows the long and short run relationship of the credit risk management related factors other than baseline model:

Variable	Coefficient	P value
Long Run Equation		
Operaing Expense Ratio	0.14	0.00*
Tobins Q Mv Equity Total A…..	-8.52E	0.01*
Short Run Equation		
Cointeq01	-0.60	0.00*
D (Operaing Expense Ratio)	-0.03	0.22
D (Tobins Q Mv Equity Total A…..)	-300.06	0.31
C	-0.01	0.00*
@Trend	0.00	0.57

Table 72: ARDL for management efficiency is significant at 5% level denoted by * 10% level denoted by **

Long run estimation finds significant impact of operating expense ratio on NPL by increasing NPL at 0.14% for 1% decrease in operating expense ratio. Bank performance through Tobin's Q negatively influences the NPL that is under lag consideration at 5% significance level. In the long run auto-regressive distributed lag assumption here explains that negative impact of credit risk in the market for some bank specific factor presumed to exist that considers all the current and past values of credit market. In the long run proper credit management with monitoring is important for ensuring market value and reduce the bad loan in the industry. In the short run, difference of expense ratio negatively influences the credit risk. More expense ratio mostly reduces the NPL if write off has been made from the operating expense portion of the market. Market price of the listed banks inversely related to the

NPL. While Q ratio is increasing, NPL is decreasing in the short tun. It is the immediate effect of the sudden rise in the Tobin's Q Ratio. Stable Q ratio supports the strength of the banks in the short run. In the short run without being influenced by the market, level of existence of the credit risk is positive but at a lower rate with statistical significance. Disruption in the credit market is corrected through 0.60% and statistically significant. In the immediate action, adjustment in credit market of the banking sector moves to take stable position by the direct action of the regulatory body and the allocators of the industry.

Chapter 5: Recommendation

5.1 Recommendation

Bangladesh's banking industry has been suffering from the credit risk management weakness and facing higher rate of NPL from last couple of years. Though different changes in the regulatory and economic factors have been made to supervise to maintain discipline and promote stability in the market, adverse selection, moral hazard problem, bad management, weak governance in some listed banks, fraud collateral, illegal involvement of some dishonest bankers, political instability have made the condition of credit risk in the banking sector at a notable rate. Current level of NPL is above one lac thirty 9 crore taka. But it is satisfactory that recent policy changes by central banks are being used to avoid bad loan. Bad loan creates market instability and investors, depositors. Recent Islami Bank crisis is the case that reveals how information of bad loan can devastate the confidence of the depositors. This had created unexpected crisis of money supply and anarchy in the banking sector while it was used to be discussed about the gradual increase in loan default rate on regular basis. Therefore, the following strategies from the findings of this research can be adopted in the listed commercial banks of banking sector in Bangladesh.

1. Regulatory supervision always tries to put its ultimate policies in the banking sector to maintain credit related discipline. But with the biggest number of commercial banks in a small industry it is difficult to control all the banks through the single policy. It will be wise that all individual banks must maintain strong solvency ratios that should not be below of the industry standards at which financial condition will allow the banks to survive in any condition and to mitigate NPL amount at a significant percentage.
2. Management efficiency opens the opportunity of earning more money by reducing cost. But currently it is considered that only higher authority is mainly responsible for the loan defaults. But at desk to final credit appraisal approval a number of officers become involved so they should be aware and their activities can be monitored through independent auditor under the regulatory body in Bangladesh.
3. Reduction of bad investment of the banks is more needed. In spite of knowing the bad loan of the lenders, banks try to cut its evaluation of the credit demand. As a result, the weak borrowers get the opportunity to take loan. This skimping chances must be stopped through the direct monitoring of the central banks.
4. Policy decision very often liberalize the credit policy for the large borrowers to carry out the economic development in different economic phases. It is historically proven that; the large-

scale borrowers feel less interest to return the loan to the banks. So, listed banks should take the goods or services for which credit being taken as direct control. The rate of banks percentage on those goods must be increased. Banks should revalue the goods through the government or own revaluation committee.

5. Currently, the scenario of the profit of the listed commercial banks comes from the interest rate spread mostly. But non-interest income through the investment in securities, bonds, treasury securities dealership and other financial investment must be increased. It will create stability in financial strength with the reduction in the credit amount and depositors will be secured by receiving stable secured income. Industry guidelines on the investment proportion a should be strongly followed.
6. In time of submitting loan proposals, borrowers have to submit audited reports of the financial metrics of the business or loan proposals. This audit report is mad by private firms that are often distorted with tempered values. So, accountability must be increased by acting against audit firms if their audited report on loan proposals defaults in future after credit is provided. Auditors' quality and acceptance rate must be set by Bangladesh Bank.
7. Market values of the collateral under loan proposal should be considered. This market value of the collateral should be revalued through the special revaluation committee of Bangladesh Bank. This type of committee can be formed under Bangladesh Bank as regulatory index with higher score is found significant to reduce credit risk through the minimization of the NPL rate.
8. Loan concentration is too much in Bangladesh. Most of the banks provide loan to three or 4 sectors. But other sectors don't get loan needed on time. Adverse selection often takes place. As a result, balanced development in the country and diversification in disbursement are disrupted. This concentration ratio should be reduced to avoid large loss from individual bigger loan.
9. Provision of bad loan should be maintained from return but write of off of the bad loan should not be made from the other reserves. Showing profit from the reserves should be strictly prohibited. If needed, Bangladesh bank can categorize according to the dynamism of the banks credit rating and guides to make provision according to the credit rating. This will bind the weak banks to maintain more provision and strong banks to keep safety reserve.
10. Most of the NPL has been made in the state own banks experiencing from last decade. Banking commission can be formed following the Asian states to avoid further defaults.

11. A strong supervision and international standards management to distinguish the amount of finance by identifying the exact level of foreign import and domestic production level under loan proposal must be followed.

Chapter 6: Conclusion

6.1 Conclusion

Credit risk management is one of the significant risk management techniques in the financial market as well as in the economy. By reducing the probability of the default in loan, financial institution, most importantly, listed commercial banks of the economy can increase the financial viability and stability of the banks. In spite of taking many promising credits risk management techniques, banking sector of Bangladesh is experiencing an untenable defaulted loan scenario that over time has been creating financial losses and vulnerability in the market. Moreover, finding gap and reaching in to the solution might be the reason to conduct analysis on the credit risk management such as concentration risk, downgrade risk of the listed commercial banks in the economy.

Developing hypothesis for the credit risk measurement and movement of the banking sector with volatile credit position and extreme defaulters. In the last couple of years, the rate of NPL is extending in the banking industry of Bangladesh. Besides, different factors and policy changes directly impact in the market including economic, political, bank specific factors. Bank Size, Inflation rate, Expense Ratio, GDP growth rate, Income Ratio all these factors significantly influence the credit risk management of the banking industry. However, governance and management efficiency directly control the performance and the amount of bad debt in the credit market. Presuming regular activities of the banks it is found that equity to asset ratio, loan to asset, non-interest income, expense ratio, ROA, ROE, financial policy implementation is significant on the stationary values depended least square results. When equity to asset ratio rises, banks' strength increases and increases the confidence of the depositors and thus reduces the NPL rate or credit risk level in the banking industry. Loan to asset ratio is found inversely related to the NPL rate that does not comply to the expected results. As part of the credit management, higher lending amount with strong asset level, increases the credit risk through higher NPL rate. The reason behind the extensive LTA with lower NPL is that strong asset fundamentals of the commercial banks improve the earnings capability so that financially disturbed banks can make write off with bigger earnings surprise from high LTA. In this this analysis diversification hypothesis assumes that listed commercial banks with non-interest generation ability makes the banks strong to reduce NPL as earnings other than interest income diversify the credit risk of the banks and NII has found negatively related to the NPL. Hypothesis of bad management that implies on the higher operating expense ratio with higher income gradually increases the credit risk by simultaneously increasing the rate of NPL in the industry (Podpiera & Weil, 2008). The market is competitive but the numbers of the banks are increasing on regular basis. This put intense pressure to earn interest to meet the operating expense that ultimately makes bound the banks to provide more credit and rate of defaulters becomes increased under adverse selection process. This is found statistically significant in the analysis for Bangladesh's banking industry. Return on Assets tends to increase with the tendency of rising in NPL level. With good asset quality motivates the banks to extend the credit disbursement level in the market. But industry instability and the extensive amount of bad loan though increases the return for short run with differed interest income, in the long run NPL increases at a higher rate and write off has been made that is dissimilar with the hypothesis of lower NPL with higher ROA. However, this is satisfactory that ROE is inversely related to the NPL and statistically significant. Banks provide credit from most of the part of the deposit and a small percentage of the equity. As a result, return on equity reduces the NPL that is evident and same to the hypothesis of good management. Financial Act is increasing the credit risk level after initiation that is not matched with the moral hazard hypothesis. In spite of introducing different policies related to financial credit market through banking sector, NPL amount is extending gradually. But introduction of regulatory policy should decrease NPL rate and increases market discipline and the depositor's confidence.

In the fixed effect analysis, the same relationship or influence of the bank specific factors and economic factors for CAP, NII, Expense Ratio and ROE on NPL has been found statistically significant. But consideration of the fixed effect of qualitative values such as loan quality, borrowers tendency, market behavior, age, regulatory guidelines, confidence of the depositors, guarantors quality, social value of the loan receivers have exposed that loan to asset ratio, ROA and Financial policy adoption even though impact on the NPL rate is same direction as before but statistically these factors are not sound to explain the right direction as these qualitative factors are assumed to influence the NPL at a constant level which is less likely to take place in the real market of the banking industry. In Bangladesh, multiple qualitative factors are considered for loan approval that are associated with the bank specific and economic actors at different rate. Bank size influences the credit level at diversified level (Voulgaris et al., 2004)

When, random effect assumption on the stable values of the econometric model being considered, it is observed that Equity to asset, Loan to Asset, Non-interest Income, Expense Ratio, Return on Equity are similarly influencing the NPL or credit risk in the banking sector and these instrumental factors are statistically found significant. Moreover, it considers random influence of the qualitative values on the credit risk management besides the existence of the central banks' credit quality measurement process. Consistently, the similar influence is found both in fixed and random effect model in the credit risk management of listed commercial banks in Bangladesh. Notable that, Return on Assets impact is same but only significant in random effect model. ROA tends to increase with respective to the increase in the NPL rate but this only happens when policy changes influence the bank specific factors and growth rate, inflation at different level. Any random event in the market including political turmoil, Basel requirement changes, exchange rate changes, repo rate changes, market hype on banks' financial possible distress can impact on return on assets and hence credit risk might be in tensed at that moment.

The baseline model under Generalized Method of Moments with lag one consideration, operating expense ratio, equity to asset ratio (CAP), capital adequacy ratio, non-interest income is included as baseline factors as these factors are directly related to the banks' existence in the industry. Bank forms and operate within a frame where financial position and performance can be traced through these baseline factors. Credit risk measurement in the current market in this analysis finds that NPL increases in the last year tends to rise in the current year under lag 1 estimation. This finding is more relevant in the banking sector as in Bangladesh NPL has become a burden already and it reaches to almost 1 lac thirty-six thousand crore taka. In spite of implementing several policy and governance related directories, no feasible reduction in the NPL rate has been achieved from the last decade and this has been worsening on continuous basis in the banking sector. In baseline model with lag one estimation expense ratio is positively associated credit risk and statistically significant that more earnings generation tendency motivates the banks to disburse more loan in the market and banks try to manage the loan with low cost in managing and monitoring which supports the skimping hypothesis of credit risk management in the banking industry. Equity to asset ratio decrease while credit risk increases that is statistically significant in baseline analysis. Banks provide loan from the deposit that increases the credit risk but if CAP is higher financial health of the banks become high and NPL rate is reduced but equity capital in bank asset liability position is lower that is also the reason of more credit risk of the banks. Though capital adequacy ratio improvement doesn't reduce the NPL rate as in baseline model with lag 1 estimation reveals that CAR is positively related with NPL but it is evident that in banking sector CAR has been upgraded from 10% to 12% in several time to improve the capital strength of the banks but overall credit risk didn't reduce at a notable rate and this is statistically not significant. Non-interest income is inversely associated with the NPL under baseline model with lag 1 estimation and statistically significant. This finding of NII supports the diversification hypothesis and if banks can earn return other than from lending through investing in capital market and government treasury bond, corporate bond, retail banking, credit risk can be diversified (Stiroh & K. J., 2004).

While moment condition is applied, the baseline factors result remain stable under lag 1 estimation only new factor added for finding the changes in the expected outcome (Hove, S., & Tursoy, T, 2019). After adding Net Interest Margin (NIM) statistical significance is found for influencing NPL by NIM and the level of influence is inverse which doesn't support the hypothesis of procyclical credit policy. If the banks perform better in the previous year with higher NIM tends provide more loan without considering risk level and liberal credit policy has been operated and gradually NPL increases. Including asset size (BS) is positively related to the credit while asset size increases credit risk also increases this finding is opposite to the hypothesis as strong asset size should decrease the NPL and this finding is statistically not significant. When dummy variable (financial policy initiation) has provided expected hypothesis that introduction financial act in the market or regulatory laws should reduce the NPL that is statistically not significant. In Bangladesh, regulatory supervision in different market period did not change the NPL at significant rate rather it is rising over time. GDP growth rate addition in the baseline GMM estimation under lag 1 estimation finds economic growth tends to increase while NPL rate decreases. But this is not relevant to observe in the market of Bangladesh as economic growth has been expanding from last 12 years but NPL has not reduced rather it is becoming higher in the banking sector. With higher growth more, investment needs to receive loan from the banking industry and information asymmetry with adverse selection paves the way of taking loan by the defaulters and thus increases NPL (Bosworth et. al., 2001). While spread is increased, NPL decreases and statistically significant that implies on the more return with procyclical credit policy. With increasing spread banks becomes motivated to disburse more loan and liberal credit policy is taken and this is opposite of the hypothesis expected. In each year financial statement of banks deferred interest income is shown that instantly increases income but in the long run it becomes NPL.

Though loan to asset ratio and loan to deposit ratio with baseline model inversely impact on the NPL reveal that increasing rate in LDR and LTA focuses on the tight control to reduce NPL. This hypothesis is found significant for LTA only in Bangladesh. ROA and ROE has negative coefficient that are statistically significant and this supports the bad management and procyclical credit policy.

