

**An internship report submitted in partial fulfillment of the requirements for the
Degree of Master of Business Administration (MBA)**



An Internship Report

On

Determinants of Capital Adequacy of State-Owned Commercial Banks in Bangladesh.

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Subject: **Determinants of Capital Adequacy of State-Owned Commercial Banks in Bangladesh.**

Respected Mam,

With due respect, I am reporting your giving titled: **Determinants of Capital Adequacy of State-Owned Commercial Banks in Bangladesh**, assigned as my topic and it is a mandatory requirement for MBA program. I have tried my best to do the report properly considering every trifle thing you advised and make the report in a fascinating way. Finally, I would like to express my sincere appreciation and thanks to your help while preparing the report. I shall be glad to answer any queries that you may have in this regard.

Sincerely Yours,

Jannatul Eva

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Session: 2022-2023

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Acknowledgement

Firstly, I would like to express my deep gratitude to all mighty Allah for keeping me physically fit and mentally alert to prepare this report.

I would like to express my sincere gratitude & appreciation to my supervisor Ferdous Jahan Assistant Professor, Department of Finance & Banking Comilla University, Cumilla, who has been glad to give me right approach, guidance and support which helped me a lot in writing this report. I am grateful to him for his constant help and supervision, proposals. Without his help and guidelines, it is difficult for me to complete the report.

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Finally, I pay my obligation to those websites that helped me by providing lot of information. Without this help, it will be so tough for me to complete my report or to reach me on my destination.

Student Declaration

Myself, Jannatul Eva, student of Master of Business Administration, Department of Finance and Banking, Comilla University, do hereby declare that the Internship Report on **Determinants of Capital Adequacy of State-Owned Commercial Banks in Bangladesh**, uniquely prepared by me after the completion of three months working at Sonali Bank PLC.

I also confirm that the report is only prepared for my academic requirements and didn't submit this report any other place before. I also assure you that; this report was not submitted for any other degree.

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Supervisor's Certificate

This is to certify that **Jannatul Eva**, ID NO- 22317008, a student of the Master of Business Administration (MBA) Program at Comilla University, has completed the internship report under my supervision. He has worked at Sonali Bank PLC as an intern and completed the report entitled- **Determinants of Capital Adequacy of State-Owned Commercial Banks in Bangladesh** as a partial requirement for obtaining a Master of Business Administration (MBA) Degree. He has completed the report by himself. He has been permitted to submit the report.

I wish his success.

.....

Ferdous Jahan

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Internship Certificat

Executive Summary

For establishing a healthy banking structure, and for comparing the ability of banks with global standard, banks must keep certain amount of CAR (Capital Adequacy Ratio) to ascertain that banks can manage their risk exposures. This CAR is set by Basel which is an international regulatory system of capital of banking industry. Bangladesh bank also implement Basel-3 from 2015, January. According to Basel-3 a bank has to keep minimum 10% of their capital and 2.5% capital conservation buffer, in total $10\% + 2.5\% = 12.5\%$ of their risk weighted asset as CAR. This regulation of minimum capital requirement is kept to ensure that banks keep enough capital to face their risk. By this, Bangladesh banks lower the risk and protect the banks from being default. CAR is measured by tier-1 (core capital) plus tier-2 (supplementary capital) divided by banks RWA. This report aims to examine the relationship between CAR and determinants (Firm-Specific and Macroeconomic drivers) of CAR. This analysis of data is based on the sample of 5 State-Owned Commercial Banks namely Sonali, Basic, Agrani, BDBL, and Janata Bank for the duration of 2011 to 2021. This analysis has been done through a panel data regression by statistical software STATA in pooled OLS, Random Effect, Fixed effect, GLS, GMM, and Unit Root Test. Here, have highlighted how some bank-specific and macroeconomic factors affected the CAR throughout the period from 2010 to 2021. Firm-specific factors that influence CAR, including bank size, deposits, bank loans, loan deposit, loan loss provisions, ROA, NIM, Leverage, Cost to income, NPL to total loan. The macroeconomic factors are GDP, inflation, and foreign remittance. In OLS method 4 variables, in fixed effect one variable and in Random effect only 4 variables have been found significant. These models suffers from the problem of Multicollinearity, Heteroscedesticity, Model Specification Bias and Autocorrelation. That's why GLS, GMM and Unit root test has been incorporated. GMM shows out of 13 variables 8 have been found significant in affecting CAR namely lag period CAR, bank-size, deposits, LA, LD, loan provisions, ROA, leverage, NPL, and constant. Unit root test suggest all variables are stationary to include in this model except deposits.

Table of Contents

Chapter 01: Introduction	1
1.0 Introduction	1
1.1 Background.....	1
1.2 Rational of the study	2
1.3 Objective	2
1.4 Scope of the Study	3
1.5 Limitations of the study	3
Chapter 02: Literature Review.....	4
Review of Literature	5-9
Chapter 03: Methodology	10
3.1 Methodology	11
3.2 Sources of Data Collection.....	11
3.3 Model Specification	11
3.4 Model for analyzing data	11
3.5 Model Specification	13
3.6 Conceptual Framework.....	16

Chapter 04: Overview of the Banks and Conceptual Background	
under the Study	18
4.1 Key Financial Fundamentals of Bangladesh Govt. Banks.	18
4.2 Capital Adequacy Ratio of Five SOCBs.....	19
4.3 Implementation of Basel iii.....	23
Chapter 05: Data Analysis and Findings.....	26
5.1 Models for Analyzing Data.....	27
5.2 Descriptive Statistics	28
5.3 OLS (Ordinary Least Square Model)	30
5.4 Diagnostic Test for OLS	33
5.5 Fixed Effect	34
5.6 Diagnostic test for Fixed effect.....	36
5.7 Random Effect.....	38
5.8 GLS (Generalized Least Square).....	39
5.9 GMM (Generalized Methods of Moments).....	40
5.10 Unit Root Test.....	43
5.11 Summary output.....	44

Chapter 06: Conclusion.....	45
Recommendations	46
Conclusion.....	47
References	48
Appendix	50

List of Tables and Figures

<u>Table 3.1 Variables explanation</u>	<u>20</u>
<u>Table: 4.1 Key Financial Indicators of 5 SOCBs</u>	<u>23</u>
<u>Figure: 01 CAR of 5 SOCBs</u>	<u>25</u>
<u>Table 4.2: Capital Tiers and their constituents</u>	<u>27</u>
<u>Table 4.3: aPhase-in aarrangement of least capital requirements.</u>	<u>28</u>
<u>Table 4.4: Individual Bank least Capital Conservation Standards</u>	<u>29</u>
<u>Table 5.1: Descriptive Statistics Output</u>	<u>33</u>
<u>Table 5.2 Linear regression</u>	<u>34</u>
<u>Table 5.3: Multicollinearity Test</u>	<u>36</u>
<u>Table:a5.4- Breuscha-Paganaa/Cook-Weisbergaa test for aheteroskedasticity for OLS.....</u>	<u>37</u>
<u>Table:5.5- Raamsey RESET test usinng powers of the fitted values of car</u>	<u>37</u>
<u>Table 5.6: Wooldridgea test for autocorrelation in panel dataa</u>	<u>38</u>
<u>Table 5.7: Regression results Fixed</u>	<u>39</u>
<u>Table 5.8: Modified Waald test for group wise heteroskedasticity in fiixed effect regreession model</u>	<u>40</u>
<u>Table 5.9: Correlaation matrix of residualsa:</u>	<u>41</u>
<u>Table 5.10: Regression results</u>	<u>42</u>
<u>Table 5.11:- Summary of the output of BP-LM Test</u>	<u>43</u>
<u>Table 5.12: Summary of the output of the Hausman Test</u>	<u>43</u>
<u>Table 5.13: Cross-sectional time-series FGLS regression</u>	<u>44</u>
<u>Table 5.14: Regression results : GMM</u>	<u>45</u>
<u>Table 5.15: LLC aUnit Root Test</u>	<u>46</u>
<u>Table 5.16: Summary of all Models</u>	<u>49</u>

Chapter 01: Introduction

1.0 Introduction

Banking industry, which is regarded as the foundation of an economy, has a significant impact on how quickly a nation may advance. The financial crisis and the banking crisis were linked in 1963 by economists from monetary theory. They claimed that if there is a crisis in banking, there will be a crisis in the economy, which might endanger the durability of the banking and cause the economy to collapse in the penury of central bank action. Moreover, the local financial system in Bangladesh has grown strongly and significantly better. The recent expansion in banking activity, both in terms of scope and diversity, has obscured the enormous risks that directly jeopardize the stability and safety of the state-owned commercial banking system. In order to prevent bank failure and safeguard depositors, banking authorities must stress the importance of the CAR in banking operations in accordance with Basel regulations. Banks must maintain CAR according to Basel accord. Adequate CAR shows the bank strength and capability. CAR is an important consideration when assessing a bank's health. Bangladesh bank impose the Basel-3 accord from January 2015.

1.1 Background

The Basle Committee on Banking Supervision (BCBS) has the power to tighten rules and raise the standard of global banking supervision (Bank for International Settlement). The group published the Basle Accord and decided to standardize international banks by defining a least capital adequacy ratio of 8% of RWA. In Basel-3, the most recent Basel rules, it is now 10% of all RWA. By reducing the possibility of bank failure, the implementation of minimum CAR promotes fluidity and inefficiencies of the economy. Since the financial crisis of 2007, regulatory agencies have worked to strengthen banks. To do this, governments around the developed world are putting pressure on their citizens to punctuate their balance sheet by raising capital, if they are unable to do so, to reduce the risk assets-loans that are shown on their report (Abba, 2013). All entities are often impacted by capital adequacy. However, as a phrase, it is most frequently used to discuss how corporations are doing in the banking sector of the economy, and more specifically, if firms have enough money to handle the adverse moment they face. Because capital is seen by regulatory authorities like a safeguard or throne for burring losses, they consider the CAR as a crucial indication of banks and depository institutions.

Bangladesh bank also impose the Basel-III accord from January 2015. Now every scheduled bank should follow the rules and regulations of Basel-III accord. Every bank has to keep 10% of their risk weighted asset and 2.5% of capital conservation buffer. So state owned commercial bank like Janata, Sonali, Agrani, BDBL and Basic also follow this rules and regulations like others. It ensure the bank management of risk and facing the risk. It also protect banks from the default. Bangladesh bank believed that this regulations will help to reduce the bank failure. It is very fruitful for our country because this Basel-III accord is internationally accepted. So, bank can manage their risk by following and maintaining the Basel-III accord regulations.