Optimization in the results of the findings of the hypothesis testing with GMM under lag2 estimation the baseline factors remain constant as same as baseline factors with lag 1 estimation through same impact and significant level. GMM with lag 2 estimation reveals that if NPL increases in the last year it will also increase in the current year. In Bangladesh this is prevalent and acute in the time being passed. NIM impact on NPL is same under lag 1 and 2 estimation. It is notable to see that bank size (BS) is found significant in lag 2 GMM estimation which was absent in lag 1 estimation. Big size of the banks supports the hypothesis of diversification and reduces the NPL in banking market. Big banks have the ability to overcome shock quickly. Influence of financial policy adoption is significant in lag 2 consideration with GMM analysis which is not significant under lag 1 estimation. Interest rate spread is not relevant under lag 2. Loan to deposit ratio is as same as under lag 1 but statistical significance found in lag 2 estimation in credit risk management. Both ROA and ROE under GMM with lag 2 estimation is found statistical significance. This is related to the existence of the bad management and procyclical credit policy.

Autoregressive Distributed Lag (ARDL) results expresses the long run and short run forecasting for the bank specific factors and economic movement of the banking sector. In the long run, expense ratio increases but NPL decreases this is analogous to the hypothesis of skimping but statistically significant. CAP is found analogous to the tight control hypothesis. Increasing rate in CAP should decrease NPL with distributed lag values assumption but results is statistically found significant. The fact behind the increasing NPL with more CAP rate is more credit increases with the hope of more return by flexible credit. CAR under BASEL guidelines improves the NPL condition by increasing capital condition of banks to survive in times of distress and buffer (Kosmidou et al., 2005). Non-interest income supports the diversification hypothesis in ARDL. In the short run, opposite results or direction is found for the CAP and Expense ratio but statistical significance level remains same in both short run and long run. Though CAR and NII provide same relationship both in short run and long run but significant only in the long run. It is persistence that though in the short run bank specific factors and macro factors don't move in the expected direction in the credit market but in the long run it becomes corrected.
Financial stability measurement based on Log Z(ROA), Log Z(CAR) and Log Z (Infection Ratio) as dependent variable finds that participation of woman in board reduces the stability and statistically significant. In Bangladesh, most of the woman members exercise less control in board in decision on lending credit. Besides, family members of the board minimize the scope of ensuring more governance by holding control in the board as a result stability doesn't improve at significant level. Bank size is found significant with expected sign and analogous hypothesis of too big to fail as more bank size increases the stability in the long run (Ennis et. al., 2005). It brings shock absorption capacity while market credit risk is gradually increasing in the market. Non -interest income impacts on the stability positively and found significant in the long run. Diversification hypothesis supports this result as more diversified income increases the ability mitigate credit risk in the market. But it is notable that all the financial stability assumption under three different estimation random effect from qualitative impact such as market discipline changes, borrower interest, credit quality on the banking factors found statistically significant. Under random impact, it is found that if woman participation in the banks' board of directors increases through regulatory changes financial stability in the industry increases. In

the findings, random changes in voice and accountability and regulatory index are positively influencing the financial stability while the score of index becomes higher, banking stability thrives.

Financial stability increases in the present year that was increased in the first year with lag one estimation under all the three-stability condition and statistically significant. Cost efficiency and woman participation increases the financial stability with significance. Participation of woman ensues governance in the industry. Cost efficiency supports the bad management hypothesis as more efficient in cost management reduces credit risk and increases the financial stability (Berger et. Al., 1997).
With lag 2 estimation in GMM analysis, if the stability increases in the last year, stability will be increased in the current year and vice versa but opposite condition under lag 2 is found in stability analysis. The same baseline outcome is found under lag 2 estimation. Higher loan to asset reduces the financial stability of the banks and statistically significant. It supports the tight control hypothesis. More awareness in loan disbursement reduces the risk level by maintaining strong asset base. While Z (CAR) based stability reveals that if CAR is increased in the last year, it will increase in the current and next year that enhances the financial stability and statistical significance found. More prudently, it is worth noting that, non-performing loan, inflation, economic growth rate is inversely associated with the financial stability under generalized method of moments analysis with lag 2 estimation. These macro-economic factors play significant role in determining the market discipline and the future movement in the credit level with the expectation of the bank's performance by credit risk management. Therefore, NPL gradually declines the financial stability by extend the pressure in the market. It is often difficult in the banking industry to adjust interest rate with inflation rate and thus with more money supply in the market increases the NPL in the listed commercial banks as less risky borrowers are deprived to get the loan. Immediate growth put pressure to extend credit in the banking sector and economy as well. As more employment with more investment is possible, disregarding the crowding out effect more private and public finance exist in the market. At this turn, the bad borrowers, take the large scale of the total credit but return level of the credit is lower that creates anarchy and reduce stability in the industry of the commercial banks. Government provides opportunity to bring the development process but the defaulters misuse of this opportunity.

Finally, management efficiency analysis expresses that if credit risk increases in the last year, it also increases in the current year under lag estimation and statistically significant. Similarly, when expense ratio increases efficiency is reduced and higher NPL increases the credit risk level in the market. Moral hazard impact works behind the generation of more interest with more credit allocation. This violates stability of the banking sector. Tobin's Q as performance measurement ratio positively influence the credit risk management condition. While increases in the ratio, it decreases the NPL and hence credit risk is reduced. Banks' financial strength and the loan recovery success intensify the Tobin's Q ratio with the higher rate of market value of the assets of the banking industry. None the less, good management efficiency reduces the NPL rate and credit risk in the market to compete and exist in the industry in the long run.

6.2 Policy Implications & Suggestions

This research is based on the historical credit risk management related factors that are frequently dealt in the financial banking sector. As Bangladesh is suffering from loan defaults for long time bank specific and macro-economic factors have been analyzed in the study here. The bank specific factors might be focused mostly as it immediately suppresses the performance of the banking industry. Bank can diversify its investment to reduce the default loan and governance must be ensured to avoid scam in the industry. The number of the cases filed in the money and loan court has been rising over time and alternative dispute resolution should be focused to squeeze the size of the default loan. Market anomaly and the conspiracy to temper the financial values with the help of the bankers and auditors can be the topic of further research as governance and regulatory compliances can be changed over time. The size of the credit and development growth process are interlinked so quality and evaluation process of the credit needs to be reconsidered. The future researchers in banking industry on credit risk management can work on the financial tempering to make the borrowers capable of receiving loan from the market. Research on over valuation and distortion in the loan evaluation and approval process in the future researcher's findings will bring great addition to reduce credit risk in the market. The performance of the Bangladesh Bank and Bangladesh Securities and Exchange Commission on the reduction of the loan default in the banking industry can be considered to carry forward the new research. Different significant findings under GMM, ARDL model suggests that some bank specific factors such as NIM, ROA, ROE, LDR directly influences the credit risk level. CAR sometimes fails to stable the credit market and to reduce the defaults rate. Besides that, GDP growth rate flourishment increases the credit risk with more amount of credit in the economy. This study finds that bank specific factors mostly control the credit risk or defaults rate in the industry and this must be regulated with prudence through reconstruction of the credit policy and credit risk management system. The selected hypotheses have provided insight that CAR, NII, OPEX, GDP growth rate, LTA and ROE can be used to make study on the state own banks that are not listed but still hold a major portion of credit risk in the economy and banking sector. The increasing trend in default rate suggest that more attention must be given in time of credit evaluation and all the management process in credit allocation should come under transparency through time-to-time grading. Regulatory and Accountability index reveals that strong corporate governance can reduce the NPL at a sustainable rate. Governance related policies and regulatory independent can add more value in credit risk management so that risk is mitigated in the short run to avoid crisis and crowd in the credit market. Financial stability of the banks should get special attention as Z score is found significant in the study. Central bank should not compromise or ease the guidelines to affect the financial strength of the banks I of Bangladesh. International credit standard must be followed and monitored in such a way that will create the ability to adopt strong guidelines in the industry that is supported in this study with capital adequacy ratio and accountability index related impact on the expansion of the non-Performing loan. Legal procedures and system in the credit market should be adopted by considering the real market scenario and mostly implementable as quick as possible. Financial act adoption in this study finds no effective immediate impact in the credit risk reduction and this indicates that government must enact laws in financial credit market by focusing on the all the participants so that it can be useful quickly.

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Appendix

Unit Root Test: CAP

Panel unit root test: Summary
Series: CAP
Date: 09/24/23 Time: 17:53
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.6556	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.29533	0.0005	28	280
ADF - Fisher Chi-square	106.153	0.0001	28	280
PP - Fisher Chi-square	72.4510	0.0687	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Unit Root Test: CAR

Panel unit root test: Summary
Series: CAR
Date: 09/24/23 Time: 17:55
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.24465	0.4034	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.77845	0.7818	28	280
ADF - Fisher Chi-square	49.5576	0.7157	28	280
PP - Fisher Chi-square	117.349	0.0000	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Unit Root Test: BS

Panel unit root test: Summary
Series: BS
Date: 09/24/23 Time: 17:55
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.99330	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.26041	0.1038	28	280
ADF - Fisher Chi-square	74.3737	0.0508	28	280
PP - Fisher Chi-square	219.202	0.0000	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: DUMMY VARIABLE

Panel unit root test: Summary
Series: DUMMY_VARIABLE
Date: 09/24/23 Time: 17:56
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.07079	0.8579	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	3.83109	0.9999	28	280
ADF - Fisher Chi-square	11.8910	1.0000	28	280
PP - Fisher Chi-square	12.3987	1.0000	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: GDP Growth Rate

Panel unit root test: Summary
Series: GDP_GROWTH_RATE
Date: 09/24/23 Time: 17:59
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.44013	0.9997	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.03081	0.0000	28	280
ADF - Fisher Chi-square	113.073	0.0000	28	280
PP - Fisher Chi-square	87.2716	0.0047	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: Interest Rate Spread

Panel unit root test: Summary
Series: INTEREST_RATE_SPREAD__DECEMBER_
Date: 09/24/23 Time: 18:02
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.74666	0.9597	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.06552	0.9806	28	280
ADF - Fisher Chi-square	39.2269	0.9567	28	280
PP - Fisher Chi-square	54.4384	0.5342	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: LTA

Panel unit root test: Summary
Series: LTA
Date: 09/24/23 Time: 18:04
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.21532	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.57400	0.0002	28	280
ADF - Fisher Chi-square	100.126	0.0003	28	280
PP - Fisher Chi-square	77.8485	0.0284	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: LDR

Panel unit root test: Summary
Series: LDR
Date: 09/24/23 Time: 18:03
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.76083	0.2234	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.07226	0.5288	28	280
ADF - Fisher Chi-square	50.1412	0.6952	28	280
PP - Fisher Chi-square	55.5430	0.4921	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: NII

Panel unit root test: Summary
Series: NII
Date: 09/24/23 Time: 18:05
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-12.2571	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.54863	0.0054	28	280
ADF - Fisher Chi-square	92.2525	0.0016	28	280
PP - Fisher Chi-square	41.8875	0.9194	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: NIM

Panel unit root test: Summary
Series: NIM
Date: 09/24/23 Time: 18:06
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.38911	0.0824	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.95239	0.1705	28	280
ADF - Fisher Chi-square	75.4254	0.0428	28	280
PP - Fisher Chi-square	65.9542	0.1705	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: NPL

Panel unit root test: Summary
Series: NPL
Date: 09/24/23 Time: 18:07
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.50955	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.75496	0.0396	28	280
ADF - Fisher Chi-square	72.0843	0.0726	28	280
PP - Fisher Chi-square	73.5052	0.0583	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Unit Root Test: OPEX

Panel unit root test: Summary
Series: OPEX
Date: 09/24/23 Time: 18:08
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.85626	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.91836	0.0018	28	280
ADF - Fisher Chi-square	102.861	0.0001	28	280
PP - Fisher Chi-square	87.2146	0.0048	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Unit Root Test: ROA

Panel unit root test: Summary
Series: ROA
Date: 09/24/23 Time: 18:09
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-22.9421	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.0308	0.0000	28	280
ADF - Fisher Chi-square	220.600	0.0000	28	280
PP - Fisher Chi-square	91.4146	0.0020	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Unit Root Test: ROE

Panel unit root test: Summary
Series: ROE
Date: 09/24/23 Time: 18:10
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.5392	0.0000	28	280
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-9.70978	0.0000	28	280
ADF - Fisher Chi-square	192.599	0.0000	28	280
PP - Fisher Chi-square	109.273	0.0000	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Stationary Test

1. CAR at 1st Difference

Panel unit root test: Summary
Series: D(CAR)
Date: 09/24/23 Time: 18:12
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.31946	0.0935	28	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.27670	0.0000	28	252
ADF - Fisher Chi-square	114.586	0.0000	28	252
PP - Fisher Chi-square	399.179	0.0000	28	280

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

2. CAR at 2ND Difference

Panel unit root test: Summary
Series: D(CAR,2)
Date: 09/24/23 Time: 18:13
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.74769	0.0001	28	224
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.03936	0.0000	28	224
ADF - Fisher Chi-square	167.370	0.0000	28	224
PP - Fisher Chi-square	474.445	0.0000	28	252

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

3. Dummy Variable Stationary at trend and Intercept:

Panel unit root test: Summary
Series: DUMMY_VARIABLE
Date: 09/24/23 Time: 18:17
Sample: 2009 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.48278	0.0065	28	280
Breitung t-stat	-6.03996	0.0000	28	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.43702	0.6690	28	280
ADF - Fisher Chi-square	39.1743	0.9573	28	280
PP - Fisher Chi-square	36.4769	0.9799	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

4. GDP growth Rate at 1st Difference

Panel unit root test: Summary
Series: D(GDP_GROWTH_RATE)
Date: 09/24/23 Time: 18:18
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	22.7996	1.0000	28	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.23785	0.0006	28	252
ADF - Fisher Chi-square	89.7805	0.0028	28	252
PP - Fisher Chi-square	3.52206	1.0000	28	280

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

5. GDP growth Rate at 2nd Difference

Panel unit root test: Summary
Series: D(GDP_GROWTH_RATE,2)
Date: 09/24/23 Time: 18:20
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	10.4731	1.0000	28	224
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.41344	0.0000	28	224
ADF - Fisher Chi-square	135.920	0.0000	28	224
PP - Fisher Chi-square	7.21174	1.0000	28	252