1.2 Rational of the study

In recent time bank failure is one of the most concerning issues in the world. If most of the banks fail, the country will face a great recession in their economy. If a bank follows and maintains the rules and regulations of Basel accord, there is a least possibility to be defaulted. So bank should maintain their activity in such a way that doesn't reduce their minimum capital requirement. Bank can also determine which bank-specific and macro-economic factors impact the CAR. So this analysis has been done for to see which factors are necessary to change the CAR of bank. This analysis is also necessary for facing risk and managing risk wisely.

1.3 Objective

This study's main goal is to investigate the impact of macroeconomic and bank-specific drivers on the CAR of SOCBS. The following particular objectives are developed in accordance with the overarching goal.

- To investigate the relationship between the CAR and firm-specific factors.
- To examine the relationship between the CAR and macroeconomic factors.
- To determine the degree affecting the CAR by macro-economic factors.
- To evaluate the degree affecting the CAR by bank-specific factors.

1.4 Scope of the Study

CAR is very crucial for bank. There is a huge scope to study on it. The findings presented in this report have implications for decisions makers at both macroeconomic or national and banking or organizational levels. Here, decision makers can take decision according to how macro and bank factors affecting the CAR. They can also find what the reason behind the decreasing CAR. Is they can suggest bank to take proper steps if any capital adequacy problems exist.

Observing other emerging countries can be similarly beneficial in granting a comprehensive perspective on the situation.

Likewise, this report can be used for future study on CAR in order to focus different supervisory, institutional, and legal aspects as the vital elements of CAR.

1.5 Limitations of the study

This report sole objective is to examine the drivers that influence CAR in various aspects of Bangladesh's state-owned commercial banks. Even though this report has been written with the utmost sincerity, it nevertheless has its limitations and flaws. There are a few things to keep in mind about the study, including the following:

Only 5 SOCBs in Bangladesh—Janata, Sonali, Agrani, BDBL, and Basic—are taken into account in this analysis. Other banks, including the remaining two state-owned institutions, private commercial institutions, foreign commercial institutions, and Islamic institutions were not included in the study.

All of the data from Rupali Bank was not available based on the model and criteria which have been chosen.

Due to their comparatively low level of Basel III compliance, fourth-generation banks have been omitted.

Due to restrictions on data gathering, some variables that might have an impact on the CAR might be removed.

The study's time constraints are a major weakness. 5 banks' 12 years' worth of data has been taken into account.

Nevertheless, it is anticipated that, when all the flaws are taken into account, the findings won't be significantly harmed.

Chapter 02: Literature Review

Review of Literature

Review of the literature demonstrates the general thesis of earlier reports on the same subject that were published. This provides a clear understanding of who worked on a given topic, their goals, and the results they found. The drivers that affect the banking industry's CAR have been the subject of numerous studies. Some studies were conducted with a single country as the focus, while others looked at a group of nations. A few references to earlier research on the factors influencing capital adequacy from panel countries as well as individual countries are provided below to help the topic make more sense.

Ratan Ghosh and Farzana Nur Saima's study on the resilience of Bangladesh's commercial banks to the COVID-19 pandemics shock (Asian Journal of AccountResearcharch, 2021). According to this report, COVID-19's effects have had a negative impact on the financial endurance and resilience of banks (commercial) in Bangladesh.

Abu Issa, Nahiduzzaman, and Imam Study on the effect of COV-19 on the economic stability and profitability of PCBs in Bangladesh (20 may 2022). To assess their financial performance, CAMELS, profitability, macroeconomic indicators impact has been shown. This was done by studying panel regression. They demonstrated how the COV-19 epidemic has impacted on the performance and profitability of CBs.

The profitability of CBs in Bangladesh was examined in relation to lev, operating performance, NPL, and CAR by Mr. Kamal Uddin. Six PCBs and 4 SOCBs were purposefully chosen as samples for this. Panel data regression was considered to test this study's research hypotheses. It demonstrates that the CAR significantly and favorably affects ROA. According to the current study, banks should choose suitable clients and finance loans responsibly in order to maintain Bangladesh's sound financial standing.

"Impact of Basel-3on Profitability & CAR of PCBs in Bangladesh is the title of a study written by Mohiuddin Tipu and published in 2021. This study aims to provide light on Bangladeshi

generation-wise banks' Basel III implementation status. Additionally, research has been done to reveal how Basel III's implementation may affect banks' profitability and capital sufficiency.

To begin with, Sarwar's (2015) research on the experiential effects of Basel-2 implementation on the economic stability of PCBs in Bangladesh investigates pertinent secondary information of 25 listed PCBs for a 5-year period in. Finally, the outcome suggests that the CAR maintenance may have a favorable effect on the profit performance of Bangladesh's PCBs.

The relationship between CAR and banking risks is investigated by Abba et al. (2013). Risk and bank capital adequacy ratios have a strong inverse relationship, meaning that as risk increases, capital adequacy ratios decrease. This link is particularly pronounced in the Nigerian banking sector. According to these conclusions, the study recommended that Nigerian banks switch from their recent practice of concentrating on paid-up capital and retained earnings to a risk-based approach to managing capital because there is an impactful connections between CAR and banking risks.

Williams (2011) used an error correction model in Nigeria between 1980 and 2008 to evaluate the link between CAR and a few macroeconomic, and bank-specific drivers. The author came to the conclusion that a significant factor affecting the CAR is the money supply. The real interest rate and capital adequacy basis are inversely correlated, which means that when the interest rate rises, the CAR weakens. The exchange rate is a substantial driver, but its coefficient is not as deserved, and neither the deposit nor the liquidity exposure are statistically impactful. He discovered that the capital adequacy base in Nigeria may be explained by investments and political instability, which are both statistically significant and appropriately signed.

Hubertus Nugroho Addo Wibowo and Herlanto Anggono (2014) investigated the effects of several variables on the CAR, including LNsize, LRLA, RLA, OEOI, ROA, and ROE. Increased understanding of the capital adequacy of Indonesian commercial banks is anticipated as a result of this research.

To determine risk-based capital adequacy metrics, Nuviyanti and Anggono studied 19 Indonesian PCBs in 2014. To analyze the effects of explanatory drivers, a multiple linear regression model was developed and an ordinary least square estimate was used. Excellence corporate governance was rated by OE to OI and net NIM, exposure profile by NPL ratio and LD ratio, and earnings by ROA and ROE.

Using information collected between 2006 and 2011, Büyüksalvarc et al. (2011) evaluated the drivers influencing the CAR of Turkish banks. The regression findings reveal a strong relationship between CAR and loan defaults, loan loss reserves, leverage, ROA, and ROE, but a smaller connection between CAR and bank size, deposits, liquidity, net interest margin.

Miliaet al. (2014) looked at what impacts the CARs branches of abroad banks. When figuring out a bank's CAR in a foreign jurisdiction, analysts additionally consider the impact of domestic economic and regulatory factors. Strong evidence is provided by their findings that CAR in developing nations and industrialized areas does not recline on the identical set of independent factors. He conclude by demonstrating that foreign banks with significant ties to the interbank industry are particularly influenced by certain variables at the parent bank.

When it comes to the CAR of banks in the SEE region, Rafet, (2015) analyzed the effect of both internal and external drivers. Firm-specific explanatory variables such as bank-size, ROA, leverage, liquidity, NIM, and exposure are used in a workable GLS regression. Moreover, economic growth, inflation, interest rate, Euro stock market index, insurance coverage, and governance driver are cosidered to the model to compensate for environmental impact. Our analysis means that bank-size, ROA, leverage, liquidity, NIM, and exposure of the bank are all major factors in determining CAR in the region.

Evidence from Emerging Economies on Capital Adequacy, Bank Behavior, and Crises was the topic of a study by Alkadamani (2015). This research used a simultaneous equations model to analyze how capital requirements affected banks' willingness to take risks during the recent financial crisis. The data suggest that banks near to the least capital requirements increase their

CAR by growing their capital and declining their risk-taking. Estimates also demonstrate an affirmative connection between bank-profitability and increase in capital.

Binh examined the connection between degree of CAR, exposures and profitability drivers of Vietnamese CBs using both conceptual and empirical investigations. The result of research showed the following: CAR in CBs is affirmatively correlated with both liquidity exposure and ROA. On the other hand, factors outside than the ROE and interest rate exposure have a statistically significant inverse association with the degree to which commercial banks have adequate capital.

Capital adequacy in the banking industry of Pakistan was studied by Bokhari and Ali (2009). Practical analyses were undertaken by considering statistical approaches such as least square on the panel data. Report were done based on the 12 sample banks reports in Pakistan. According to findings, there is a moderate relationship between the CAR, the capital requirement, and the portfolio exposure, whereas the ratio is highly but adversely connected with the proportion of deposits to equity and the return on equity.

The capital adequacy ratio of Iranian banks was analyzed by Bateniet al., 2014. They used information gleaned from sample banks' annual reports. For this reason, the research concentrated on PCBs in Iran. In this work, they employed panel data methods to examine interrelationships among bank-centric factors. Findings showed a negative correlation between bank-size and CAR, and positive correlations between ROA, LAR, ROE, EQR, and CAR. CAR is unaffected by the ratios RAR and DAR.

Dawit analyzed firm-specific and macro determining elements of CARs of PCBs in Ethiopia. Inflation had a adverse but minor influence on PCBs CAR in Ethiopia, while bank-size, liquidity, and the NPL, all had favorable effects. CARs of PCBs in Ethiopia were adversely and statistically significantly impacted by the percentage of deposits, loans, loan provisions, bank risk, return on equity, and gross domestic product. The CAR of Ethiopian commercial banks was positively and statistically significantly impacted by ROA and NIM.

Capital and interest rates were discovered to be related by Demirguc-Kunt and Detragiache (1997). They claimed that debtors' repayment capacity would diminish as interest rates increased. As a result, the capital ratio suffers as a result of the rising amount of bad debt.

Wong in 2005 examined that bank-size is negatively correlated with CAR in Hong Kong since larger banks are more likely to hold riskier assets. As they hold more riskier assets, bank-size of Hong Kong is adversely affecting the CAR

Capital from deposits is said to have a minimum cost than the cost of taking money from other financial sectors (Kleff and Weber, 2003). Additionally, (DRECA, 2014) noted that if depositors could not ascertain the soundness of the institutions to whom it sent money, the bank should keep a lower CAR ideal capital.