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

6. GDP growth rate at level and None

Panel unit root test: Summary
Series: GDP_GROWTH_RATE
Date: 09/24/23 Time: 18:22
Sample: 2009 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.53088	0.0629	28	280
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	32.1279	0.9957	28	280
PP - Fisher Chi-square	44.1927	0.8731	28	308

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

7. Interest Rate_ Spread at 1st Difference

Panel unit root test: Summary
Series: D(INTEREST_RATE_SPREAD__DECEMBER_)
Date: 09/24/23 Time: 18:23
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.78837	0.0026	28	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.71903	0.0428	28	252
ADF - Fisher Chi-square	79.8446	0.0199	28	252
PP - Fisher Chi-square	149.617	0.0000	28	280

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

8. LDR at 1st Difference

Panel unit root test: Summary
Series: D(LDR)
Date: 09/24/23 Time: 18:25
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.12289	0.0000	28	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.96702	0.0015	28	252
ADF - Fisher Chi-square	91.9902	0.0017	28	252
PP - Fisher Chi-square	224.328	0.0000	28	280

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

9. NIM AT 1ST Difference

Panel unit root test: Summary
Series: D(NIM)
Date: 09/24/23 Time: 18:26
Sample: 2009 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.05244	0.0201	28	252
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.49450	0.0002	28	252
ADF - Fisher Chi-square	100.548	0.0002	28	252
PP - Fisher Chi-square	214.614	0.0000	28	280

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Heterocedasticity:

Panel Cross-section Heteroskedasticity LR Test
Equation: UNTITLED
Specification: OPEX ROA ROE NIM NII LTA LDR INTEREST_RATE_SPRE
AD__DECEMBER_ GDP_GROWTH_RATE DUMMY_VARIABLE CAR
CAP BS C
Null hypothesis: Residuals are homoskedastic

	Value	df	Probability
Likelihood ratio	226.6013	28	0.0000

LR test summary:

	Value	df
Restricted LogL	213.7775	323
Unrestricted LogL	327.0782	323

Unrestricted Test Equation:
Dependent Variable: OPEX
Method: Panel EGLS (Cross-section weights)
Date: 09/29/23 Time: 20:16
Sample: 2009 2020
Periods included: 12
Cross-sections included: 28
Total panel (balanced) observations: 336
Iterate weights to convergence
Convergence achieved after 47 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-5.779481	1.756690	-3.289984	0.0011
ROE	0.429771	0.169467	2.536022	0.0117
NIM	-3.027838	0.637815	-4.747201	0.0000
NII	0.490173	0.644313	0.760768	0.4474
LTA	0.003531	0.007759	0.455113	0.6493
LDR	-0.038527	0.043746	-0.880707	0.3791
INTEREST_RATE_SPREAD__DECEMBER_	0.013743	0.004072	3.374957	0.0008
GDP_GROWTH_RATE	0.002876	0.003447	0.834517	0.4046
DUMMY_VARIABLE	0.027828	0.010273	2.708846	0.0071
CAR	-0.014974	0.030237	-0.495231	0.6208
CAP	0.353493	0.218903	1.614837	0.1073
BS	0.010622	0.009527	1.114983	0.2657
C	0.145117	0.241584	0.600690	0.5485

Weighted Statistics

R-squared	0.332731	Mean dependent var	0.875966
Adjusted R-squared	0.307941	S.D. dependent var	0.663639
S.E. of regression	0.141744	Akaike info criterion	-1.869513
Sum squared resid	6.489489	Schwarz criterion	-1.721827
Log likelihood	327.0782	Hannan-Quinn criter.	-1.810641
F-statistic	13.42188	Durbin-Watson stat	0.604320
Prob(F-statistic)	0.000000		

Unweighted Statistics

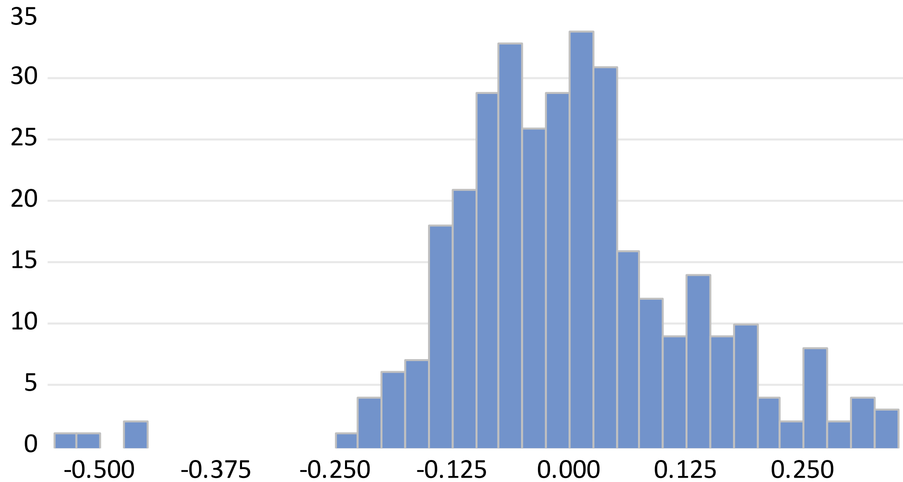
R-squared	-0.035352	Mean dependent var	0.471842
Sum squared resid	6.489515	Durbin-Watson stat	0.310916

Cross sectional Dependence Test:

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in residuals
Equation: Untitled
Periods included: 12
Cross-sections included: 28
Total panel observations: 336
Note: non-zero cross-section means detected in data
Cross-section means were removed during computation of correlations

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	949.5066	378	0.0000
Pesaran scaled LM	20.78550		0.0000
Pesaran CD	0.184545		0.8536

Normality Test:



Series: Standardized Residuals	
Sample 2009 2020	
Observations 336	
Mean	1.55e-16
Median	-0.011418
Maximum	0.345491
Minimum	-0.529441
Std. Dev.	0.128261
Skewness	-0.084864
Kurtosis	4.937270
Jarque-Bera	52.94553
Probability	0.000000

Endogenety Test:

Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 17:34
Sample: 2009 2020
Periods included: 12
Cross-sections included: 28
Total panel (balanced) observations: 336

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPEX	0.293701	0.042796	6.862746	0.0000
RES_OPEX	-0.254473	0.045556	-5.585905	0.0000
CAP	-0.072492	0.023246	-3.118427	0.0020
CAR	-0.028853	0.021644	-1.333105	0.1835
NII	-0.506193	0.206955	-2.445907	0.0150
C	-0.075819	0.020682	-3.665931	0.0003

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.380387	Mean dependent var	0.047222
Adjusted R-squared	0.314949	S.D. dependent var	0.028192
S.E. of regression	0.023334	Akaike info criterion	-4.584749
Sum squared resid	0.164978	Schwarz criterion	-4.209855
Log likelihood	803.2379	Hannan-Quinn criter.	-4.435306
F-statistic	5.812956	Durbin-Watson stat	0.933839
Prob(F-statistic)	0.000000		

Lagrange Multiplier:

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided
(all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	530.0035 (0.0000)	3.788924 (0.0516)	533.7924 (0.0000)
Honda	23.02180 (0.0000)	-1.946516 (0.9742)	14.90248 (0.0000)
King-Wu	23.02180 (0.0000)	-1.946516 (0.9742)	10.74559 (0.0000)
Standardized Honda	25.13818 (0.0000)	-1.426641 (0.9232)	13.09046 (0.0000)
Standardized King-Wu	25.13818 (0.0000)	-1.426641 (0.9232)	8.950396 (0.0000)
Gourieroux, et al.	--	--	530.0035 (0.0000)

Descriptive Statistics:

	OPEX	ROA	ROE	NIM	NII	LTA	LDR	INTEREST_...	GDP_GRO...	DUMMY_VA...	CAR	CAP	BS
Mean	0.471842	0.011080	0.134048	0.023057	0.011593	0.713951	0.849136	4.541031	6.214167	0.413690	0.124236	0.083968	25.94088
Median	0.456300	0.009868	0.122067	0.022765	0.009858	0.694619	0.846830	4.530000	6.490000	0.000000	0.121143	0.078990	25.97807
Maximum	0.878537	0.050918	0.388022	0.046216	0.066769	7.403821	1.058590	9.750000	7.880000	1.000000	1.212483	1.100726	27.97944
Minimum	0.000000	5.83E-05	0.000805	0.005071	0.000552	0.486800	0.299000	0.050000	3.450000	0.000000	0.044770	0.035032	24.41167
Std. Dev.	0.136785	0.006392	0.060630	0.008382	0.007131	0.372544	0.086114	1.260696	1.107871	0.493229	0.062388	0.059365	0.614035
Skewness	0.159018	1.829786	1.060201	0.282864	2.638690	17.30481	-1.037298	0.625110	-0.994112	0.350500	15.84390	15.02512	-0.015538
Kurtosis	4.298641	8.869811	4.723554	2.813625	15.65947	311.3275	7.952199	5.147734	3.910707	1.122850	277.2105	257.6799	2.999858
Jarque-Bera	25.02662	669.8600	104.5344	4.966966	2633.581	1347691.	403.5952	86.46136	66.95391	56.21129	1066737.	920708.0	0.013521
Probability	0.000004	0.000000	0.000000	0.083452	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.993262
Sum	158.5391	3.722997	45.03996	7.747276	3.895302	239.8876	285.3097	1525.787	2087.960	139.0000	41.74317	28.21334	8716.134
Sum Sq. Dev.	6.267930	0.013689	1.231476	0.023535	0.017037	46.49438	2.484222	532.4333	411.1714	81.49702	1.303920	1.180609	126.3079
Observations	336	336	336	336	336	336	336	336	336	336	336	336	336

Correlation Matrix:

	OPEX	ROA	ROE	NIM	NII	LTA	LDR	INTEREST_...	GDP_GRO...	DUMMY_VA...	CAR	CAP	BS
OPEX	1	-0.2231092...	-0.2033867...	0.04041565...	-0.0518711...	0.00347891...	0.09750651...	0.03768278...	0.04370619...	0.15446848...	0.02496198...	0.03012268...	0.29091175...
ROA	-0.2231092...	1	0.85770811...	0.32243792...	0.34828091...	-0.0246689...	0.06752177...	0.03681595...	-0.1614479...	-0.4129269...	-0.0789663...	0.26536222...	-0.5078974...
ROE	-0.2033867...	0.85770811...	1	0.33370999...	0.23032150...	-0.0284540...	0.06432052...	0.06408237...	-0.1608248...	-0.3172380...	-0.0383332...	-0.0488891...	-0.4942337...
NIM	0.04041565...	0.32243792...	0.33370999...	1	-0.0164656...	0.06925357...	0.18617605...	0.44611217...	0.16544429...	-0.1525343...	-0.0173953...	0.14518359...	-0.0608162...
NII	-0.0518711...	0.34828091...	0.23032150...	-0.0164656...	1	-0.0413835...	0.21431131...	-0.1493980...	-0.2668612...	0.00843308...	-0.0078114...	0.06319540...	-0.0439159...
LTA	0.00347891...	-0.0246689...	-0.0284540...	0.06925357...	-0.0413835...	1	0.17295096...	-0.0352078...	0.03129205...	0.00405579...	0.01352380...	-0.0048433...	0.06074355...
LDR	0.09750651...	0.06752177...	0.06432052...	0.18617605...	0.21431131...	0.17295096...	1	-0.1184993...	-0.0796957...	0.25449571...	0.09813166...	-0.0132048...	0.16267320...
INTER...	0.03768278...	0.03681595...	0.06408237...	0.44611217...	-0.1493980...	-0.0352078...	-0.1184993...	1	0.23823112...	-0.1739421...	-0.0636477...	0.01523983...	-0.0488874...
GDP_...	0.04370619...	-0.1614479...	-0.1608248...	0.16544429...	-0.2668612...	0.03129205...	-0.0796957...	0.23823112...	1	0.19076657...	-0.1366920...	-0.0071639...	0.16453020...
DUMM...	0.15446848...	-0.4129269...	-0.3172380...	-0.1525343...	0.00843308...	0.00405579...	0.25449571...	-0.1739421...	0.19076657...	1	0.16153236...	-0.1736469...	0.65976475...
CAR	0.02496198...	-0.0789663...	-0.0383332...	-0.0173953...	-0.0078114...	0.01352380...	0.09813166...	-0.0636477...	-0.1366920...	0.16153236...	1	-0.0243311...	0.18341841...
CAP	0.03012268...	0.26536222...	-0.0488891...	0.14518359...	0.06319540...	-0.0048433...	-0.0132048...	0.01523983...	-0.0071639...	-0.1736469...	-0.0243311...	1	-0.1110622...
BS	0.29091175...	-0.5078974...	-0.4942337...	-0.0608162...	-0.0439159...	0.06074355...	0.16267320...	-0.0488874...	0.16453020...	0.65976475...	0.18341841...	-0.1110622...	1

Panel Regression on Raw Data:

Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 01:07
Sample: 2009 2020
Periods included: 12
Cross-sections included: 28
Total panel (balanced) observations: 336

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPEX	0.022261	0.010637	2.092699	0.0372
ROA	1.675446	0.576349	2.906997	0.0039
ROE	-0.282691	0.056950	-4.963823	0.0000
NIM	-0.361291	0.211738	-1.706309	0.0889
NII	-0.181955	0.223874	-0.812757	0.4170
LTA	-0.005440	0.003758	-1.447452	0.1487
LDR	-0.035579	0.018064	-1.969565	0.0497
INTEREST_RATE_SPREAD__DECEMBER_	0.002380	0.001286	1.851286	0.0650
GDP_GROWTH_RATE	-2.66E-05	0.001400	-0.019026	0.9848
DUMMY_VARIABLE	0.017035	0.004109	4.145908	0.0000
CAR	-0.032510	0.022787	-1.426668	0.1546
CAP	-0.063985	0.029639	-2.158795	0.0316
BS	-0.004560	0.003409	-1.337441	0.1820
C	0.210587	0.089240	2.359779	0.0189

R-squared	0.245873	Mean dependent var	0.047222
Adjusted R-squared	0.215427	S.D. dependent var	0.028192
S.E. of regression	0.024972	Akaike info criterion	-4.501380
Sum squared resid	0.200793	Schwarz criterion	-4.342334
Log likelihood	770.2318	Hannan-Quinn criter.	-4.437980
F-statistic	8.075683	Durbin-Watson stat	0.811112
Prob(F-statistic)	0.000000		