Chapter 03: Methodology

3.1 Methodology

Any report methodology includes information about the report subject and the strategy used to carry out the analysis. This report discusses the CAR state-owned commercial banks. As a result, the data has been gathered from various sources and used a variety of tools and presentation techniques to present the findings. This report will be finished using secondary data.

3.2 Sources of Data Collection

Secondary data has been used to accomplish this report. For this, macroeconomic information has been collected from many websites, including the Bangladesh Bank website via Google, and bank-specific information from the annual reports of five chosen SOCBs.

3.3 Sample Design

The sample has been designed for state-owned commercial banks in Bangladesh. The state-owned commercial bank has taken into consideration because they have dealt with huge capital and more than 50% share of these banks are hold by the govt. these banks represent whole countrys banking sector as well. Determinants of Capital adequacy of SOCBs can represent the situation of maintaining CAR of banking sector in Bangladesh.

3.4 Models for Analyzing Data

A. OLS-Ordinary Least Square

The OLS Model is extensively used to calculate the coefficients of linear and multiple regression models and to determine the nature of the relationship between a dependent variable and one or more explanatory variables. The assumptions of CLRM are linearity in parameters, there will be no correlation between error term and explanatory variables, mean value of error term should be 0, constant variance, there will be no correlation between error terms, should not be any model specification bias.

B. Fixed Effect

The intercept of the regression model can be permitted to vary freely between individuals or groups in a fixed effects regression model. It is frequently used with panel data to account for characteristics of individuals that do not change over time.

It has two assumptions

- Constant is time invariant that means one point of time to another point of time constant remains same for every bank.
- There are some outside factors that may affect independent variable within every group or entity.

C. Random Effect

In this case, the factor's levels are completely at random. Therefore the values observed in the research are a statistically valid representation of the full range of possible values.

It has two assumptions

- Constant is time variant that means one time of time to another point of time constant change for every bank.
- There are some outside factors that will not affect independent variable within every group or entity.

D. GLS-Generalized Least Square

In GLS model, OLS method has been applied in a transformed regression method. For solving the problems of OLS method it has been used. If OLS method suffers from the problem of heteroscedasticity and autocorrelation problem, and also few variables have been found statistically significant then for remedial purpose GLS method has been used.

Assumptions

- Panels are homoscedastic. That means panels contain the non-constant error variance. So, there is no problem of heteroscedasticity.
- Initially assumes that there is no autocorrelation problem.

E. Generalized Methods of Moments

GMM model should be used when dataset suffers endogenous problem that means explanatory variables are influenced by outside variables which are not incorporated in the model. When maximum variables has been found insignificant GMM should be used. GMM popularly known as one step GMM approach as it takes one year lag period dependent variable data.

3.5 Model Specification

This report tries to clarify the relationship between macroeconomic and bank-specific drivers and the CAR (Capital Adequacy Ratio) of selected state-owned banks. This study makes use of secondary data collected over the course of the past twelve years, starting in 2010, from 5 SOCBs in Bangladesh. Use of convenience sampling is part of the non-probabilistic approach. As a result, a panel data set with 60 total observations has been created. The empirical variables on which general state-owned commercial banks CAR depend are discussed here:

There are firm-specific factors that influence CAR, including bank size, deposits, bank loans, loan deposit, loan loss provisions, ROA, NIM, Leverage, Cost to income, and NPL to total loan. The macroeconomic factors are GDP, inflation, interest rate spread, and foreign remittance.

Table 3.1 Variables explanation

Explained Variables	Notation	Measurement Method	Expected Impact
Capital Adequacy	CAR	Dividing a Bank's Capital by Its RWAs.	n/a
Explanatory Variables, $\sum X$			
X_1 = Bank Size	BS	Natural log of Total Assets	Positive/Negative
X_2 =Deposit	Dep	Customers Deposit / Total Assets	Positive/Negative
X_3 = Loans	LA	Loans / Total Assets	Positive/Negative
X_4 = Loan Deposit	LD	Total Loans / Total Deposits	Positive
X_5 = Loan Loss Provision	LLP	LLP / Total Loans	Negative
X_6 = Return on Assets	ROA	Net Income / Total Assets	Positive
X_7 = Nim Ratio	Nim	(Interest income-interest expense)/ total earning assets	Negative
X_8 = Leverage	Lev	Equity / Total Asset	Positive/Negative
X_9 = Cost to Income	CI	Cost to Income	Negative
X_{10} = NPL to Total Loan	NPLTL	NPL to Total Loan	Negative
X_{11} = GDP Growth	GDP	(GDP _t /GDP _{t-1})-1	Positive
X_{12} = Inflation	Inf	(CPI _t /CPI _{t-1})-1	Negative
X_{13} = Growth of Foreign Remittance	FRG	(FR-FR _{t-1}) / FR _{t-1}	Positive

To complete this investigation, secondary data has been used. The macroeconomic data for this project has been collected from a variety of places, including the Bangladesh Bank website via Google, and the bank-specific data has been collected from the annual reports of 5 selected SOCBs and from their websites.

To determine how macroeconomic conditions and industry-specific factors affect state-owned commercial banks CAR, the following empirical models have been developed:

$$CAR_{it} = a_{it} + \sum_{k=1}^{13} \beta_{it} X_{itk} + u_{it} \dots \dots \dots (1)$$

$$CAR_{it} = a_i + \sum_{k=1}^{13} \beta_{it} X_{itk} + u_{it} \dots \dots \dots (2)$$

$$CAR_{it} = a + \sum_{k=1}^{13} \beta_{it} X_{itk} + \epsilon_{it} + u_{it} \dots \dots \dots (3)$$

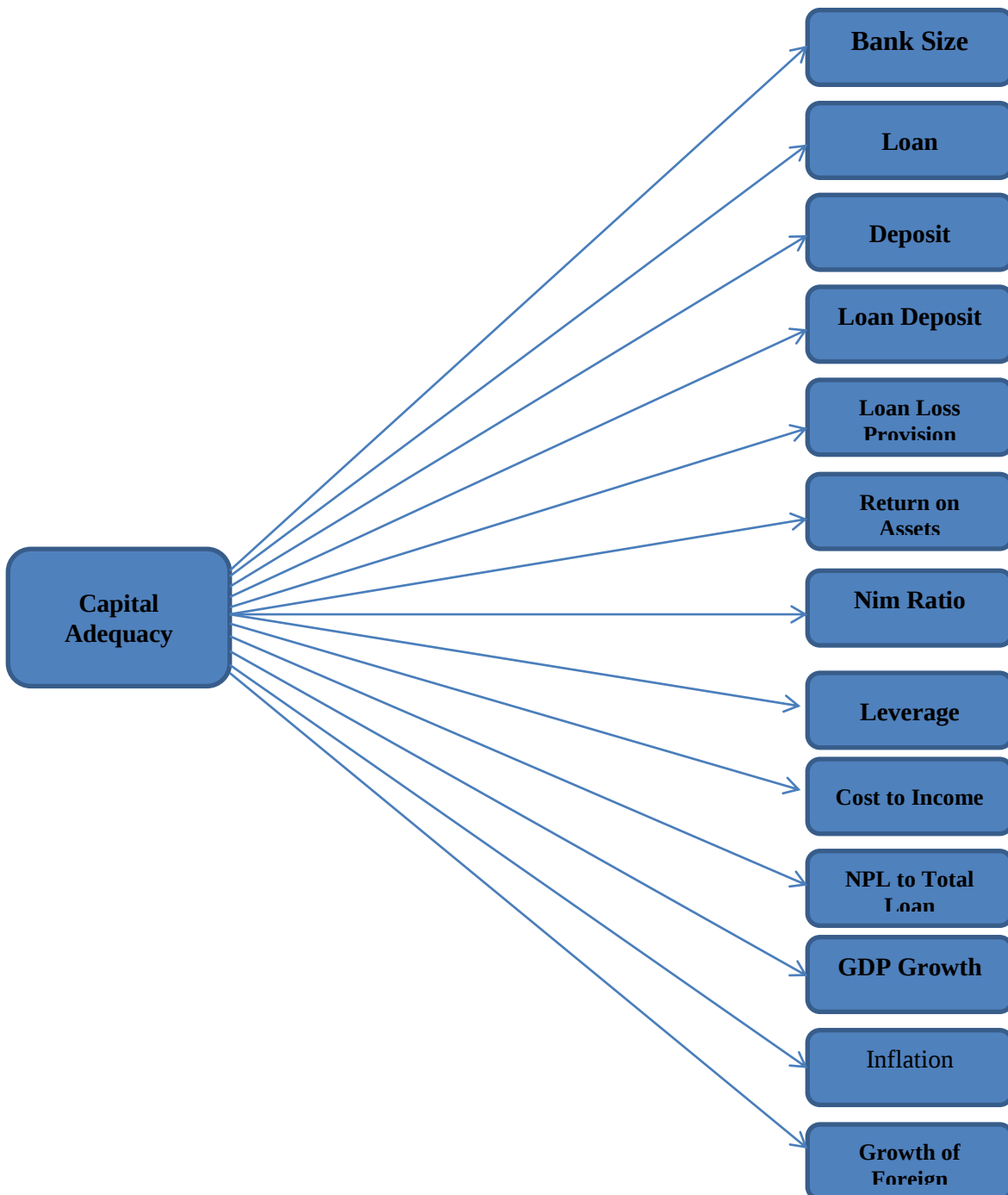
$$CAR_{it} = a_{it} + \gamma CAR_{i(t-1)} + \sum_{k=1}^{13} \beta_{it} X_{itk} + u_{it} \dots \dots \dots (4)$$

Here, the Pooled OLS, Fixed Effect, and Random Effect methods are each represented by a constant, denoted by it, i and. X is the total of all explanatory variables that represent both macroeconomic influences and industry-specific characteristics that were used in the model. = coefficient of the explanatory variable; u_{it} = model error term or error term within the entity; ϵ_{it} = error term between the entity; γ = coefficient of lagged dependent variable, i.e., CAR_{t-1} = One year lagged CAR.

Equations 1 and 2 will first be subjected to the application of the Pooled OLS and GLS methods, and then the application of the Fixed Effect method, in order to estimate the coefficients. Equation 3 will be applied to the Random Effect, and the final equation will be utilized to apply the one-step GMM methodology.

The Fixed effect operates under the presumption that the constant won't change over time. It also believes that each business has some internal elements (such as managerial effectiveness) that will influence external, industry-specific factors. The result will eventually be biased. In this sense, it is presumable that the entity's error term and the explanatory variable are correlated. The random effect technique, in contrast, makes the assumption that variation inside entities (such as general insurance firms) is random. Additionally, it is unrelated to the repressors. The one-step GMM is used to estimate the coefficients in order to control the endogeneity issue since endogeneity leads to inaccurate and ineffective estimations of regression coefficient

3.6 Conceptual framework:



Chapter 04: A Close Look in the State-Owned Commercial Banks of Bangladesh and Implementations of Basel- III

4.1 State-Owned Commercial Banks in Bangladesh

There are 6 state-owned commercial banks in Bangladesh namely Sonali, Agrani, Janata, Rupali, Basic, and BDBL.

Sonali Bank

The Sonali Bank Limited is the largest and most prominent public commercial bank in Bangladesh. The bank dominates the market in its country. It has started its journey in 1972. It has 6000 crore authorized capital.

Agrani Bank

The Agrani Bank Limited was founded in 1972 as a state-owned commercial bank in Bangladesh. It has 2500 crore authorized capital.

Janata Bank

Bangladesh's government founded the commercial bank Janata Bank Ltd. in 1972. It's arguably the best financial institution in bd. It's also the biggest financial institution in Bangladesh. It has 3000 crore authorized capital

Rupali Bank

On March 26, 1972, under the Bangladesh Banks (Nationalization) Order 1972, three commercial banks operating in the then East Pakistan merged to form what is now known as Rupali Bank Limited. These banks were Muslim Commercial Bank Limited, Australasia Bank Limited, and Standard Bank Limited. Its authorized capital is about Rs.7,000 crore.

Basic Bank

Founded on August 2, 1988, BASIC Bank Limited is a Bangladeshi financial institution that is 100 percent controlled by the government. The original purpose for the establishment of the bank was to provide funding for lesser known businesses. It has 5500 crore authorized capital.

BDBL

Bangladesh Development Bank is a state-owned specialised commercial bank in Bangladesh. The bank has one of the highest loan default rate in Bangladesh. It has also started its journey from 1972. It has only 1000 crore authorized capital.

4.2 Key Financial Fundamentals of Bangladesh Govt. Banks.

SOCBs are also called govt. banks which help the govt. for establishment of a country. Its main motive is not only generates profits but also help the govt. and help the people of a country. Bangladesh has 6 SOCBs namely Sonali, Agrani, Janata, Rupali, Basic, and BDBL. Out of these 5 state-owned banks have been taken into consideration. The whole or partial ownership of these banks are hold by the Government of Bangladesh. Some key financial fundamentals of these banks are given below:

Table: 4.1 Key Financial Fundamentals of State-Owned Commercial Banks

	Sonali Bank	Agrani Bank	JANATA Bank	Rupali Bank	BDBL	Basic Bank
Establishment Year	1972	1972	1972	1972	1972	1988
Authorized-Capital	6000 Crore	2500 crore	3000 crore	7000 crore	1000 crore	5500 crore
Paid-up Capital	4530 crore	2072 crore	2314 crore	4380 crore	400 crore	(1084.6) crore
Reserve	4561 crore	2121 crore	2428.8 crore	4372 crore	1464.64 crore	(46.56) crore
Total Asset	130775 crore	119501 crore	124954 crore	66645 crore	5839.57 crore	19556.13 crore
Loans and Advances	69059.6 crore	59790 crore	69965.67 crore	41288.9 crore	1998.39 crore	14451.77 crore
NPL	11958.5 crore	9987 crore	12319.92 crore	15388.3 crore	766.25 crore	8637.75 crore
Interest Income	3374.4 crore	3504 crore	3917.73 crore	33887 crore	234.84 crore	488.81 crore
Interest Expense	4353.7 crore	4266 crore	3999.78 crore	25705 crore	273.89 crore	270.76 crore
Profit	232 crore	137 crore	300.3 crore	50 crore	30 crore	(396.97) crore
EPS	7.63	6.63	12.98	1.08	1.64	(3.66)
Number of Employees	21839	11389	12220	6000	753	2000
Number of Branches	1230	969	918	586	46	72

This table shows some key financial indicators of SOCBs in Bangladesh. Among these banks, sonali is in the best position. Here Rupali has the highest authorized which is 7000 crore. The

highest regulatory capital is in sonali bank which is 4530 crore and highest reserve which is 4561 crore among the banks. Total asset is 130775 crore of sonali which is also highest among the five banks. Sonali gives 69059.6 crore loans and advances against 130775 asset that means they give 52.81% loans against their assets. Agrani has asset of 119501 crore they give 50.01% loans against their asset. Janata gives 56.21% loans against their asset. BDBL gives only 34.22% loans against their asset. Finally, Basic gives 73.89% which is not very safe as their asset is low. So, according to these information sonali and janata bank utilizes their asset more efficiently than others because they give not too much and not too low loans. They have also enough liquidity to meet up client's need of money. Now banks can give loans up to 87.50% against their deposit because ADR is now 12.5% for commercial banks. According to basel-3 CAR must be kept $10\% + 2.5\%$ (capital conservation buffer) = 12.5%. That's why banks can give loans up to 87.5%. But should not give all portion of deposits because they have to meet up the demand of clients. That's why sonali and janata gives moderate percentage loans against their assets. NPL is highest in sonali bank and lowest in BDBL. Interest income and interest expense is also highest in sonali bank. Sonali made 232 crore profit in 2021 and janata made 300.3 crore profit in 2021 which is highest among the banks. Sonali bank facilitate highest number of people as their employee and also they give services throughout the country with highest number of branches which is 1230.

So, considering overall performance sonali is in best position among these banks. also this banks main concern is not to make profit, it main concern is to give services to all kinds of people whether poor or rich people.

4.2 CAR of Five SOCBs

According to basel-3 bank has to maintain 12.5% CAR of RWAs. Bangladesh bank also implement this rule from 2015. Full phase implementation began from January 2019 in Bangladesh. To ensuring bank health, capability, strength etc. bank must kept 12.5% CAR. SOCBs of Bangladesh are also maintain this CAR. Before 2015, banks kept CAR according to basel-2. According to basel-2 banks should keep only 8% of their RWAs. Last 12 years CAR of SOCBs are given below:

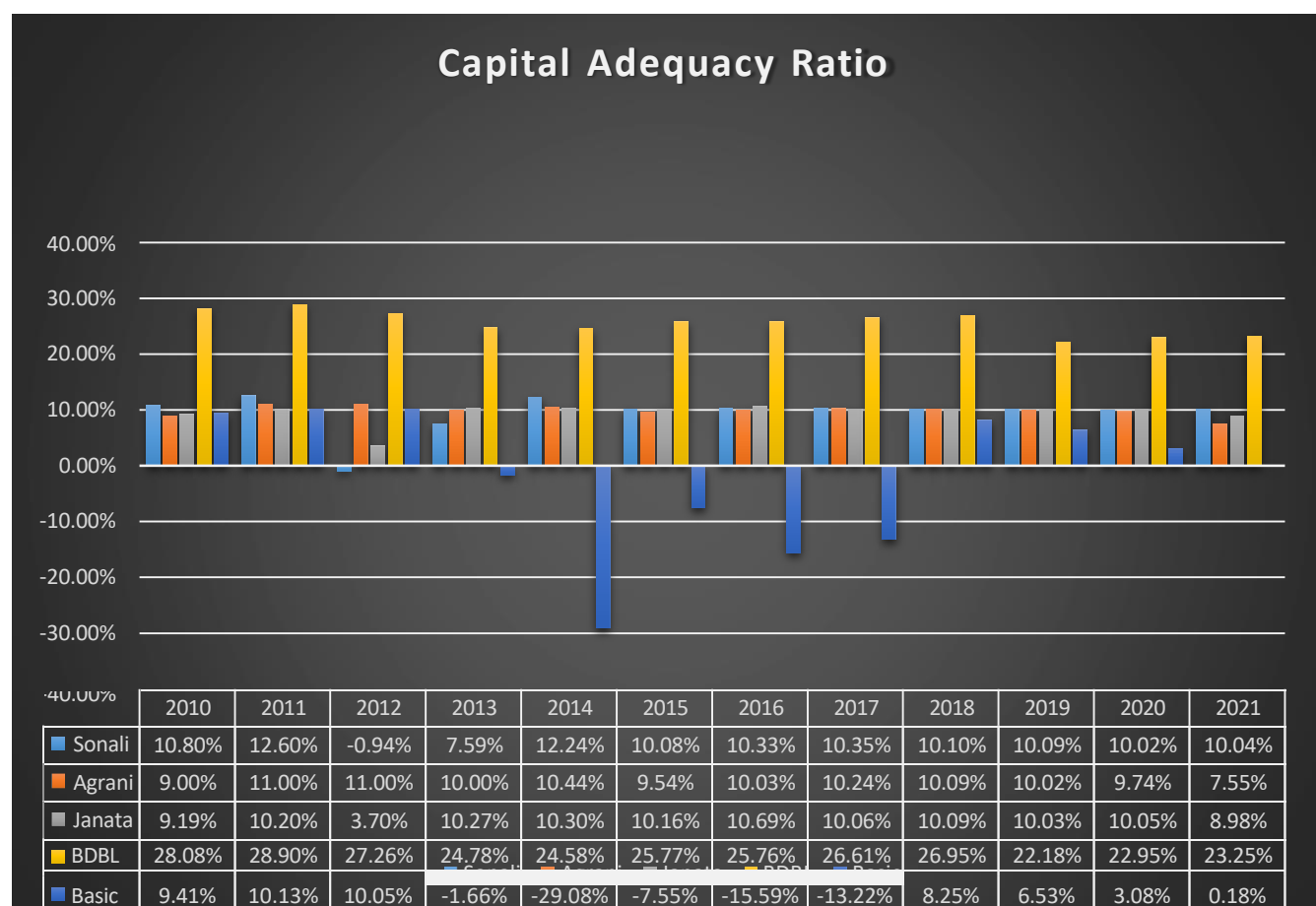


Figure: 01 Capital Adequacy Ratio of State-Owned Commercial Banks in Bangladesh

Here, 5 SOCBs namely Sonali, Agrani, Janata, BDBL and basic CAR has been shown from the year 2010 to 2021. Sonali bank maintains consistent CAR throughout the period from 2010 to

2021. According to basel-2 sonali banks CAR is good. But according to basel-3 which has been fully implement from 2019. Bank has to maintain minimum CRAR of 10% of the total RWA. In addition to minimum capital, bank has to maintain 2.5% capital conservation buffer of RWA which will maintained in the form of CET1. So, in 2020 and in 2021 no SOCBs maintained 12.5% CAR except BDBL. Sonali is consistent in maintaining CAR except the year 2012 which they didn't maintained any capital rather they had a negative CAR. In 2013 CAR was also lower then 8% for sonali. Agrani maintained consistent CAR from 2010 to 2020. But they had less CAR in the year of 2020 and 2021. Janata bank also maintained CAR according to basel-2 upto 2018. They maintained consistent CAR except the 2012 which they kept only 3.70% CAR. In 2021 janata bank CAR was also lower than the requirement according to Basel-3. BDBL has the highest CAR maintain bank among the 5 SOCBs. They maintained more than 20% CAR in every year. This satisfied the basel-2 and basel-3 rules. But this is not good for this bank also. It indicates that they were not utilizing their RWAs properly. Finally, basic banks is most inconsistent in maintaining CAR. They had negative CAR in the year from 2013 to 2017. They also maintained only 0.18% CAR in 2021.