Panel Regression Fixed Effect on Raw Data:

Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 01:18
Sample: 2009 2020
Periods included: 12
Cross-sections included: 28
Total panel (balanced) observations: 336

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPEX	0.034471	0.015651	2.202412	0.0284
ROA	0.093997	0.675181	0.139217	0.8894
ROE	-0.138709	0.065910	-2.104515	0.0362
NIM	-0.395339	0.282261	-1.400612	0.1624
NII	-0.469441	0.224140	-2.094409	0.0371
LTA	-0.004196	0.003613	-1.161402	0.2464
LDR	0.000311	0.021356	0.014579	0.9884
INTEREST_RATE_SPREAD__DECEMBER_	0.000977	0.001871	0.522292	0.6019
GDP_GROWTH_RATE	0.000547	0.001413	0.386855	0.6991
DUMMY_VARIABLE	0.012130	0.004875	2.488500	0.0134
CAR	-0.012198	0.021864	-0.557909	0.5773
CAP	-0.056393	0.028533	-1.976437	0.0490
BS	-0.005997	0.004857	-1.234513	0.2180
C	0.214751	0.124351	1.726979	0.0852

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.419021	Mean dependent var	0.047222
Adjusted R-squared	0.340245	S.D. dependent var	0.028192
S.E. of regression	0.022899	Akaike info criterion	-4.601512
Sum squared resid	0.154691	Schwarz criterion	-4.135734
Log likelihood	814.0540	Hannan-Quinn criter.	-4.415840
F-statistic	5.319097	Durbin-Watson stat	1.024204
Prob(F-statistic)	0.000000		

Panel Regression Random Effect on Raw Data:

Dependent Variable: NPL
Method: Panel EGLS (Cross-section random effects)
Date: 09/30/23 Time: 01:19
Sample: 2009 2020
Periods included: 12
Cross-sections included: 28
Total panel (balanced) observations: 336
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPEX	0.027615	0.012784	2.160150	0.0315
ROA	0.843040	0.610869	1.380067	0.1685
ROE	-0.206600	0.059933	-3.447193	0.0006
NIM	-0.407736	0.236924	-1.720958	0.0862
NII	-0.338249	0.216656	-1.561228	0.1195
LTA	-0.004714	0.003556	-1.325645	0.1859
LDR	-0.014023	0.019459	-0.720664	0.4716
INTEREST_RATE_SPREAD__DECEMBER_	0.001804	0.001522	1.184709	0.2370
GDP_GROWTH_RATE	0.000308	0.001338	0.230358	0.8180
DUMMY_VARIABLE	0.014284	0.004314	3.310874	0.0010
CAR	-0.019487	0.021502	-0.906307	0.3655
CAP	-0.059664	0.028038	-2.128007	0.0341
BS	-0.005242	0.004019	-1.304127	0.1931
C	0.208526	0.103697	2.010921	0.0452

Effects Specification

	S.D.	Rho
Cross-section random	0.010236	0.1665
Idiosyncratic random	0.022899	0.8335

Weighted Statistics

R-squared	0.243922	Mean dependent var	0.025619
Adjusted R-squared	0.213397	S.D. dependent var	0.025956
S.E. of regression	0.023020	Sum squared resid	0.170636
F-statistic	7.990933	Durbin-Watson stat	0.924578
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.229557	Mean dependent var	0.047222
Sum squared resid	0.205138	Durbin-Watson stat	0.769076

Hausman Test on RAW Data:

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	13	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
OPEX	0.034471	0.027615	0.000082	0.4477
ROA	0.093997	0.843040	0.082709	0.0092
ROE	-0.138709	-0.206600	0.000752	0.0133
NIM	-0.395339	-0.407736	0.023538	0.9356
NII	-0.469441	-0.338249	0.003299	0.0224
LTA	-0.004196	-0.004714	0.000000	0.4165
LDR	0.000311	-0.014023	0.000077	0.1033
INTEREST_RATE_SPREAD__DECEMBER_	0.000977	0.001804	0.000001	0.4477
GDP_GROWTH_RATE	0.000547	0.000308	0.000000	0.5988
DUMMY_VARIABLE	0.012130	0.014284	0.000005	0.3428
CAR	-0.012198	-0.019487	0.000016	0.0660
CAP	-0.056393	-0.059664	0.000028	0.5363
BS	-0.005997	-0.005242	0.000007	0.7819

Cross-section random effects test equation:
Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 01:21
Sample: 2009 2020
Periods included: 12
Cross-sections included: 28
Total panel (balanced) observations: 336

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.214751	0.124351	1.726979	0.0852
OPEX	0.034471	0.015651	2.202412	0.0284
ROA	0.093997	0.675181	0.139217	0.8894
ROE	-0.138709	0.065910	-2.104515	0.0362
NIM	-0.395339	0.282261	-1.400612	0.1624
NII	-0.469441	0.224140	-2.094409	0.0371
LTA	-0.004196	0.003613	-1.161402	0.2464
LDR	0.000311	0.021356	0.014579	0.9884
INTEREST_RATE_SPREAD__DECEMBER_	0.000977	0.001871	0.522292	0.6019
GDP_GROWTH_RATE	0.000547	0.001413	0.386855	0.6991
DUMMY_VARIABLE	0.012130	0.004875	2.488500	0.0134
CAR	-0.012198	0.021864	-0.557909	0.5773
CAP	-0.056393	0.028533	-1.976437	0.0490
BS	-0.005997	0.004857	-1.234513	0.2180

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.419021	Mean dependent var	0.047222
Adjusted R-squared	0.340245	S.D. dependent var	0.028192
S.E. of regression	0.022899	Akaike info criterion	-4.601512
Sum squared resid	0.154691	Schwarz criterion	-4.135734
Log likelihood	814.0540	Hannan-Quinn criter.	-4.415840

Panel Regression Stationary Data:

Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 13:06
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAP	-0.100381	0.033787	-2.970986	0.0032
BS	-0.005953	0.004204	-1.416193	0.1579
LTA	-0.008107	0.003933	-2.061448	0.0402
NII	-0.653198	0.301088	-2.169458	0.0309
OPEX	0.025262	0.012148	2.079559	0.0385
ROA	2.723733	0.893998	3.046689	0.0025
ROE	-0.439345	0.079798	-5.505722	0.0000
D(CAR,2)	-0.007450	0.023254	-0.320399	0.7489
DUMMY_VARIABLE	0.015513	0.004558	3.403847	0.0008
D(GDP_GROWTH_RATE,2)	0.000759	0.001264	0.600442	0.5487
D(INTEREST_RATE_SPREAD__DECEM...	-0.001990	0.002591	-0.768298	0.4430
D(LDR)	-0.001311	0.022181	-0.059118	0.9529
D(NIM)	0.177783	0.353929	0.502313	0.6159
C	0.233464	0.108366	2.154400	0.0321

R-squared	0.215796	Mean dependent var	0.050435
Adjusted R-squared	0.177470	S.D. dependent var	0.029022
S.E. of regression	0.026321	Akaike info criterion	-4.388191
Sum squared resid	0.184284	Schwarz criterion	-4.206452
Log likelihood	628.3468	Hannan-Quinn criter.	-4.315295
F-statistic	5.630561	Durbin-Watson stat	0.869830
Prob(F-statistic)	0.000000		

Panel Regression Fixed Effect Stationary Data:

Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 13:09
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAP	-0.084742	0.035786	-2.368051	0.0187
BS	0.000302	0.007512	0.040247	0.9679
LTA	-0.005296	0.003855	-1.373724	0.1708
NII	-0.868274	0.298441	-2.909365	0.0040
OPEX	0.043597	0.017567	2.481841	0.0138
ROA	0.688511	1.258727	0.546990	0.5849
ROE	-0.215025	0.110741	-1.941697	0.0533
D(CAR,2)	0.005747	0.022212	0.258710	0.7961
DUMMY_VARIABLE	0.008470	0.005455	1.552816	0.1218
D(GDP_GROWTH_RATE,2)	0.000603	0.001186	0.508184	0.6118
D(INTEREST_RATE_SPREAD__DECEM...	-0.001784	0.002434	-0.732824	0.4644
D(LDR)	0.003804	0.020850	0.182442	0.8554
D(NIM)	0.185334	0.332751	0.556977	0.5781
C	0.056482	0.193945	0.291225	0.7711

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.406941	Mean dependent var	0.050435
Adjusted R-squared	0.307684	S.D. dependent var	0.029022
S.E. of regression	0.024148	Akaike info criterion	-4.474710
Sum squared resid	0.139366	Schwarz criterion	-3.942473
Log likelihood	667.4594	Hannan-Quinn criter.	-4.261229
F-statistic	4.099885	Durbin-Watson stat	1.068395
Prob(F-statistic)	0.000000		

Panel Regression Random Effect Stationary Data:

Dependent Variable: NPL
Method: Panel EGLS (Cross-section random effects)
Date: 09/30/23 Time: 13:11
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAP	-0.100400	0.032486	-3.090546	0.0022
BS	-0.004295	0.004772	-0.899977	0.3689
LTA	-0.006794	0.003721	-1.825941	0.0690
NII	-0.709081	0.285167	-2.486548	0.0135
OPEX	0.029773	0.013173	2.260133	0.0246
ROA	2.240532	0.941275	2.380316	0.0180
ROE	-0.380758	0.083939	-4.536100	0.0000
D(CAR,2)	-0.001668	0.021727	-0.076789	0.9388
DUMMY_VARIABLE	0.013758	0.004497	3.059066	0.0024
D(GDP_GROWTH_RATE,2)	0.000699	0.001170	0.597314	0.5508
D(INTEREST_RATE_SPREAD__DECEM...	-0.001794	0.002402	-0.746894	0.4558
D(LDR)	0.001141	0.020504	0.055652	0.9557
D(NIM)	0.175612	0.327408	0.536371	0.5922
C	0.186149	0.123017	1.513195	0.1314

Effects Specification

	S.D.	Rho
Cross-section random	0.007412	0.0861
Idiosyncratic random	0.024148	0.9139

Weighted Statistics

R-squared	0.201979	Mean dependent var	0.036189
Adjusted R-squared	0.162978	S.D. dependent var	0.027190
S.E. of regression	0.024875	Sum squared resid	0.164598
F-statistic	5.178812	Durbin-Watson stat	0.942662
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.210714	Mean dependent var	0.050435
Sum squared resid	0.185478	Durbin-Watson stat	0.836544

Hausman test on Stationary Data:

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	13	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CAP	-0.084742	-0.100400	0.000225	0.2968
BS	0.000302	-0.004295	0.000034	0.4281
LTA	-0.005296	-0.006794	0.000001	0.1370
NII	-0.868274	-0.709081	0.007747	0.0705
OPEX	0.043597	0.029773	0.000135	0.2342
ROA	0.688511	2.240532	0.698395	0.0633
ROE	-0.215025	-0.380758	0.005218	0.0218
D(CAR,2)	0.005747	-0.001668	0.000021	0.1081
DUMMY_VARIABLE	0.008470	0.013758	0.000010	0.0867
D(GDP_GROWTH_RATE,2)	0.000603	0.000699	0.000000	0.6254
D(INTEREST_RATE_SPREAD__DECEM...	-0.001784	-0.001794	0.000000	0.9777
D(LDR)	0.003804	0.001141	0.000014	0.4817
D(NIM)	0.185334	0.175612	0.003527	0.8700

Cross-section random effects test equation:
Dependent Variable: NPL
Method: Panel Least Squares
Date: 09/30/23 Time: 13:13
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280

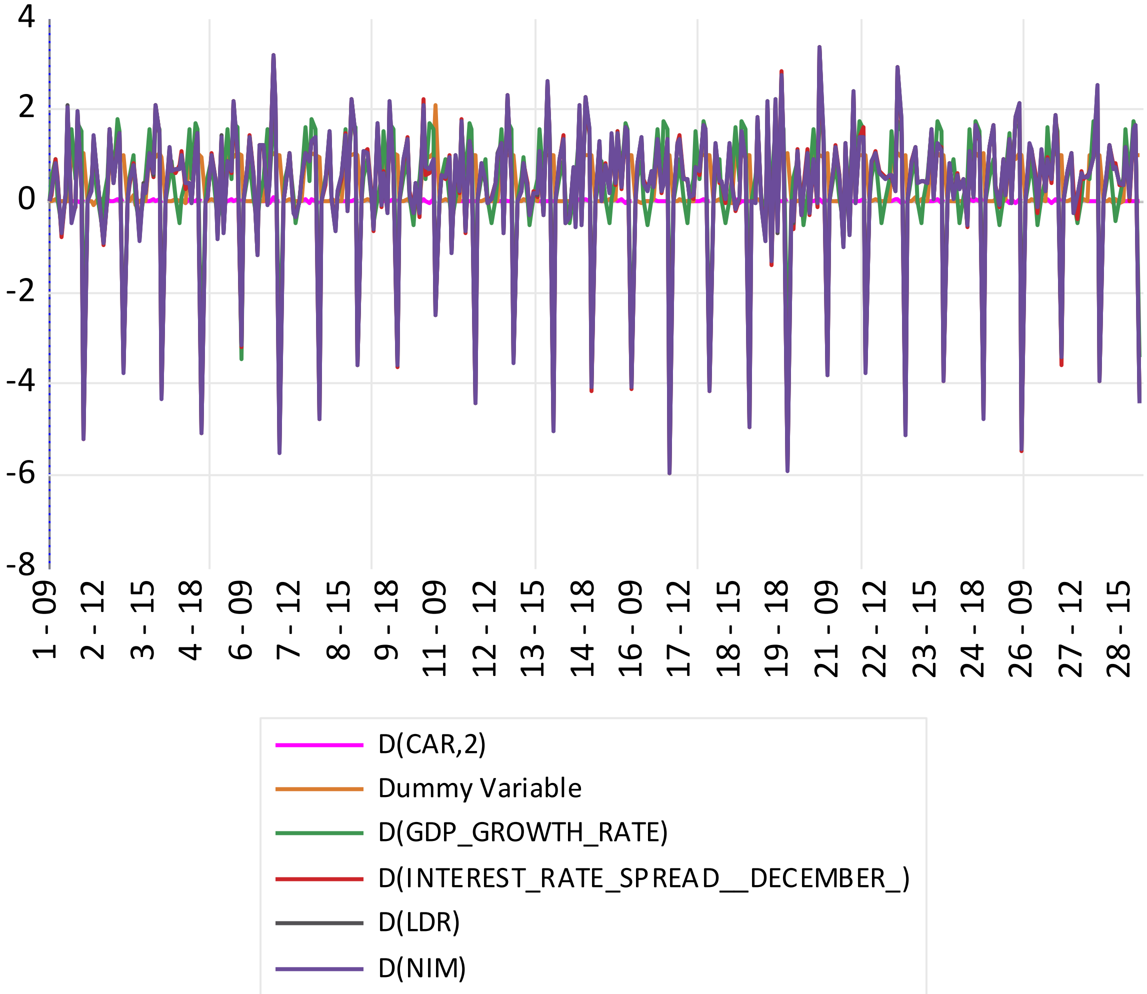
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056482	0.193945	0.291225	0.7711
CAP	-0.084742	0.035786	-2.368051	0.0187
BS	0.000302	0.007512	0.040247	0.9679
LTA	-0.005296	0.003855	-1.373724	0.1708
NII	-0.868274	0.298441	-2.909365	0.0040
OPEX	0.043597	0.017567	2.481841	0.0138
ROA	0.688511	1.258727	0.546990	0.5849
ROE	-0.215025	0.110741	-1.941697	0.0533
D(CAR,2)	0.005747	0.022212	0.258710	0.7961
DUMMY_VARIABLE	0.008470	0.005455	1.552816	0.1218
D(GDP_GROWTH_RATE,2)	0.000603	0.001186	0.508184	0.6118
D(INTEREST_RATE_SPREAD__DECEM...	-0.001784	0.002434	-0.732824	0.4644
D(LDR)	0.003804	0.020850	0.182442	0.8554
D(NIM)	0.185334	0.332751	0.556977	0.5781