Overall, it can be said that sonali, agrani and janata maintained consistent CAR except few years. In the year of 2020 and 2021 CAR was low for every bank. This might be the reason of COV-19 impact on banking sector.

4.3 Implementation of Basel iii

The following ratios must be met on a continuous basis by all banks:

- CET-1 of at least 4.5% of the total Risk Weighted Assets
- Minimum RWA Tier-1 Capital of 6%
- RWA Capital Requirement Ratio of 10% Minimum
- The maximum amount of additional T-1 capital that can be mentioned is 33.33% of CET1 or 1.5% of the total RWA, whichever is greater.
- Up to 4.0 percentage points of RWA or 88.8 percent of CET1 may come from Tier 2 capitals.
- CET-1 will be used to hold a Capital Conservation Buffer (CCB) equal to 2.5% of the total RWA over the minimum capital requirement.

The schedule for introducing mandatory minimum capital requirements is as follows:

Table 4.2: Capital Tiers and their constituents

Tiers	Constituents
Tier 1: Core Capital	1. Paid-up capital 2. Non-repayable share premium account 3. Statutory reserve 4. General reserve 5. Retained earnings 6. Minority interest in subsidiaries 7. Non-cumulative irredeemable preference shares 8. Dividend equalization account
Tier 2: Supplementary Capital	1. General provision (Unclassified loans, Special Mention Account loans and off Balance Sheet exposures) 2. Revaluation reserves for fixed assets, securities and equity instruments 3. All other preference shares 4. Subordinated debt
Tier 3: Additional Supplementary Capital (for Market Risk Only)	1. Short term subordinated debt (2 years ≤ maturity ≤ 5 years)

Table 4.3: Phase-in arrangement of minimum capital requirements.

	2015	2016	2017	2018	2019
Minimum CET-1%	4.50%	4.50%	4.50%	4.50%	4.50%
CCB	-	0.625%	1.25%	1.875%	2.50%
Minimum CET1+CCB	4.50%	5.125%	5.75%	6.375%	7.00%
Minimum t-1 Cap Ratio	5.50%	5.50%	6.00%	6.00%	6.00%
Minimum T. Capital	10.00%	10.00%	10.00%	10.00%	10.00%
TC+CCB	10.00%	10.625%	11.25%	11.875%	12.50%

Conserving Capital Through a Buffer Financial institutions are mandated to keep a Common Equity Tier 1 capital conservation buffer of 2.5% above the statutory minimum of 10%. If a bank's capital ratio is in this range, it should not make any capital distributions (such as dividends or bonuses). Nonetheless, whenever their capital levels drop into the conservation range as a result of losses, they will be able to carry on with business as usual. As a result, the restrictions imposed are not connected to the functioning of banks but rather pertain solely to distributions. When a bank's capital falls below the range, distribution restrictions are put in place. These restrictions get more severe when a bank's capital falls below the minimum criteria. The minimum capital conservation ratios required of a bank at different Common Equity Tier 1 capital ratios are detailed in the table below.

Table 4.4: Individual Bank Minimum Capital Conservation Standards

CET-1 Ratio	Minimum CC Ratios (expressed as a % of earnings)	Disbursement
4.5% to 5.125%	100%	0%
5.125% to 5.75%	80%	20%
5.75% to 6.375%	60%	40%
6.375% to 7.00%	40%	60%
Above 7.00%	0%	100%

Bank with a Common Equity Tier-1 capital ratio between 5.125% and 5.75% is needed to retain 80% of its earnings in the following financial year (payout of no more than 20% in the form of dividends, share buybacks, and discretionary incentive payments is allowed). Other essential elements of the required capital conservation buffer are as follows: Amounts utilized to satisfy the 4.5 percent minimum Common Equity Tier-1 capital need are factored into the Common Equity Tier-1 ratio, but the 7 percent minimum Tier-1 capital requirement and the 10 percent total capital requirement are not. An illustration of this would be a bank with 8% Common Equity Tier-1 capital, 1% Additional Tier-1 capital, and 1% Tier-2 capital. Therefore, the bank would be in compliance with all minimum capital requirements, but it would have no conservation buffer, and it would be subject to a total restriction of 100% on capital distributions such as dividends, share repurchases, and discretionary bonuses.

Chapter 05: Data Analysis and Findings

5.1 Descriptive Statistics

Descriptive statistics are brief informational coefficients that summarize a given data set, which can be either a representation of the entire population or a sample of a population. This statistics are broken down into measures of central tendency and measures of variability. Measure of central tendency include the mean, median, and mode while measures of variability include standard deviation, variance, minimum and maximum variables.

Table 5.1: Descriptive Statistics Output

Variable	Ob s	Mean	Std. Dev	Min	Max
CAR (Capital Adequacy Ratio)	60	.106	.105	-.291	.289
BS (Bank Size)	60	24.0	1.35	20.18	25.86
Dep (Deposits)	60	.715	.174	.118	.859
LA (Loan to Assets)	60	.509	.147	.309	.793
LD (Loan to Deposits)	60	.738	.254	.373	1.689
LLP (Loan Loss Provisions)	60	.114	.05	.03	.204
ROA Return on Assets	60	.001	.015	-.049	.026
NIM (Net Interest Margin)	60	.015	.024	-.023	.065
Lev (Leverage)	60	.121	.138	-.003	.568
CI (Cost to Income)	60	.808	.21	.471	1.503
NPLTL (NPL to Total Loan)	60	.311	.161	.052	.598
GDPG (GDP Growth)	60	.064	.011	.034	.079
Inf (Inflation)	60	.067	.017	.055	.114
FRG (Foreign Remittance Growth)	60	.085	.144	-.136	.361

The descriptive data shows that the ranges are quite close together and that the variables have tiny standard deviations except some of the variables. The standard deviation of bank size is more than 1, hence it carries the most danger. In terms of standard deviation, the interest rate spread is the

safest variable at 0.009. The ranges and standard deviations of the other variables are minor and quite close. Deposits, loans, loans to deposits standard deviations are also very high which are 71.5%, 50.90%, and 73.80% respectively. Cost of income also carries high standard deviations which is 80.08%. Other variables have tiny standard deviations and their mean values are also consistent with standard deviations. These variables' ranges are quite close together as well.

5.2 OLS (Ordinary Least Square Model)

The OLS Model is extensively used to calculate the coefficients of linear and multiple regression models and to determine the nature of the relationship between a dependent variable and one or more explanatory variables. This can be used to test for the existence of a correlation between the dependent variable and the independent factors. This output was found using the statistical software STATA and the OLS model of multiple regression.

Table 5.2 Linear regression

car	Coef.	St. Er	t- val	p- val	[95% Cf	Interval]	Sig
BS (Bank Size)	.042	.016	2.68	.01	.011	.074	**
Dep (Deposits)	-.679	.314	-2.16	.036	-1.312	-.046	**
LA (Loan to Assets)	.428	.212	2.02	.049	.001	.855	**
LD (Loan to Deposits)	-.327	.124	-2.65	.011	-.576	-.078	**
LLP (Loan Loss Provisions)	.395	.387	1.02	.314	-.385	1.175	
ROA Return on Assets	1.553	.928	1.67	.101	-.317	3.423	
NIM (Net Interest Margin)	.588	.51	1.15	.255	-.439	1.615	
Lev (Leverage)	.372	.352	1.06	.296	-.337	1.081	
CI (Cost to Income)	-.036	.072	-0.50	.623	-.181	.11	
NPLTL (NPL to Total Loan)	-.103	.125	-0.83	.412	-.355	.148	
GDPG (GDP Growth)	.552	.914	0.60	.549	-1.289	2.393	
Inf (Inflation)	-.213	.663	-0.32	.75	-1.549	1.123	
FRG (Foreign Remittance Growth)	.068	.069	0.98	.332	-.071	.207	
Constant	-.483	.565	-0.86	.397	-1.62	.654	

Mean depen var	0.106	SD depen var	0.105
R-sq	0.758	obs	60
F-t	10.051	Pr > F	0.000

*** *p less than .01*, ** *p less than .05*, * *p less than .1*

Here R-Square is the coefficient of determination that shows 75.80% variability in CAR has been narrated by all explanatory drivers. When R-square value has been adjusted with d.f then we will call it adjusted R-square. Adj-R Sq is less than R-sq which indicates we can add more independent variables in this model. F test indicates joint significance of independent variables on Capital Adequacy. P values of F-Test is less than 5% that means the explanatory drivers are jointly significantly affecting the dependent driver- Capital Adequacy ratio. Regression output also shows that bank specific drivers such as bank size, deposits, loan to asset, loan to deposit has been found significant in affecting the Capital Adequacy Ratio as their p-value is less than 5%. Other explanatory variables namely loans loss provisions, ROA, NIM, Leverage, cost to income, NPL, interest rate spread, GDP, Inflation, foreign remittance, all have been found insignificant in affecting CAR as their p-value is greater than 5%. Out of 14 explanatory variables, only 4 variables have been found individually significant in affecting CAR and other 10 variables have been found insignificant in affecting CAR.

Here, If Bank size increases by 1 unit, CAR would be increased by 0.042 unit considering ceteris paribus (all other variables remain constant). If, deposits increases by 1 unit CAR would be decreased by 0.679 unit. If loan to asset increases by 1 unit, CAR would be increased by 0.428 unit. If loan to deposit increases by 1 unit, CAR would be decreased by 0.327 unit.