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.406941	Mean dependent var	0.050435
Adjusted R-squared	0.307684	S.D. dependent var	0.029022
S.E. of regression	0.024148	Akaike info criterion	-4.474710
Sum squared resid	0.139366	Schwarz criterion	-3.942473
Log likelihood	667.4594	Hannan-Quinn criter.	-4.261229

Graphical Presentation on Stationary Data:



Graphical Presentation on Non-Stationary Data:

GMM on Baseline Model:

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:09
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.378326	0.042934	8.811788	0.0000
OPEX	0.097741	0.016741	5.838313	0.0000
CAP	-0.084820	0.042122	-2.013689	0.0541
CAR	0.045608	0.082889	0.550225	0.5867
NII	-0.747781	0.230235	-3.247899	0.0031

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027204	Sum squared resid	0.203509
J-statistic	21.83217	Instrument rank	28
Prob(J-statistic)	0.530402		

GMM on Baseline Model: +NIM

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:11
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) NIM(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.347605	0.080319	4.327810	0.0002
OPEX	0.064666	0.041452	1.560023	0.1304
CAP	-0.075100	0.043552	-1.724385	0.0961
CAR	0.051276	0.127884	0.400953	0.6916
NII	-0.920750	0.312843	-2.943168	0.0066
NIM	-1.013227	0.323263	-3.134377	0.0041

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.026617	Sum squared resid	0.194124
J-statistic	21.84050	Instrument rank	28
Prob(J-statistic)	0.469443		

GMM on Baseline Model: +BS

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:13
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) BS(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.370283	0.045046	8.220166	0.0000
OPEX	0.095633	0.020303	4.710321	0.0001
CAP	-0.082797	0.041912	-1.975522	0.0585
CAR	0.048558	0.102794	0.472379	0.6405
NII	-0.769228	0.232017	-3.315400	0.0026
BS	0.000702	0.002543	0.276157	0.7845

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027136	Sum squared resid	0.201770
J-statistic	21.89808	Instrument rank	28
Prob(J-statistic)	0.465986		

GMM on Baseline Model: +Dummy Variable

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:15
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) DUMMY_VARIABLE(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.371659	0.070787	5.250355	0.0000
OPEX	0.098785	0.023796	4.151331	0.0003
CAP	-0.087650	0.059444	-1.474496	0.1519
CAR	0.051345	0.097552	0.526337	0.6030
NII	-0.725243	0.261447	-2.773959	0.0099
DUMMY_VARIABLE	-0.000119	0.001418	-0.083977	0.9337

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027261	Sum squared resid	0.203631
J-statistic	21.81267	Instrument rank	28
Prob(J-statistic)	0.471117		

GMM on Baseline Model: + GDP Growth Rate

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:17
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) GDP_GROWTH_RATE(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.392166	0.060215	6.512746	0.0000
OPEX	0.096209	0.021879	4.397363	0.0002
CAP	-0.089323	0.042488	-2.102288	0.0450
CAR	0.025625	0.090053	0.284557	0.7782
NII	-0.845833	0.203438	-4.157697	0.0003
GDP_GROWTH_RATE	-0.000732	0.001046	-0.700354	0.4897

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027427	Sum squared resid	0.206108
J-statistic	21.88760	Instrument rank	28
Prob(J-statistic)	0.466614		

GMM on Baseline Model: + Interest Rate Spread

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:23
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) INTEREST_RATE_SPREAD__DECEMBER_(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.354905	0.046634	7.610464	0.0000
OPEX	0.104763	0.018945	5.529949	0.0000
CAP	-0.072148	0.036499	-1.976683	0.0584
CAR	0.017110	0.082339	0.207804	0.8369
NII	-1.007181	0.231504	-4.350602	0.0002
INTEREST_RATE_SPREAD__DECEMBER_	-0.003090	0.000806	-3.834108	0.0007

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027033	Sum squared resid	0.200228
J-statistic	22.44818	Instrument rank	28
Prob(J-statistic)	0.433426		

GMM on Baseline Model: +LDR

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:25
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) LDR(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.421357	0.044950	9.373935	0.0000
OPEX	0.097121	0.014418	6.736069	0.0000
CAP	-0.082555	0.037104	-2.224962	0.0346
CAR	0.031698	0.064174	0.493934	0.6253
NII	-0.579882	0.246441	-2.353024	0.0262
LDR	-0.025351	0.026696	-0.949590	0.3507

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027636	Sum squared resid	0.209264
J-statistic	22.01866	Instrument rank	28
Prob(J-statistic)	0.458775		

GMM on Baseline Model: +LTA

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:28
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) LTA(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.375514	0.058340	6.436635	0.0000
OPEX	0.095344	0.024712	3.858259	0.0006
CAP	-0.089861	0.043642	-2.059055	0.0493
CAR	0.047907	0.087385	0.548226	0.5880
NII	-0.745864	0.413424	-1.804113	0.0824
LTA	-0.006000	0.002991	-2.006126	0.0550

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.027079	Sum squared resid	0.200924
J-statistic	21.76615	Instrument rank	28
Prob(J-statistic)	0.473919		

GMM on Baseline Model: +ROA

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:31
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) ROA(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.375858	0.041640	9.026366	0.0000
OPEX	0.080426	0.017555	4.581272	0.0001
CAP	-0.072577	0.037635	-1.928467	0.0644
CAR	0.024945	0.086501	0.288381	0.7753
NII	-0.666389	0.271103	-2.458064	0.0207
ROA	-0.454744	0.082572	-5.507257	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.026791	Sum squared resid	0.196662
J-statistic	21.62055	Instrument rank	28
Prob(J-statistic)	0.482722		

GMM on Baseline Model: +ROE

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:33
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-1) CAP(-1) CAR(-1) NII(-1) ROE(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.371578	0.055692	6.671981	0.0000
OPEX	0.078668	0.024812	3.170607	0.0038
CAP	-0.092709	0.047116	-1.967655	0.0595
CAR	0.042103	0.107522	0.391577	0.6984
NII	-0.557472	0.312554	-1.783606	0.0857
ROE	-0.062679	0.011365	-5.515075	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.026855	Sum squared resid	0.197610
J-statistic	21.53349	Instrument rank	28
Prob(J-statistic)	0.488010		

GMM on Baseline Model: Lag 2

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:54
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.324186	0.041224	7.864106	0.0000
NPL(-2)	0.137223	0.026733	5.133200	0.0000
OPEX	0.067010	0.016385	4.089827	0.0003
CAP	-0.124704	0.044084	-2.828800	0.0087
CAR	0.050114	0.077989	0.642575	0.5259
NII	-0.766718	0.241618	-3.173261	0.0037

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.027280	Sum squared resid	0.183077
J-statistic	24.29060	Instrument rank	28
Prob(J-statistic)	0.332183		

GMM on Baseline Model: Lag 2+NIM

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:56
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) NIM(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.304111	0.082824	3.671779	0.0010
NPL(-2)	0.122508	0.029028	4.220332	0.0002
OPEX	0.060707	0.025967	2.337834	0.0271
CAP	-0.142948	0.048397	-2.953667	0.0064
CAR	0.017618	0.143877	0.122450	0.9034
NII	-0.883974	0.299087	-2.955573	0.0064
NIM	-0.840801	0.363675	-2.311957	0.0286

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.027071	Sum squared resid	0.179545
J-statistic	21.72865	Instrument rank	28
Prob(J-statistic)	0.415289		

GMM on Baseline Model: Lag 2+BS

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 16:58
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) BS(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.318476	0.044482	7.159718	0.0000
NPL(-2)	0.150703	0.028603	5.268857	0.0000
OPEX	0.073329	0.017452	4.201860	0.0003
CAP	-0.242378	0.042954	-5.642728	0.0000
CAR	0.079647	0.087547	0.909760	0.3710
NII	-0.640298	0.262596	-2.438339	0.0216
BS	-0.008835	0.003971	-2.224961	0.0346

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.029987	Sum squared resid	0.220315
J-statistic	22.88709	Instrument rank	28
Prob(J-statistic)	0.350028		

GMM on Baseline Model: Lag 2+DUMMY VARIABLE

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 17:00
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) DUMMY_VARIABLE(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.267918	0.080102	3.344707	0.0024
NPL(-2)	0.144299	0.026298	5.487055	0.0000
OPEX	0.072278	0.027224	2.654966	0.0131
CAP	-0.255297	0.081185	-3.144618	0.0040
CAR	0.026994	0.105109	0.256819	0.7993
NII	-0.576698	0.352608	-1.635521	0.1135
DUMMY_VARIABLE	-0.004722	0.002666	-1.770903	0.0879

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.029587	Sum squared resid	0.214476
J-statistic	21.27147	Instrument rank	28
Prob(J-statistic)	0.442476		

GMM on Baseline Model: Lag 2+GDP growth rate

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 17:02
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) GDP_GROWTH_RATE(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.296168	0.058022	5.104411	0.0000
NPL(-2)	0.133972	0.023421	5.720128	0.0000
OPEX	0.065267	0.017508	3.727877	0.0009
CAP	-0.183848	0.034206	-5.374646	0.0000
CAR	0.043132	0.087183	0.494734	0.6248
NII	-0.857130	0.295112	-2.904419	0.0073
GDP_GROWTH_RATE	-0.001577	0.001586	-0.993941	0.3291

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.028103	Sum squared resid	0.193500
J-statistic	23.52052	Instrument rank	28
Prob(J-statistic)	0.316865		

GMM on Baseline Model: Lag 2+Interest Rate Spread

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 17:05
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) INTEREST_RATE_SPREAD__DECEMBER_(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.308907	0.047483	6.505575	0.0000
NPL(-2)	0.127792	0.044410	2.877515	0.0077
OPEX	0.071016	0.016021	4.432626	0.0001
CAP	-0.108660	0.044181	-2.459411	0.0206
CAR	0.052297	0.081847	0.638961	0.5282
NII	-0.901251	0.255599	-3.526035	0.0015
INTEREST_RATE_SPREAD__DECEMBER_	-0.001878	0.001811	-1.037012	0.3089

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.027129	Sum squared resid	0.180316
J-statistic	24.02545	Instrument rank	28
Prob(J-statistic)	0.291827		

GMM on Baseline Model: Lag 2+LDR

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 17:07
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) LDR(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.341945	0.045992	7.434888	0.0000
NPL(-2)	0.154090	0.032716	4.709945	0.0001
OPEX	0.061833	0.018923	3.267688	0.0030
CAP	-0.206973	0.042256	-4.898090	0.0000
CAR	-0.004738	0.078311	-0.060505	0.9522
NII	-0.503916	0.287823	-1.750786	0.0913
LDR	-0.037853	0.022606	-1.674478	0.1056

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.029041	Sum squared resid	0.206632
J-statistic	22.65998	Instrument rank	28
Prob(J-statistic)	0.362372		

GMM on Baseline Model: Lag 2+LTA

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 17:09
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) LTA(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.292658	0.050397	5.807041	0.0000
NPL(-2)	0.134347	0.031029	4.329669	0.0002
OPEX	0.080987	0.020173	4.014698	0.0004
CAP	-0.154725	0.039044	-3.962810	0.0005
CAR	0.028984	0.099056	0.292600	0.7721
NII	-0.565014	0.413024	-1.367992	0.1826
LTA	0.001680	0.006116	0.274649	0.7857

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.027532	Sum squared resid	0.185711
J-statistic	22.44386	Instrument rank	28
Prob(J-statistic)	0.374331		

GMM on Baseline Model: Lag 2+ROA

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23   Time: 17:11
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) ROA(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.302195	0.056956	5.305731	0.0000
NPL(-2)	0.132366	0.044890	2.948639	0.0065
OPEX	0.058795	0.026401	2.227020	0.0345
CAP	0.048885	0.046695	1.046885	0.3044
CAR	0.020323	0.115369	0.176158	0.8615
NII	-0.879207	0.273733	-3.211914	0.0034
ROA	-1.650533	0.279067	-5.914474	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.026318	Sum squared resid	0.169696
J-statistic	21.70657	Instrument rank	28
Prob(J-statistic)	0.416585		

GMM on Baseline Model: Lag 2+ROE

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 09/30/23 Time: 17:13
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPEX(-2) CAP(-2) CAR(-2) NII(-2) ROE(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.304270	0.058215	5.226639	0.0000
NPL(-2)	0.138750	0.046666	2.973227	0.0061
OPEX	0.063277	0.030728	2.059233	0.0492
CAP	-0.060263	0.048792	-1.235107	0.2274
CAR	0.009191	0.125347	0.073324	0.9421
NII	-0.833809	0.277038	-3.009723	0.0056
ROE	-0.145894	0.025808	-5.653004	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.026012	Sum squared resid	0.165774
J-statistic	22.34112	Instrument rank	28
Prob(J-statistic)	0.380087		

ARDL on Baseline Model:

Dependent Variable: D(NPL)
Method: ARDL
Date: 09/30/23 Time: 17:48
Sample: 2010 2020
Included observations: 308
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): OPEX CAP CAR NII
Fixed regressors: C
Number of models evaluated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
OPEX	-0.084375	0.007170	-11.76719	0.0000
CAP	0.971647	0.094970	10.23110	0.0000
CAR	-0.109305	0.060688	-1.801091	0.0739
NII	-1.241682	0.117965	-10.52587	0.0000
		Short Run Equation		
COINTEQ01	-0.630955	0.082614	-7.637405	0.0000
D(OPEX)	0.088022	0.031137	2.826884	0.0054
D(CAP)	-0.327700	0.131416	-2.493614	0.0138
D(CAR)	-0.141485	0.150262	-0.941589	0.3481
D(NII)	-0.538652	0.378796	-1.422010	0.1573
C	-0.005511	0.006711	-0.821181	0.4130
@TREND	0.004583	0.001299	3.527929	0.0006

Root MSE	0.012603	Mean dependent var	0.001856
S.D. dependent var	0.021820	S.E. of regression	0.019809
Akaike info criterion	-5.571937	Sum squared resid	0.053365
Schwarz criterion	-3.299847	Log likelihood	1136.085
Hannan-Quinn criter.	-4.666218		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL on Other Factors Model:

Dependent Variable: D(NPL)
Method: ARDL
Date: 09/30/23 Time: 17:53
Sample: 2010 2020
Included observations: 308
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): GDP_GROWTH_RATE
DUMMY_VARIABLE INTEREST_RATE_SPREAD__DECEMBER_ ROA
Fixed regressors: C
Number of models evaluated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
GDP_GROWTH_RATE	-0.004178	0.000903	-4.628026	0.0000
DUMMY_VARIABLE	0.011563	0.001024	11.29545	0.0000
INTEREST_RATE_SPREAD__DECEMBER_	0.000325	0.000483	0.671638	0.5028
ROA	-1.034096	0.138232	-7.480852	0.0000
Short Run Equation				
COINTEQ01	-0.436957	0.086727	-5.038287	0.0000
D(GDP_GROWTH_RATE)	0.001386	0.000773	1.792326	0.0749
D(DUMMY_VARIABLE)	-0.006694	0.004242	-1.578084	0.1165
D(INTEREST_RATE_SPREAD__DECEM...	7.50E-05	0.001964	0.038170	0.9696
D(ROA)	-0.625938	0.387971	-1.613362	0.1086
C	0.034607	0.007103	4.872472	0.0000

Root MSE	0.015956	Mean dependent var	0.001856
S.D. dependent var	0.021820	S.E. of regression	0.022838
Akaike info criterion	-5.438292	Sum squared resid	0.085540
Schwarz criterion	-3.484295	Log likelihood	1085.633
Hannan-Quinn criter.	-4.659374		

*Note: p-values and any subsequent tests do not account for model selection.

Panel Regression : Log Z(ROA)

Dependent Variable: LOG_Z__ROA_
Method: Panel Least Squares
Date: 10/01/23 Time: 01:10
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
___OF_WOMAN_IN_BOARD	-0.934945	0.316739	-2.951780	0.0035
COST_EFFICIENCY_RATIO	-0.458153	0.330989	-1.384193	0.1677
LOG_ASSETS	0.066045	0.045672	1.446090	0.1496
LTA	0.037294	0.098450	0.378810	0.7052
NON_INTEREST_INCOME	9.488723	7.474409	1.269495	0.2056
C	1.928082	1.176360	1.639023	0.1027

R-squared	0.058782	Mean dependent var	3.441926
Adjusted R-squared	0.037194	S.D. dependent var	0.678087
S.E. of regression	0.665357	Akaike info criterion	2.049434
Sum squared resid	96.50850	Schwarz criterion	2.140817
Log likelihood	-223.5366	Hannan-Quinn criter.	2.086320
F-statistic	2.722952	Durbin-Watson stat	0.528359
Prob(F-statistic)	0.020751		

Panel Regression Fixed Effect: Log Z(ROA)

Dependent Variable: LOG_Z__ROA_
Method: Panel Least Squares
Date: 10/01/23 Time: 01:07
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
___OF_WOMAN_IN_BOARD	-1.514240	0.537481	-2.817292	0.0054
COST_EFFICIENCY_RATIO	0.266961	0.408768	0.653086	0.5145
LOG_ASSETS	0.082883	0.040564	2.043253	0.0424
LTA	0.079263	0.084983	0.932691	0.3522
NON_INTEREST_INCOME	16.54839	6.881847	2.404644	0.0171
C	1.098689	1.068058	1.028680	0.3049

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.475482	Mean dependent var	3.441926
Adjusted R-squared	0.387605	S.D. dependent var	0.678087
S.E. of regression	0.530641	Akaike info criterion	1.705810
Sum squared resid	53.78183	Schwarz criterion	2.208418
Log likelihood	-158.0507	Hannan-Quinn criter.	1.908687
F-statistic	5.410748	Durbin-Watson stat	0.966542
Prob(F-statistic)	0.000000		

Panel Regression Random Effect: Log Z(ROA)

Dependent Variable: LOG_Z__ROA_
Method: Panel EGLS (Cross-section random effects)
Date: 10/01/23 Time: 01:15
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
___OF_WOMAN_IN_BOARD	-1.263266	0.426665	-2.960788	0.0034
COST_EFFICIENCY_RATIO	0.023412	0.367816	0.063652	0.9493
LOG_ASSETS	0.080140	0.039721	2.017586	0.0449
LTA	0.070880	0.083800	0.845818	0.3986
NON_INTEREST_INCOME	15.23762	6.698054	2.274933	0.0239
C	1.278792	1.040251	1.229310	0.2203

Effects Specification

	S.D.	Rho
Cross-section random	0.423372	0.3890
Idiosyncratic random	0.530641	0.6110

Weighted Statistics

R-squared	0.086668	Mean dependent var	1.394453
Adjusted R-squared	0.065720	S.D. dependent var	0.548489
S.E. of regression	0.530160	Sum squared resid	61.27313
F-statistic	4.137293	Durbin-Watson stat	0.840174
Prob(F-statistic)	0.001306		

Unweighted Statistics

R-squared	0.039703	Mean dependent var	3.441926
Sum squared resid	98.46479	Durbin-Watson stat	0.522827

Hausman Test: Log Z(ROA)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.604497	5	0.4660

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
___OF_WOMAN_IN_BOARD	-1.514240	-1.263266	0.106842	0.4426
COST_EFFICIENCY_RATIO	0.266961	0.023412	0.031802	0.1720
LOG_ASSETS	0.082883	0.080140	0.000068	0.7389
LTA	0.079263	0.070880	0.000200	0.5530
NON_INTEREST_INCOME	16.548391	15.237623	2.495893	0.4067

Cross-section random effects test equation:
Dependent Variable: LOG_Z__ROA_
Method: Panel Least Squares
Date: 10/01/23 Time: 01:16
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.098689	1.068058	1.028680	0.3049
___OF_WOMAN_IN_BOARD	-1.514240	0.537481	-2.817292	0.0054
COST_EFFICIENCY_RATIO	0.266961	0.408768	0.653086	0.5145
LOG_ASSETS	0.082883	0.040564	2.043253	0.0424
LTA	0.079263	0.084983	0.932691	0.3522
NON_INTEREST_INCOME	16.54839	6.881847	2.404644	0.0171

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.475482	Mean dependent var	3.441926
Adjusted R-squared	0.387605	S.D. dependent var	0.678087
S.E. of regression	0.530641	Akaike info criterion	1.705810
Sum squared resid	53.78183	Schwarz criterion	2.208418
Log likelihood	-158.0507	Hannan-Quinn criter.	1.908687
F-statistic	5.410748	Durbin-Watson stat	0.966542
Prob(F-statistic)	0.000000		

GMM on Baseline: Log Z (ROA Based)

Dependent Variable: LOG_Z__ROA_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:20
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__ROA_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__ROA_(-1)	0.699355	0.048950	14.28725	0.0000
LOG_ASSETS	-0.017828	0.034591	-0.515394	0.6105
COST_EFFICIENCY_RATIO	1.152752	0.428522	2.690067	0.0121
___OF_WOMAN_IN_BOARD	1.597471	1.564336	1.021181	0.3162

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.133329	S.D. dependent var	0.486530
S.E. of regression	0.625671	Sum squared resid	64.20008
J-statistic	25.96432	Instrument rank	24
Prob(J-statistic)	0.166994		

GMM on Baseline+ LTA: Log Z (ROA Based)

Dependent Variable: LOG_Z__ROA_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:22
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__ROA_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1) LTA(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__ROA_(-1)	0.737998	0.051663	14.28483	0.0000
LOG_ASSETS	-0.025308	0.036246	-0.698218	0.4910
COST_EFFICIENCY_RATIO	0.947172	0.325521	2.909709	0.0072
___OF_WOMAN_IN_BOARD	1.935476	1.747551	1.107536	0.2778
LTA	0.177435	0.102261	1.735119	0.0941

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.133329	S.D. dependent var	0.486530
S.E. of regression	0.637179	Sum squared resid	66.17756
J-statistic	26.04618	Instrument rank	25
Prob(J-statistic)	0.164292		

GMM on Baseline+ Non Int Income: Log Z (ROA Based)

Dependent Variable: LOG_Z__ROA_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:25
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__ROA_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1) NON_INTEREST_INCOME(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__ROA_(-1)	0.712983	0.069994	10.18636	0.0000
LOG_ASSETS	-0.039668	0.055067	-0.720368	0.4775
COST_EFFICIENCY_RATIO	1.430974	0.762956	1.875566	0.0716
___OF_WOMAN_IN_BOARD	2.172309	1.662368	1.306756	0.2023
NON_INTEREST_INCOME	6.449429	5.540670	1.164016	0.2546

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.133329	S.D. dependent var	0.486530
S.E. of regression	0.644486	Sum squared resid	67.70398
J-statistic	25.39239	Instrument rank	25
Prob(J-statistic)	0.186830		

GMM on Baseline: Log Z (ROA Based) Lag 2

Dependent Variable: LOG_Z__ROA_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:27
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__ROA_,-2) LOG_ASSETS(-2) COST_EFFICIENCY_RATIO(-2) ___OF_WOMAN_IN_BOARD(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__ROA_(-1)	0.472743	0.078800	5.999245	0.0000
LOG_Z__ROA_(-2)	-0.051703	0.051751	-0.999083	0.3266
LOG_ASSETS	-0.042366	0.059934	-0.706876	0.4857
COST_EFFICIENCY_RATIO	0.251010	0.366868	0.684199	0.4997
___OF_WOMAN_IN_BOARD	1.866456	1.950756	0.956786	0.3472

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.048757	S.D. dependent var	0.404842
S.E. of regression	0.504125	Sum squared resid	34.30911
J-statistic	17.75756	Instrument rank	23
Prob(J-statistic)	0.471728		

GMM on Baseline+ LTA: Log Z (ROA Based) Lag 2

Dependent Variable: LOG_Z__ROA_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:31
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__ROA_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1) LTA(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__ROA_(-1)	0.471231	0.104756	4.498379	0.0001
LOG_Z__ROA_(-2)	-0.097978	0.064384	-1.521783	0.1397
LOG_ASSETS	-0.030288	0.049828	-0.607858	0.5484
COST_EFFICIENCY_RATIO	0.164198	0.381317	0.430608	0.6702
___OF_WOMAN_IN_BOARD	2.300338	2.030776	1.132738	0.2673
LTA	0.057237	0.018326	3.123269	0.0042

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.048757	S.D. dependent var	0.404842
S.E. of regression	0.514939	Sum squared resid	35.53179
J-statistic	16.41386	Instrument rank	24
Prob(J-statistic)	0.563688		

GMM on Baseline+ Non Int Income: Log Z (ROA Based) Lag 2

Dependent Variable: LOG_Z__ROA_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:34
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__ROA_,-2) LOG_ASSETS(-2) COST_EFFICIENCY_RATIO(-2) ___OF_WOMAN_IN_BOARD(-2) NON_INTEREST_INCOME(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__ROA_(-1)	0.413064	0.071923	5.743174	0.0000
LOG_Z__ROA_(-2)	-0.056182	0.049198	-1.141963	0.2635
LOG_ASSETS	-0.045539	0.062426	-0.729494	0.4720
COST_EFFICIENCY_RATIO	0.464274	0.423127	1.097246	0.2822
___OF_WOMAN_IN_BOARD	1.429680	1.425615	1.002851	0.3248
NON_INTEREST_INCOME	3.451428	5.226545	0.660365	0.5146

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.048757	S.D. dependent var	0.404842
S.E. of regression	0.484238	Sum squared resid	31.42121
J-statistic	21.52381	Instrument rank	24
Prob(J-statistic)	0.253814		

Panel Regression: Log Z (CAR) Based

Dependent Variable: LOG_Z__CAR_
Method: Panel Least Squares
Date: 10/01/23 Time: 01:41
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_ASSETS	0.087499	0.054329	1.610528	0.1087
COST_EFFICIENCY_RATIO	-0.296296	0.393730	-0.752535	0.4525
___OF_WOMAN_IN_BOARD	-0.745956	0.376779	-1.979822	0.0490
LTA	0.044760	0.117112	0.382198	0.7027
NON_INTEREST_INCOME	15.51711	8.891228	1.745215	0.0824
C	1.648402	1.399347	1.177980	0.2401

R-squared	0.043201	Mean dependent var	3.895222
Adjusted R-squared	0.021256	S.D. dependent var	0.800028
S.E. of regression	0.791479	Akaike info criterion	2.396594
Sum squared resid	136.5637	Schwarz criterion	2.487977
Log likelihood	-262.4185	Hannan-Quinn criter.	2.433481
F-statistic	1.968624	Durbin-Watson stat	0.435534
Prob(F-statistic)	0.084410		