5.3 Diagnostic Test for OLS

A. Multicollinearity

The models suffers from the problem of multicolliniarity if there is high pairwise relationship between the explanatory variables or VIF , a benchmark value of detecting multicolliniarity, value is greater than 5.

Variance inflation factor

	VIF	1/VIF		VIF	1/VIF
dep	50.69	.02	bs	7.701	.13
lev	40.083	.025	npltl	6.84	.146
ld	16.715	.06	llp	6.464	.155
la	16.557	.06	ci	3.917	.255
bs	7.701	.13	roa	3.108	.322
npltl	6.84	.146	nim	2.603	.384
llp	6.464	.155	inf	2.07	.483
ci	3.917	.255	frg	1.674	.598
roa	3.108	.322	Gdpg	1.628	.614
nim	2.603	.384			
inf	2.07	.483	Mean VIF	4.001	.
frg	1.674	.598			
Gdpg	1.628	.614			
Mean VIF	11.552	.			

Table 5.3: Multicollinearity Test

This model suffers from the problem of multicollinearity as this Variance Inflation Factor(VIF) is greater than 5. Individually deposit, leverage, loan to deposit, loan to asset, bank-size NPL, Loan loss provisions has vif value over 5 which is the cause of multicollinearity. If these variables been exclude which is shown here, the multicollinearity problem would be resolved.

B. Heteroscedasticity

If the constant variance exists there is no problem of heteroscedasticity. If the model suffers from heteroscedastic problem we have to take remedial measures for removing this problem which is called the GLS-Generalized Least Square model.

H0: constant variance

	CAR
Chi2(1)	32.89
P-Value	0.0000

Table: 5.4- Breusch -Pagan / Cook-Weisberg test for heteroskedasticity for OLS

According to this output, H1 has been accepted because p-value is less than 5%. That means variance has been found non-constant. That means there is heteroscedasticity problem in this model.

C. Model Specification Bias

Whether the model has omitted variable bias or not we can test this by using this test in STATA. If the model has specification bias problem that means here more irrelevant variables have been included and excluded the core variables.

Table:5.5- Ramsey RESET test using powers of the fitted values of car

	CAR
F	6.61
P-Value	0.0009

Ho: model has no omitted variables

The output shows p-value is less than 5%. That means we are failed to reject H0. So, this model has omitted variable bias. This is because there might be include more peripheral variables and exclude core variable which violates the attribute of good model- parsimony model specification bias problem.

D. Autocorrelation

If error term of one bank is correlated with error term of another bank there would be the problems of autocorrelation.

Table 5.6: Wooldridge test for autocorrelation in panel data

	CAR
F	25.940
P-Value	0.0070

H0: no first order autocorrelation

Here p-val is less than 5%. So we accept H1 that means error term of one bank is correlated with another banks. So we can conclude that there is an autocorrelation problem in this model.

So, overall in OLS method we have found only 4 explanatory variables has affected CAR and 10 explanatory variables has not affecting the CAR. Diagnostic test shows that there is existence of multicolliniarity, heteroscedasticity, and model specification bias and autocorrelation problems in OLS method.

5.4 Fixed Effect

It has two assumptions

- Constant is time invariant that means one point of time to another point of time constant remains same for every bank.
- There are some outside factors that may affect independent variable within every group or entity.

So, in this model we see whether outside variables are affecting the CAR or not.

Table 5.7: Regression results Fixed

car	Coef	St. Er	t-val	p-val	[95% Conf	Interval]	Sig
	.	r.					
BS (Bank Size)	.046	.016	2.88	.006	.014	.078	***
Dep (Deposits)	-.101	.431	-0.23	.816	-.97	.769	
LA (Loan to Assets)	.282	.312	0.91	.371	-.348	.912	
LD (Loan to Deposits)	-.036	.202	-0.18	.859	-.444	.372	
LLP (Loan Loss Provisions)	.478	.405	1.18	.246	-.341	1.296	
ROA Return on Assets	1.701	.996	1.71	.095	-.31	3.712	*
NIM (Net Interest Margin)	.547	1.011	0.54	.591	-1.495	2.588	
Lev (Leverage)	.006	.448	0.01	.989	-.899	.911	
CI (Cost to Income)	.042	.086	0.49	.629	-.131	.215	
NPLTL (NPL to Total Loan)	.104	.172	0.60	.55	-.244	.452	
GDPG (GDP Growth)	.342	.903	0.38	.707	-1.481	2.166	
Inf (Inflation)	.653	.72	0.91	.37	-.802	2.107	
FRG (Foreign Remittance Growth)	.066	.069	0.96	.344	-.073	.206	
Constant	-1.28	.654	-1.96	.057	-2.601	.041	*
Mean dependent var	0.106	SD dependent var				.105	
R-sq	0.319	obs				60	
F-test	1.373	Prob > F				.197	

*** $p < .01$, ** $p < .05$, * $p < .1$

Here R-square within the banks is 31.90% that means within the banks it has 31.90% variability happens within the banks on CAR due to all the explanatory variables.

F-test p value is greater than 5% that means independent variables are not jointly affecting the CAR.

In this fixed method only 1 independent variable namely bank-size significantly affect the CAR individually at 5% significant level. All other independent variables are not significantly affecting the CAR as there p value is greater than 5%.

Sigma_u represents mean error term of individual bank which is 0.1214. Sigma_e represent whole banks error terms which is 0.0568. Rho indicates growth which indicates 82.10% variability in CAR has been done because of the difference across the panels (difference from one bank to another bank).

5.5 Diagnostic test for Fixed effect

As we assume outside variable may affect the variables within every group and constant are time variant and also r-square is less than 60% there is no multicolliniarity and model specification bias problems in fixed method.

A. Heteroscedasticity

Table 5.8: Modified Wald test for group wise heteroskedasticity in fixed effect regression model

	CAR
Chi (10)	192.56
P-Value	0.0000

$$H_0: \sigma(i)^2 = \sigma^2 \text{ for all } i$$

Here p-value is less than 5%. So, H0 has been rejected. That means there is an existence of heteroscedasticity in this model.

B. Autocorrelation

If error term of one bank is correlated with error term of another bank there would be the problems of autocorrelation.

H0: there is no significant relationship between error term panels

H1: there is significant relationship between error term panels

Table 5.9: Correlation matrix of residuals :

	__e-1	__e-2	__e-3	__e-4	__e-5
__e-1	1.00				
__e-2	0.0285	1.00			
__e-3	-0.4191	-0.3906	1.00		
__e-4	0.2676	-0.6521	0.0814	1.00	
__e-5	0.0011	-0.5010	-0.1259	0.2298	1.00

Breusch -Pagan LM test of independence: $\chi^2(10) = 13.825$, $Pr = .1811$

Based on 12 complete observations over panel units

Here p-value is greater than 5% that means we accept H0. So, there is no significant relationship between error terms. So, there is no autocorrelation problems.

So this model is also good as It has no problems of multicollinearity, model specification bias, and autocorrelation problems. But it has only suffered from the problem of heteroscedasticity.

5.6 Random Effect

It has two assumptions

- Constant is time variant that means one time of time to another point of time constant change for every bank.
- There are some outside factors that will not affect independent variable within every group or entity.

As we assume outside variables have no impact and constant is change for every bank, there will be no problems of multicollinearity, model specification bias, heteroscedasticity and autocorrelation in Random effect.

Table 5.10: Regression results

car	Coef	St. Err.	t-val	p-val	[95% Conf Interval]	Sig
BS (Bank Size)	.042	.016	2.68	.007	.011 .073	***
Dep (Deposits)	-.679	.314	-2.16	.031	-1.295 -.063	**
LA (Loan to Assets)	.428	.212	2.02	.043	.013 .844	**
LD (Loan to Deposits)	-.327	.124	-2.65	.008	-.57 -.085	***
LLP (Loan Loss Provisions)	.395	.387	1.02	.308	-.364 1.154	
ROA Return on Assets	1.553	.928	1.67	.094	-.266 3.373	*
NIM (Net Interest Margin)	.588	.51	1.15	.249	-.411 1.587	
Lev (Leverage)	.372	.352	1.06	.291	-.318 1.062	
CI (Cost to Income)	-.036	.072	-0.50	.62	-.178 .106	
NPLTL (NPL to Total Loan)	-.103	.125	-0.83	.408	-.348 .141	
GDPG (GDP Growth)	.552	.914	0.60	.546	-1.239 2.344	
Inf (Inflation)	-.213	.663	-0.32	.748	-1.513 1.087	
FRG (Foreign Remittance Growth)	.068	.069	0.98	.327	-.068 .203	
Constant	-.483	.565	-0.86	.392	-1.59 .623	
Mean dependent var	0.106	SD dependent var				.105
Overall r-squared	0.758	obs				60
Chi-square	140.716	Prob > chi2				.000
R squared within	0.225	R squared between				.995

*** $p < .01$, ** $p < .05$, * $p < .1$

Here, bank-size, deposits, loan to asset, loan to deposit, ROA has been found significant in affecting the CAR. All other explanatory variables has been found insignificant in affecting CAR. P-value is also less than 5% that means all explanatory variables are jointly significantly affecting the CAR.

Which one is better?

OLS vs RE

Table 5.11:- Summary of the output of BP-LM Test

	CAR
Chi (10)	0.00
P-Value	1.00

H0: Pooled OLS is better than Random Effect for this model

As value of p is greater than 5%. So, H0 has been accepted. That means pooled OLS is better than random effect.

Fixed vs Random

Table 5.12: Summary of the output of the Hausman Test

	CAR
Chi2 (16)	7.82
P-Value	0.8984

H0: Random Effect is better than Fixed Effect for this model

Here value of p is greater than 5%. So H0 has been accepted. That means random effect is better than fixed effect.

So, Pooled OLS is best model among the 3 Models for explaining these results.

As we have found heteroscedasticity, autocorrelation problems in OLS and Fixed effect we should use further model named GLS (Generalized Least Square) model.

5.7 GLS (Generalized Least Square)

Assumptions

- Panels are homoscedastic. That means panels contain the non-constant error variance. So, there is no problem of heteroscedasticity.
- Initially assumes that there is no autocorrelation problem.