Panel Regression Fixed Effect: Log Z (CAR) Based

Dependent Variable: LOG_Z__CAR_
Method: Panel Least Squares
Date: 10/01/23 Time: 01:42
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_ASSETS	0.101260	0.048606	2.083265	0.0386
COST_EFFICIENCY_RATIO	0.378773	0.489810	0.773307	0.4403
___OF_WOMAN_IN_BOARD	-1.471268	0.644040	-2.284434	0.0234
LTA	0.083281	0.101832	0.817829	0.4145
NON_INTEREST_INCOME	35.13697	8.246229	4.260974	0.0000
C	0.813619	1.279809	0.635735	0.5257

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.458970	Mean dependent var	3.895222
Adjusted R-squared	0.368326	S.D. dependent var	0.800028
S.E. of regression	0.635845	Akaike info criterion	2.067547
Sum squared resid	77.22115	Schwarz criterion	2.570156
Log likelihood	-198.5653	Hannan-Quinn criter.	2.270425
F-statistic	5.063444	Durbin-Watson stat	0.835810
Prob(F-statistic)	0.000000		

Panel Regression Random Effect: Log Z (CAR) Based

Dependent Variable: LOG_Z__CAR_
Method: Panel EGLS (Cross-section random effects)
Date: 10/01/23 Time: 01:43
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_ASSETS	0.099724	0.047364	2.105460	0.0364
COST_EFFICIENCY_RATIO	0.096650	0.430741	0.224381	0.8227
___OF_WOMAN_IN_BOARD	-1.113937	0.489350	-2.276360	0.0238
LTA	0.074375	0.100072	0.743207	0.4582
NON_INTEREST_INCOME	30.31898	7.974286	3.802093	0.0002
C	1.004881	1.237830	0.811809	0.4178

Effects Specification

	S.D.	Rho
Cross-section random	0.442784	0.3266
Idiosyncratic random	0.635845	0.6734

Weighted Statistics

R-squared	0.111864	Mean dependent var	1.763381
Adjusted R-squared	0.091494	S.D. dependent var	0.675756
S.E. of regression	0.644100	Sum squared resid	90.44064
F-statistic	5.491588	Durbin-Watson stat	0.692308
Prob(F-statistic)	0.000088		

Unweighted Statistics

R-squared	0.019258	Mean dependent var	3.895222
Sum squared resid	139.9812	Durbin-Watson stat	0.447294

Hausman Test: Log Z(CAR)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	10.697282	5	0.0577

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LOG_ASSETS	0.101260	0.099724	0.000119	0.8881
COST_EFFICIENCY_RATIO	0.378773	0.096650	0.054376	0.2263
___OF_WOMAN_IN_BOARD	-1.471268	-1.113937	0.175325	0.3934
LTA	0.083281	0.074375	0.000355	0.6365
NON_INTEREST_INCOME	35.136970	30.318978	4.411054	0.0218

Cross-section random effects test equation:
Dependent Variable: LOG_Z__CAR_
Method: Panel Least Squares
Date: 10/01/23 Time: 01:45
Sample: 2013 2020
Periods included: 8
Cross-sections included: 28
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.813619	1.279809	0.635735	0.5257
LOG_ASSETS	0.101260	0.048606	2.083265	0.0386
COST_EFFICIENCY_RATIO	0.378773	0.489810	0.773307	0.4403
___OF_WOMAN_IN_BOARD	-1.471268	0.644040	-2.284434	0.0234
LTA	0.083281	0.101832	0.817829	0.4145
NON_INTEREST_INCOME	35.13697	8.246229	4.260974	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.458970	Mean dependent var	3.895222
Adjusted R-squared	0.368326	S.D. dependent var	0.800028
S.E. of regression	0.635845	Akaike info criterion	2.067547
Sum squared resid	77.22115	Schwarz criterion	2.570156
Log likelihood	-198.5653	Hannan-Quinn criter.	2.270425
F-statistic	5.063444	Durbin-Watson stat	0.835810
Prob(F-statistic)	0.000000		

GMM on Baseline: Log Z (CAR Based)

Dependent Variable: LOG_Z__CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:47
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__CAR_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__CAR_(-1)	0.955682	0.070460	13.56345	0.0000
LOG_ASSETS	-0.134645	0.114362	-1.177354	0.2493
COST_EFFICIENCY_RATIO	3.587280	0.508801	7.050457	0.0000
___OF_WOMAN_IN_BOARD	3.828855	1.616925	2.367985	0.0253

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.216386	S.D. dependent var	0.501381
S.E. of regression	0.780809	Sum squared resid	99.98472
J-statistic	26.32888	Instrument rank	24
Prob(J-statistic)	0.155223		

GMM on Baseline + LTA: Log Z (CAR Based)

Dependent Variable: LOG_Z__CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:49
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__CAR_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1) LTA(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__CAR_(-1)	0.965993	0.074184	13.02161	0.0000
LOG_ASSETS	-0.119433	0.111349	-1.072604	0.2929
COST_EFFICIENCY_RATIO	3.521598	0.518228	6.795461	0.0000
___OF_WOMAN_IN_BOARD	4.095081	1.568591	2.610675	0.0146
LTA	0.227821	0.041400	5.502919	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.216386	S.D. dependent var	0.501381
S.E. of regression	0.779147	Sum squared resid	98.95242
J-statistic	25.99900	Instrument rank	25
Prob(J-statistic)	0.165845		

GMM on Baseline + Non Interest Income: Log Z (CAR Based)

Dependent Variable: LOG_Z__CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:51
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__CAR_,-2) LOG_ASSETS(-1) COST_EFFICIENCY_RATIO(-1) ___OF_WOMAN_IN_BOARD(-1) NON_INTEREST_INCOME(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__CAR_(-1)	0.899838	0.077214	11.65387	0.0000
LOG_ASSETS	-0.135912	0.109676	-1.239214	0.2259
COST_EFFICIENCY_RATIO	3.717178	0.588602	6.315268	0.0000
___OF_WOMAN_IN_BOARD	3.748685	1.618840	2.315661	0.0284
NON_INTEREST_INCOME	8.814970	6.592711	1.337078	0.1924

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.216386	S.D. dependent var	0.501381
S.E. of regression	0.778066	Sum squared resid	98.67799
J-statistic	25.33389	Instrument rank	25
Prob(J-statistic)	0.188954		

GMM on Baseline: Log Z (CAR Based) Lag 2

Dependent Variable: LOG_Z__CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:53
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__CAR_,-2) LOG_ASSETS(-2) COST_EFFICIENCY_RATIO(-2) ___OF_WOMAN_IN_BOARD(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__CAR_(-1)	0.814875	0.080951	10.06629	0.0000
LOG_Z__CAR_(-2)	-0.108955	0.067720	-1.608901	0.1193
LOG_ASSETS	-0.036118	0.113112	-0.319314	0.7519
COST_EFFICIENCY_RATIO	2.253615	0.515319	4.373238	0.0002
___OF_WOMAN_IN_BOARD	4.751810	2.008361	2.366014	0.0254

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.152803	S.D. dependent var	0.472245
S.E. of regression	0.724808	Sum squared resid	70.92189
J-statistic	17.94998	Instrument rank	23
Prob(J-statistic)	0.458952		

GMM on Baseline+ LTA: Log Z (CAR Based) Lag 2

Dependent Variable: LOG_Z__CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:55
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__CAR_,-2) LOG_ASSETS(-2) COST_EFFICIENCY_RATIO(-2) ___OF_WOMAN_IN_BOARD(-2) LTA(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__CAR_(-1)	0.588648	0.094150	6.252266	0.0000
LOG_Z__CAR_(-2)	-0.036722	0.073777	-0.497749	0.6227
LOG_ASSETS	-0.207549	0.170240	-1.219151	0.2333
COST_EFFICIENCY_RATIO	2.122096	0.668813	3.172928	0.0037
___OF_WOMAN_IN_BOARD	2.839965	1.575733	1.802314	0.0827
LTA	-0.921066	0.434073	-2.121913	0.0432

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.152803	S.D. dependent var	0.472245
S.E. of regression	0.863621	Sum squared resid	99.94282
J-statistic	18.38903	Instrument rank	24
Prob(J-statistic)	0.430314		

GMM on Baseline +Non-Interest Income: Log Z (CAR Based) Lag 2

Dependent Variable: LOG_Z__CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 01:57
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__CAR_,-2) LOG_ASSETS(-2) COST_EFFICIENCY_RATIO(-2) ___OF_WOMAN_IN_BOARD(-2) NON_INTEREST_INCOME(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__CAR_(-1)	0.829915	0.076091	10.90683	0.0000
LOG_Z__CAR_(-2)	-0.137782	0.065593	-2.100572	0.0452
LOG_ASSETS	-0.063902	0.093535	-0.683190	0.5003
COST_EFFICIENCY_RATIO	2.220166	0.382651	5.802058	0.0000
___OF_WOMAN_IN_BOARD	5.815333	1.763173	3.298220	0.0027
NON_INTEREST_INCOME	7.852392	7.722681	1.016796	0.3183

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.152803	S.D. dependent var	0.472245
S.E. of regression	0.768713	Sum squared resid	79.18324
J-statistic	17.45868	Instrument rank	24
Prob(J-statistic)	0.491811		

Panel Regression: Log Z (Infection Ratio) Based

Dependent Variable: LOG_Z__IR_
Method: Panel Least Squares
Date: 10/01/23 Time: 18:22
Sample: 2013 2020
Periods included: 8
Cross-sections included: 23
Total panel (balanced) observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
___OF_WOMAN_IN_BOARD	-0.054956	0.506528	-0.108496	0.9137
COST_EFFICIENCY_RATIO	-0.690091	0.499724	-1.380943	0.1690
LOG_ASSETS	-0.077026	0.066323	-1.161363	0.2471
LTA	0.034335	0.139904	0.245417	0.8064
VOICE_AND_ACCOUNTABILITY_INDEX	2.797124	4.283958	0.652930	0.5147
NON_INTEREST_INCOME	-15.51164	12.04946	-1.287330	0.1997
REGULATORY_QUALITY_INDEX	1.293081	1.346481	0.960341	0.3382
C	3.449111	2.170007	1.589447	0.1138

R-squared	0.048043	Mean dependent var	0.094503
Adjusted R-squared	0.010181	S.D. dependent var	0.948462
S.E. of regression	0.943621	Akaike info criterion	2.764321
Sum squared resid	156.7141	Schwarz criterion	2.904101
Log likelihood	-246.3176	Hannan-Quinn criter.	2.820976
F-statistic	1.268900	Durbin-Watson stat	1.940956
Prob(F-statistic)	0.268275		

Panel Regression Fixed Effect: Log Z (Infection Ratio) Based

Dependent Variable: LOG_Z__IR_
Method: Panel Least Squares
Date: 10/01/23 Time: 18:23
Sample: 2013 2020
Periods included: 8
Cross-sections included: 23
Total panel (balanced) observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
___OF_WOMAN_IN_BOARD	0.662985	1.024274	0.647273	0.5184
COST_EFFICIENCY_RATIO	-1.304364	0.796503	-1.637614	0.1035
LOG_ASSETS	-0.114873	0.073991	-1.552530	0.1226
LTA	-0.050004	0.153204	-0.326388	0.7446
VOICE_AND_ACCOUNTABILITY_INDEX	-1.137245	6.934595	-0.163996	0.8699
NON_INTEREST_INCOME	-12.01749	13.79915	-0.870887	0.3852
REGULATORY_QUALITY_INDEX	1.583148	1.387679	1.140860	0.2557
C	5.340178	2.512790	2.125198	0.0352

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.147153	Mean dependent var	0.094503
Adjusted R-squared	-0.013448	S.D. dependent var	0.948462
S.E. of regression	0.954818	Akaike info criterion	2.893512
Sum squared resid	140.3983	Schwarz criterion	3.417686
Log likelihood	-236.2031	Hannan-Quinn criter.	3.105966
F-statistic	0.916266	Durbin-Watson stat	2.177861
Prob(F-statistic)	0.593267		

Panel Regression Random Effect: Log Z (Infection Ratio) Based

Dependent Variable: LOG_Z__IR_
Method: Panel EGLS (Cross-section random effects)
Date: 10/01/23 Time: 18:24
Sample: 2013 2020
Periods included: 8
Cross-sections included: 23
Total panel (balanced) observations: 184
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
___OF_WOMAN_IN_BOARD	-0.054956	0.512539	-0.107224	0.9147
COST_EFFICIENCY_RATIO	-0.690091	0.505654	-1.364750	0.1741
LOG_ASSETS	-0.077026	0.067110	-1.147745	0.2526
LTA	0.034335	0.141565	0.242539	0.8086
VOICE_AND_ACCOUNTABILITY_INDEX	2.797124	4.334789	0.645273	0.5196
NON_INTEREST_INCOME	-15.51164	12.19244	-1.272234	0.2050
REGULATORY_QUALITY_INDEX	1.293081	1.362458	0.949079	0.3439
C	3.449111	2.195756	1.570808	0.1180

Effects Specification

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.954818	1.0000

Weighted Statistics

R-squared	0.048043	Mean dependent var	0.094503
Adjusted R-squared	0.010181	S.D. dependent var	0.948462
S.E. of regression	0.943621	Sum squared resid	156.7141
F-statistic	1.268900	Durbin-Watson stat	1.940956
Prob(F-statistic)	0.268275		

Unweighted Statistics

R-squared	0.048043	Mean dependent var	0.094503
Sum squared resid	156.7141	Durbin-Watson stat	1.940956

Hausman Test: Log Z (Infection Ratio) Based

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.383137	7	0.6133

** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
___OF_WOMAN_IN_BOARD	0.662985	-0.054956	0.786442	0.4182
COST_EFFICIENCY_RATIO	-1.304364	-0.690091	0.378731	0.3182
LOG_ASSETS	-0.114873	-0.077026	0.000971	0.2245
LTA	-0.050004	0.034335	0.003431	0.1499
VOICE_AND_ACCOUNTABILITY_INDEX	-1.137245	2.797124	29.298208	0.4673
NON_INTEREST_INCOME	-12.017493	-15.511640	41.760922	0.5887
REGULATORY_QUALITY_INDEX	1.583148	1.293081	0.069360	0.2707

Cross-section random effects test equation:
Dependent Variable: LOG_Z__IR_
Method: Panel Least Squares
Date: 10/01/23 Time: 18:25
Sample: 2013 2020
Periods included: 8
Cross-sections included: 23
Total panel (balanced) observations: 184