Table 5.13: Cross-sectional time-series FGLS regression

car	Coef	St. Err	t- val	p-val	[95% Conf	Interval]	Sig
BS (Bank Size)	.042	.014	3.10	.002	.016	.069	***
Dep (Deposits)	-.679	.272	-2.49	.013	-1.212	-.145	**
LA (Loan to Assets)	.428	.184	2.33	.02	.068	.788	**
LD (Loan to Deposits)	-.327	.107	-3.06	.002	-.537	-.118	***
LLP (Loan Loss Provisions)	.395	.335	1.18	.239	-.263	1.052	
ROA Return on Assets	1.553	.804	1.93	.053	-.023	3.129	*
NIM (Net Interest Margin)	.588	.442	1.33	.183	-.277	1.453	
Lev (Leverage)	.372	.305	1.22	.222	-.225	.969	
CI (Cost to Income)	-.036	.063	-0.57	.567	-.159	.087	
NPLTL (NPL to Total Loan)	-.103	.108	-0.96	.339	-.315	.108	
GDPG (GDP Growth)	.552	.792	0.70	.485	-.999	2.104	
Inf (Inflation)	-.213	.575	-0.37	.711	-1.339	.913	
FRG (Foreign Remittance Growth)	.068	.06	1.13	.258	-.05	.185	
Constant	-.483	.489	-0.99	.323	-1.442	.475	
Mean dependent var		0.106	SD dependent var			0.105	
Number of obs		60	Chi-square			187.622	
Prob > chi2		0.000	Akaike crit (AIC)			-156.647	

*** $p < .01$, ** $p < .05$, * $p < .1$

Here, out of 14 explanatory variables 8 variables have been found significant in affecting the CAR. Bank-size, deposits, loan to asset, loan to deposit and ROA have been found significant in affecting CAR as their p-value is less than 5%. All other explanatory variables are not significantly affecting CAR as their p-value is greater than 5%. But overall all explanatory variables have jointly significantly affecting the CAR as overall p-value is less than 5%.

5.8 GMM (Generalized Methods of Moments)

Previous 4 models not providing significant result. Only 4/5 variables are affecting CAR. So, GMM model should be used. When dataset suffers endogeneity problem that means explanatory variables are influenced by outside variables which are not incorporated in this model. As maximum variables has been found insignificant so we should use GMM popularly known as one step GMM approach which takes one year lag period dependent variable data. It has been used to resolved endogeneity problem, unobserved heteroscedastic problem.

Table 5.14: Regression results : GMM

car	Coef	St. Err.	t-val	p-val	[95% Conf Interval]	Sig
Lag CAR	.516	.103	5.04	0	.315 .717	***
BS (Bank Size)	.056	.015	3.73	0	.027 .086	***
Dep (Deposits)	-.453	.275	-1.65	.099	-.992 .086	*
LA (Loan to Assets)	.496	.183	2.71	.007	.138 .854	***
LD (Loan to Deposits)	-.236	.109	-2.16	.031	-.449 -.022	**
LLP (Loan Loss Provisions)	.916	.347	2.64	.008	.235 1.597	***
ROA Return on Assets	.732	.796	0.92	.357	-.827 2.292	
NIM (Net Interest Margin)	-.164	.42	-0.39	.695	-.987 .658	
Lev (Leverage)	.564	.287	1.96	.05	.001 1.127	**
CI (Cost to Income)	.088	.058	1.52	.128	-.025 .201	
NPLTL (NPL to Total Loan)	-.324	.123	-2.63	.009	-.565 -.083	***
GDPG (GDP Growth)	.714	.726	0.98	.326	-.71 2.138	
Inf (Inflation)	.404	.521	0.78	.438	-.617 1.426	
FRG (Foreign Remittance Growth)	.056	.052	1.08	.281	-.046 .159	
Constant	-1.32	.553	-2.40	.016	-2.414 -.245	**
Mean dependent var	0.103		SD dependent var		0.107	
Number of obs	55		Chi-square		637.404	

*** $p < .01$, ** $p < .05$, * $p < .1$

GMM has been adopted, with a one-year lag period, to analyze the persistency of capital adequacy as measured by CAR. Here P-values shows that maximum variables are significantly affecting the dependent variable CAR. Now out of 14 explanatory variables 8 variables have been found statistically significant in affecting CAR namely lag period CAR, bank-size, deposits, loan to asset , loan to deposits, loan provisions, ROA, leverage , NPL, and constant. Still 4 variables are not statistically significant here.

5.9 Unit Root Test

The LLC unit root test identifies whether the data set is stationary or not, meaning that mean variance and covariance of a data set are or non-constant across time. Here, for each explanatory variable and for the dependent variables unit root test has been performed.

H0: panels contain unit roots / panels not stationary

H1: panels are stationary

Table 5.15: LLC Unit Root Test

variables	Adjusted T -value	P-value	Results
Capital Adequacy Ratio	-2.0713	0.0192	stationary
Bank Size	0.9027	0.8166	Non-stationary
Deposits	-3.9985	0.0000	stationary
Loan to Assets	-2.2169	0.0133	Stationary
Loan to Deposits	-3.6375	0.0001	stationary
Loan Loss Provisions	-3.1282	0.0009	stationary
Return on Assets	-3.6588	0.0001	stationary
Net Interest Margin	-7.4407	0.0000	stationary
Leverage	-3.4360	0.0003	Stationary
Cost to income	-5.6607	0.0000	Stationary
Non-Performing Loan	-2.6836	0.0036	Stationary
IRS	-4.0387	0.0000	Stationary
GDP	-1.6783	0.0466	Stationary
inf	-15.8182	0.0000	Stationary
FRG	-2.1572	0.0155	stationary

The LLC unit root test for CAR of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of CAR are constant across time.

The LLC for Bank-size shows that the adjusted t value and p value are statistically insignificant; therefore H0 has been accepted that the data set is not stationary. It means the mean, variance, and co-variance of bank-size are not constant across time.

The LLC for deposits of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of deposits are constant across time.

The LLC for loans of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of loans are constant across time.

The LLC for laon to deposits of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of laon to deposits are constant across time.

The LLC for LLP of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of LLP are constant across time.

The LLC for ROA of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of ROA are constant across time.

The LLC for NIM of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of NIM are constant across time.

The LLC for Leverage of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of leverage are constant across time.

The LLC for Cost of income of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of Cost of income are constant across time.

The LLC for NPL of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of NPL are constant across time.

The LLC for Interest Spread of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of Interest Spread are constant across time.

The LLC for GDP of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of GDP are constant across time.

The LLC for Inflation of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of inflation are constant across time.

The LLC for Foreign Remittance of banks shows that the adjusted t value and p value are statistically significant; therefore H1 has been accepted that the data set is stationary. It means the mean, variance, and co-variance of Foreign Remittance are constant across time.

5.10 Summary output

Table 5.16: Summary of all Models

Variable	pols	re	fe	gls	gmm
Bank size	.04233*	.04233**	.046129**	.042330**	.056143***
Deposits	-.6788*	-.67880*	-0.101	-.678805*	-0.453
Loan to Assets	.42839*	.42839*	0.282	.428397*	.4957336**
Loan to Deposits	-.32741*	-.32742**	-0.036	-.327423**	-.235618*
Loan Loss Provisions	0.395	0.395	0.478	0.395	.915732**
Return on Assets	1.553	1.553	1.701	1.553	0.732
Net Interest Margin	0.588	0.588	0.547	0.588	-0.164
leverage	0.372	0.372	0.006	0.372	.56403*
Cost to income	-0.036	-0.036	0.042	-0.036	0.088
NPL to Total Loan	-0.103	-0.103	0.104	-0.103	-.323842**
GDP Growth	0.552	0.552	0.342	0.552	0.714
inflation	-0.213	-0.213	0.653	-0.213	0.404
Foreign Remittance Growth	0.068	0.068	0.066	0.068	0.056
car					
L1.		.51632976***			
_cons	-0.483	-0.483	-1.280	-0.483	-1.3294395*

legend: * p <0.05; ** p <0.01; *** p <0.001

Here, 3 star indicates very high significance which p-val is less than 1% or 0.01. Two star shows moderately significance which p-value is less than 5% or 0.05. Finally one star indicates only significance which p-value is less than 10% or 0.10.

In OLS 4 independent variables namely bank-size, deposits, loan to asset, loan to deposits are only significant as they have 1 star and significant at 10%

In random effect bank-size and loan to deposit has given 2 star as they are significant at 5% and deposits and loan to asset has given 1 star as they are significant at 10%.

In fixed only one variable namely bank-size has been given 1 star as it is significant at 10%.

In GLS 4 explanatory variables have been found significant in affecting CAR. All other explanatory variables are not significantly affecting the CAR.

Finally in GMM 8 variables have been found statistically significant in affecting CAR at 1%, 5% and 10% level.

Summary of Findings

The findings shows that the calculated coefficients suggest that no macroeconomic drivers employed in the models have substantial impact on CAR. So, all macroeconomic factors which we have incorporated are found statistically unimportant according to OLS, Fixed, Random, GLS, and GMM. According to OLS, FE, RE and GLS methodologies, capital adequacy of banks is substantially affected by some industry specific variables like bank-size, deposits, loan to assets, and loan to deposits, ROA, Loan loss provisions, and NIM. According to OLS approach this model suffers from the problem of multicollinearity, heteroscedasticity, model specification bias and autocorrelation concerns. For solving these difficulties GLS and GMM approaches has been incorporated. Finally, the GMM approach reveals that all of the additional independent factors strongly affect CAR, with the exception of return on assets (ROA), net income margin (NIM), cost of income, and macroeconomic drivers. In addition, the loan-to-asset ratio, loan-to-deposit ratio, net interest margin, and nonperforming loans all have a deleterious effect on capital adequacy. According to GMM, CAR is favorably influenced by all other factors. Unit Root Testing indicates that the variance, covariance, and mean of CAR are all stable. The model has a good fit for forecasting CAR as a metric of capital adequacy ratio, as it explains 75.80% of the variation in CAR using the Pooled OLS approach. The model could be improved for CAR prediction in future research using larger panel datasets and alternative performance criteria.

Chapter 06: Recommendations and Conclusion

6.1 Recommendations

State-owned commercial banks play a vital role in country's banking sector as well as whole economy. So, they must follow the rules and regulations given by Bangladesh bank. Capital adequacy is a vital element for every bank. While maintaining minimum capital, they have to follow the guidelines of Basel accord. From 2019 Basel-3 has implemented in our country. Some recommendations are given below for SOCBs about maintaining minimum capital.