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.340178	2.512790	2.125198	0.0352
___OF_WOMAN_IN_BOARD	0.662985	1.024274	0.647273	0.5184
COST_EFFICIENCY_RATIO	-1.304364	0.796503	-1.637614	0.1035
LOG_ASSETS	-0.114873	0.073991	-1.552530	0.1226
LTA	-0.050004	0.153204	-0.326388	0.7446
VOICE_AND_ACCOUNTABILITY_INDEX	-1.137245	6.934595	-0.163996	0.8699
NON_INTEREST_INCOME	-12.01749	13.79915	-0.870887	0.3852
REGULATORY_QUALITY_INDEX	1.583148	1.387679	1.140860	0.2557

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.147153	Mean dependent var	0.094503
Adjusted R-squared	-0.013448	S.D. dependent var	0.948462
S.E. of regression	0.954818	Akaike info criterion	2.893512
Sum squared resid	140.3983	Schwarz criterion	3.417686
Log likelihood	-236.2031	Hannan-Quinn criter.	3.105966
F-statistic	0.916266	Durbin-Watson stat	2.177861
Prob(F-statistic)	0.593267		

GMM on Baseline: Log Z (Infection Ratio Based)

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:13
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 23
Total panel (balanced) observations: 138
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-1) COST_EFFICIENCY_RATIO(-1) LOG_ASSETS(-1) LTA(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	0.048538	0.051086	0.950125	0.3524
___OF_WOMAN_IN_BOARD	-1.542020	1.201083	-1.283857	0.2125
COST_EFFICIENCY_RATIO	-2.648161	0.743606	-3.561241	0.0017
LOG_ASSETS	-0.048030	0.160734	-0.298818	0.7679
LTA	0.266895	0.576620	0.462862	0.6480

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.033506	S.D. dependent var	1.262108
S.E. of regression	1.345178	Sum squared resid	240.6638
J-statistic	17.25850	Instrument rank	23
Prob(J-statistic)	0.505405		

GMM on Baseline+ Regulatory Index: Log Z (Infection Ratio Based)

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:16
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 23
Total panel (balanced) observations: 138
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-1) COST_EFFICIENCY_RATIO(-1) LOG_ASSETS(-1) LTA(-1) REGULATORY_QUALITY_INDEX(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	0.030118	0.061287	0.491430	0.6280
___OF_WOMAN_IN_BOARD	-1.382143	1.320991	-1.046292	0.3068
COST_EFFICIENCY_RATIO	-3.857613	1.828582	-2.109620	0.0465
LOG_ASSETS	0.036578	0.171857	0.212840	0.8334
LTA	0.108997	0.561826	0.194005	0.8480
REGULATORY_QUALITY_INDEX	2.593575	1.374817	1.886488	0.0725

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.033506	S.D. dependent var	1.262108
S.E. of regression	1.352578	Sum squared resid	241.4895
J-statistic	17.20696	Instrument rank	23
Prob(J-statistic)	0.440432		

GMM on Baseline+ Voice and Accountability: Log Z (Infection Ratio Based)

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:26
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 23
Total panel (balanced) observations: 138
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-1) COST_EFFICIENCY_RATIO(-1) LOG_ASSETS(-1) LTA(-1) VOICE_AND_ACCOUNTABILITY_INDEX(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	0.045480	0.050696	0.897114	0.3794
___OF_WOMAN_IN_BOARD	-1.390020	1.174508	-1.183491	0.2492
COST_EFFICIENCY_RATIO	-2.656632	1.246163	-2.131851	0.0444
LOG_ASSETS	-0.039497	0.168368	-0.234585	0.8167
LTA	0.236141	0.577879	0.408635	0.6868
VOICE_AND_ACCOUNTABILITY_INDEX	-3.353514	21.19989	-0.158185	0.8758

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.033506	S.D. dependent var	1.262108
S.E. of regression	1.347366	Sum squared resid	239.6322
J-statistic	17.39275	Instrument rank	23
Prob(J-statistic)	0.428079		

GMM on Baseline+ Non-Interest Income: Log Z (Infection Ratio Based)

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:29
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 23
Total panel (balanced) observations: 138
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-1) COST_EFFICIENCY_RATIO(-1) LOG_ASSETS(-1) LTA(-1) NON_INTEREST_INCOME(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	-0.013510	0.069745	-0.193707	0.8482
___OF_WOMAN_IN_BOARD	-0.494474	1.595573	-0.309904	0.7596
COST_EFFICIENCY_RATIO	-4.061155	1.980402	-2.050672	0.0524
LOG_ASSETS	-0.023187	0.245311	-0.094521	0.9256
LTA	0.439156	0.726589	0.604408	0.5518
NON_INTEREST_INCOME	-36.69015	21.04455	-1.743451	0.0952

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.033506	S.D. dependent var	1.262108
S.E. of regression	1.389763	Sum squared resid	254.9504
J-statistic	13.93412	Instrument rank	23
Prob(J-statistic)	0.671759		

GMM on Baseline: Log Z (Infection Ratio Based) Lag 2

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:34
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 23
Total panel (balanced) observations: 115
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-2) COST_EFFICIENCY_RATIO(-2) LOG_ASSETS(-2) LTA(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	-0.076430	0.063183	-1.209660	0.2392
LOG_Z__IR_(-2)	-0.028327	0.060765	-0.466175	0.6457
___OF_WOMAN_IN_BOARD	1.352579	1.793210	0.754278	0.4587
COST_EFFICIENCY_RATIO	-2.459894	1.346808	-1.826462	0.0814
LOG_ASSETS	0.076298	0.154994	0.492266	0.6274
LTA	1.167966	1.144417	1.020577	0.3185

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.165131	S.D. dependent var	1.188812
S.E. of regression	1.441657	Sum squared resid	226.5428
J-statistic	20.56086	Instrument rank	23
Prob(J-statistic)	0.246551		

GMM on Baseline+ Regulatory Index: Log Z (Infection Ratio Based) Lag 2

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:36
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 23
Total panel (balanced) observations: 115
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-2) COST_EFFICIENCY_RATIO(-2) LOG_ASSETS(-2) LTA(-2) REGULATORY_QUALITY_INDEX(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	-0.144947	0.083576	-1.734306	0.0969
LOG_Z__IR_(-2)	-0.005167	0.078964	-0.065436	0.9484
___OF_WOMAN_IN_BOARD	2.031333	2.394201	0.848439	0.4053
COST_EFFICIENCY_RATIO	-3.672811	1.971834	-1.862637	0.0759
LOG_ASSETS	0.487477	0.480385	1.014763	0.3212
LTA	1.802646	1.031504	1.747590	0.0945
REGULATORY_QUALITY_INDEX	5.069069	1.709043	2.966027	0.0071

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.165131	S.D. dependent var	1.188812
S.E. of regression	1.844438	Sum squared resid	367.4108
J-statistic	14.53476	Instrument rank	23
Prob(J-statistic)	0.558940		

GMM on Baseline+ Non-Interest Income: Log Z (Infection Ratio Based) Lag 2

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:46
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 23
Total panel (balanced) observations: 115
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-2) COST_EFFICIENCY_RATIO(-2) LOG_ASSETS(-2) LTA(-2) NON_INTEREST_INCOME(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	-0.105601	0.076356	-1.383020	0.1805
LOG_Z__IR_(-2)	-0.010526	0.062601	-0.168140	0.8680
___OF_WOMAN_IN_BOARD	1.793058	1.923086	0.932386	0.3613
COST_EFFICIENCY_RATIO	-3.142976	2.330049	-1.348888	0.1911
LOG_ASSETS	0.316881	0.314176	1.008612	0.3241
LTA	0.968374	1.245915	0.777239	0.4453
NON_INTEREST_INCOME	-51.34059	19.84871	-2.586596	0.0168

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.165131	S.D. dependent var	1.188812
S.E. of regression	1.495812	Sum squared resid	241.6451
J-statistic	13.88687	Instrument rank	23
Prob(J-statistic)	0.607141		

GMM on Baseline+ Voice and Accountability: Log Z (Infection Ratio Based) Lag 2

Dependent Variable: LOG_Z__IR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:39
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 23
Total panel (balanced) observations: 115
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(LOG_Z__IR_,-2) ___OF_WOMAN_IN_BOARD(-2) COST_EFFICIENCY_RATIO(-2) LOG_ASSETS(-2) LTA(-2) VOICE_AND_ACCOUNTABILITY_INDEX(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_Z__IR_(-1)	-0.094169	0.066907	-1.407464	0.1733
LOG_Z__IR_(-2)	-0.023590	0.062774	-0.375788	0.7107
___OF_WOMAN_IN_BOARD	1.315909	1.845743	0.712943	0.4834
COST_EFFICIENCY_RATIO	-3.029444	1.905676	-1.589695	0.1262
LOG_ASSETS	0.139315	0.192250	0.724652	0.4763
LTA	1.696195	1.118953	1.515877	0.1438
VOICE_AND_ACCOUNTABILITY_INDEX	27.12539	34.10563	0.795335	0.4349

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.165131	S.D. dependent var	1.188812
S.E. of regression	1.661597	Sum squared resid	298.1777
J-statistic	20.29140	Instrument rank	23
Prob(J-statistic)	0.207382		

Financial Stability Analysis:

GMM Analysis : Lag 1 Financial Stability

Dependent Variable: Z___CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 18:59
Sample (adjusted): 2015 2020
Periods included: 6
Cross-sections included: 28
Total panel (balanced) observations: 168
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(Z___CAR_,-2) NPL(-1) INFLATION(-1) GDP_GROWTH_RATE(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Z____CAR_(-1)	1.445911	0.101488	14.24718	0.0000
NPL	-514.3014	171.0579	-3.006592	0.0057
INFLATION	-4515.038	188.7705	-23.91814	0.0000
GDP_GROWTH_RATE	-29.01495	2.035899	-14.25166	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	26.25811	S.D. dependent var	154.1498
S.E. of regression	161.6720	Sum squared resid	4286602.
J-statistic	22.81009	Instrument rank	24
Prob(J-statistic)	0.298216		

GMM Analysis: Lag 2 Financial Stability

Dependent Variable: Z____CAR_
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 19:00
Sample (adjusted): 2016 2020
Periods included: 5
Cross-sections included: 28
Total panel (balanced) observations: 140
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(Z____CAR_,-2) NPL(-2) INFLATION(-2) GDP_GROWTH_RATE(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Z____CAR_(-1)	1.558539	0.163884	9.510012	0.0000
Z____CAR_(-2)	0.450696	0.060304	7.473789	0.0000
NPL	-1906.476	521.3725	-3.656649	0.0011
INFLATION	-3102.273	700.4354	-4.429064	0.0001
GDP_GROWTH_RATE	-24.45311	2.278013	-10.73440	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	27.99514	S.D. dependent var	168.6460
S.E. of regression	186.7268	Sum squared resid	4707033.
J-statistic	22.03190	Instrument rank	23
Prob(J-statistic)	0.230572		

Management Efficiency Analysis:

GMM Analysis Lag 1: Management Efficiency

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 19:31
Sample (adjusted): 2011 2020
Periods included: 10
Cross-sections included: 28
Total panel (balanced) observations: 280
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPERRATING_EXPENSE_RATIO(-1) TOBINS_Q_MV_OF_EQUITY__TOTAL_ASSETS(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.359751	0.033866	10.62272	0.0000
OPERRATING_EXPENSE_RATIO	0.235738	0.032941	7.156290	0.0000
TOBINS_Q_MV_OF_EQUITY__TOTAL_A...	-7.45E-06	4.13E-05	-0.180581	0.8580

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002437	S.D. dependent var	0.022594
S.E. of regression	0.028504	Sum squared resid	0.225061
J-statistic	24.18376	Instrument rank	28
Prob(J-statistic)	0.508777		

GMM Analysis Lag 2: Management Efficiency

Dependent Variable: NPL
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 10/01/23 Time: 19:34
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 28
Total panel (balanced) observations: 252
White period (period correlation) instrument weighting matrix
White period (cross-section cluster) standard errors & covariance (d.f. corrected)
Standard error and t-statistic probabilities adjusted for clustering
Instrument specification: @DYN(NPL,-2) OPERRATING_EXPENSE_RATIO(-2) TOBINS_Q_MV_OF_EQUITY__TOTAL_ASSETS(-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPL(-1)	0.297066	0.045128	6.582784	0.0000
NPL(-2)	0.110998	0.034187	3.246755	0.0031
OPERRATING_EXPENSE_RATIO	0.177143	0.027556	6.428491	0.0000
TOBINS_Q_MV_OF_EQUITY__TOTAL_A...	-0.000406	0.000139	-2.920491	0.0070

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.002702	S.D. dependent var	0.023592
S.E. of regression	0.027874	Sum squared resid	0.192684
J-statistic	24.59176	Instrument rank	28
Prob(J-statistic)	0.428209		

ARDL for Management Efficiency:

Dependent Variable: D(NPL)
Method: ARDL
Date: 10/01/23 Time: 19:24
Sample: 2010 2020
Included observations: 308
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): OPERRATING_EXPENSE_RATIO
TOBINS_Q_MV_OF_EQUITY__TOTAL_ASSETS
Fixed regressors: C
Number of models evaluated: 1
Selected Model: ARDL(1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
OPERRATING_EXPENSE_RATIO	0.146264	0.019965	7.326061	0.0000
TOBINS_Q_MV_OF_EQUITY__TOTAL_A...	-8.52E-05	3.39E-05	-2.514039	0.0127
Short Run Equation				
COINTEQ01	-0.609582	0.050328	-12.11214	0.0000
D(OPERRATING_EXPENSE_RATIO)	-0.030534	0.025032	-1.219801	0.2240
D(TOBINS_Q_MV_OF_EQUITY__TOTAL_...	-300.0653	300.1077	-0.999859	0.3186
C	-0.015404	0.004529	-3.401246	0.0008
@TREND	0.000488	0.000864	0.565128	0.5726

Root MSE	0.013699	Mean dependent var	0.001856
S.D. dependent var	0.021820	S.E. of regression	0.018029
Akaike info criterion	-5.382045	Sum squared resid	0.063058
Schwarz criterion	-3.768862	Log likelihood	1046.184
Hannan-Quinn criter.	-4.738985		

*Note: p-values and any subsequent tests do not account for model selection.