- Every bank has to follow the guidelines of Basel-3 given by Bangladesh bank which has been implemented from January 2019.
- Bank should maintain CET-1 of at least 4.5% of the total Risk Weighted Assets
- They should also maintain minimum RWA Tier-1 Capital of 6%
- RWA Capital Requirement Ratio of 10% Minimum should be kept
- The maximum amount of additional T-1 capital that can be mentioned is 33.33% of CET1 or 1.5% of the total RWA, whichever is greater.
- CET-1 will be used to hold a Capital Conservation Buffer (CCB) equal to 2.5% of the total RWA over the minimum capital requirement. So, bank should also keep 2.5% CCB. Total 12.5% should be kept according to Basel-3 accord.
- Among these state-owned commercial banks no bank has kept 12.5% capital adequacy ratio. These should be monitored strictly by Bangladesh bank. Bank should follow these rules and regulations and should keep adequate CAR

6.2 Conclusion

The objective of the study was to determine the relationship between capital adequacy of SOCBs and several industry specific as well as macroeconomic variables, using a sample of 5 SOCBs in Bangladesh from 2010 to 2021.

The estimated coefficients reveal that no macroeconomic drivers used in the models have significant impact on CAR. So, all macroeconomic variables which we have incorporated are found statistically insignificant according to OLS, Fixed, Random, GLS, and GMM.

According to OLS, FE, RE and GLS methods, capital adequacy of banks is significantly affected by some industry specific variables like bank-size, deposits, loan to assets, and loan to deposits, ROA, Loan loss provisions, and NIM. According to OLS method this model suffers from the problem of multicollinearity, heteroscedasticity, model specification bias and autocorrelation problems. For solving these problems GLS and GMM methods has been incorporated.

Finally, when GMM approach has been applied, it is found that all independent variables which we have incorporated except ROA, NIM, cost of income, and macroeconomic drivers are significantly affecting CAR. In addition, capital adequacy is negatively affected by loan to asset ratio, loan to deposits, NIM, and NPL. CAR is positively affected by all other variables according to GMM. According to Unit Root Test, the variance, co-variance and mean of CAR are stationary. To conclude, for predicting CAR as measures of capital adequacy ratio, the model is a good fit as 75.80% variation in CAR is explained by the model under Pooled OLS approach. In future studies, larger panel datasets and additional performance indicators could be used to enhance the model for better prediction of CAR.

So, every bank of a Bangladesh should follow the guidelines of Bangladesh Bank about Capital Adequacy. BASEL-3 has been implemented in Bangladesh from 2015. So like others SOCBs should follow the rules and regulations of BASEL-3 in maintaining Capital Adequacy.

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Appendix

Bank Specific Variables

Bank	Year	CAR	BS	DEP	LA	LD	LLP	ROA	NIM	LEV	CI	NPLTL
Sonali	2010	0.11	24.85	0.77	0.46	0.60	0.16	0.00	0.01	0.06	0.59	0.24
Sonali	2011	0.13	24.96	0.77	0.50	0.65	0.11	0.01	0.01	0.08	0.47	0.18
Sonali	2012	-0.01	22.74	0.79	0.50	0.64	0.19	-0.03	-0.01	0.03	0.51	0.33
Sonali	2013	0.08	25.17	0.80	0.40	0.50	0.20	0.00	-0.02	0.06	0.80	0.31
Sonali	2014	0.12	25.26	0.83	0.36	0.43	0.16	0.01	-0.02	0.06	0.60	0.26
Sonali	2015	0.10	25.35	0.84	0.34	0.40	0.11	0.00	-0.02	0.06	0.62	0.25
Sonali	2016	0.10	25.51	0.86	0.32	0.37	0.10	0.00	-0.02	0.06	0.94	0.28
Sonali	2017	0.10	25.56	0.85	0.34	0.40	0.09	0.01	-0.02	0.05	0.84	0.35
Sonali	2018	0.10	25.60	0.84	0.34	0.42	0.09	0.00	-0.01	0.05	0.74	0.26
Sonali	2019	0.10	25.72	0.79	0.37	0.48	0.10	0.00	0.00	0.05	0.78	0.20
Sonali	2020	0.10	25.79	0.79	0.37	0.47	0.10	0.00	-0.01	0.05	0.75	0.18
Sonali	2021	0.10	25.86	0.79	0.40	0.51	0.09	0.00	-0.01	0.05	0.76	0.17
BDBL	2010	0.28	21.74	0.12	0.36	1.69	0.14	0.02	0.06	0.57	0.51	0.31
BDBL	2011	0.29	21.78	0.16	0.35	1.48	0.12	0.02	0.06	0.52	0.55	0.38
BDBL	2012	0.27	21.91	0.24	0.45	1.55	0.15	0.03	0.06	0.48	0.59	0.43
BDBL	2013	0.25	22.27	0.42	0.33	0.86	0.19	0.02	0.06	0.35	0.51	0.40
BDBL	2014	0.25	22.34	0.46	0.33	0.64	0.14	0.02	0.02	0.35	0.69	0.38
BDBL	2015	0.26	22.36	0.45	0.35	0.78	0.17	0.01	0.03	0.35	0.87	0.45
BDBL	2016	0.26	22.42	0.48	0.33	0.69	0.18	0.01	0.02	0.33	0.89	0.50
BDBL	2017	0.27	20.18	0.49	0.31	0.63	0.20	0.01	0.03	0.32	0.85	0.47
BDBL	2018	0.27	22.50	0.48	0.33	0.68	0.20	0.01	0.03	0.32	0.80	0.46
BDBL	2019	0.22	22.49	0.47	0.34	0.72	0.20	0.00	0.03	0.33	0.86	0.38
BDBL	2020	0.23	22.69	0.49	0.35	0.75	0.20	0.01	0.03	0.33	0.86	0.39
BDBL	2021	0.23	22.78	0.50	0.35	0.76	0.20	0.01	0.03	0.33	0.83	0.43
Agrani	2010	0.09	24.00	0.78	0.62	0.79	0.05	0.01	0.06	0.06	0.55	0.13
Agrani	2011	0.11	24.28	0.72	0.56	0.77	0.05	0.01	0.04	0.07	0.55	0.11
Agrani	2012	0.11	24.36	0.77	0.56	0.73	0.15	-0.05	0.02	0.02	0.73	0.25
Agrani	2013	0.10	24.51	0.79	0.46	0.58	0.16	-0.02	0.03	0.08	0.74	0.18
Agrani	2014	0.10	24.62	0.78	0.48	0.61	0.08	0.00	0.04	0.08	0.74	0.17
Agrani	2015	0.10	24.76	0.78	0.43	0.56	0.09	0.00	0.05	0.08	0.80	0.19
Agrani	2016	0.10	24.86	0.79	0.43	0.54	0.11	-0.01	0.04	0.06	0.87	0.26
Agrani	2017	0.10	24.93	0.79	0.47	0.60	0.09	0.01	0.05	0.06	0.81	0.17
Agrani	2018	0.10	25.09	0.79	0.50	0.64	0.07	0.00	0.04	0.05	0.83	0.18
Agrani	2019	0.10	25.17	0.81	0.55	0.67	0.06	0.00	0.03	0.05	0.83	0.14
Agrani	2020	0.10	25.42	0.84	0.48	0.56	0.05	0.00	0.03	0.04	0.80	0.12
Agrani	2021	0.08	25.51	0.84	0.50	0.59	0.05	0.00	0.03	0.03	0.90	0.17
Janata	2010	0.09	24.26	0.83	0.65	0.79	0.03	0.01	0.03	0.06	0.61	0.05
Janata	2011	0.10	24.52	0.81	0.58	0.71	0.03	0.01	0.03	0.08	0.61	0.06
Janata	2012	0.04	24.66	0.80	0.60	0.75	0.10	-0.04	0.02	0.03	0.71	0.17
Janata	2013	0.10	24.79	0.82	0.49	0.60	0.07	0.01	0.00	0.06	0.78	0.11

Janata	2014	0.10	24.87	0.82	0.51	0.62	0.07	0.01	0.00	0.06	0.81	0.12
Janata	2015	0.10	24.96	0.82	0.51	0.62	0.05	0.01	-0.01	0.07	0.81	0.12
Janata	2016	0.11	25.08	0.82	0.52	0.63	0.05	0.00	0.00	0.06	0.82	0.15
Janata	2017	0.10	25.11	0.81	0.57	0.71	0.05	0.00	0.01	0.06	0.78	0.17
Janata	2018	0.10	25.18	0.78	0.62	0.79	0.06	0.00	0.01	0.06	0.81	0.34
Janata	2019	0.10	25.22	0.77	0.61	0.79	0.06	0.00	0.01	0.06	0.86	0.27
Janata	2020	0.10	25.37	0.79	0.58	0.73	0.05	0.00	0.00	0.05	0.82	0.23
Janata	2021	0.09	25.55	0.81	0.56	0.69	0.05	0.00	0.00	0.04	0.85	0.18
BASIC	2010	0.09	22.54	0.80	0.75	0.94	0.12	0.01	0.03	0.07	0.72	0.57
BASIC	2011	0.10	22.78	0.80	0.73	0.88	0.11	0.01	0.03	0.07	0.73	0.53
BASIC	2012	0.10	23.12	0.80	0.78	0.92	0.12	0.00	0.02	0.06	0.81	0.56
BASIC	2013	-0.02	23.48	0.86	0.70	0.78	0.14	0.00	-0.01	0.04	0.92	0.59
BASIC	2014	-0.29	21.26	0.82	0.70	0.82	0.13	-0.01	-0.01	0.08	1.07	0.57
BASIC	2015	-0.08	23.69	0.76	0.66	0.85	0.14	-0.02	-0.01	0.13	1.22	0.51
BASIC	2016	-0.16	23.74	0.77	0.66	0.84	0.13	0.00	0.00	0.00	0.99	0.54
BASIC	2017	-0.13	23.71	0.72	0.73	1.00	0.15	-0.03	0.00	0.07	0.97	0.55
BASIC	2018	0.08	23.68	0.69	0.79	1.09	0.15	-0.02	-0.01	0.05	1.13	0.52
BASIC	2019	0.07	23.69	0.71	0.78	1.04	0.14	-0.02	-0.02	0.04	1.36	0.57
BASIC	2020	0.03	23.70	0.71	0.76	1.01	0.15	-0.02	-0.02	0.02	1.48	0.52
BASIC	2021	0.00	23.70	0.77	0.79	0.93	0.11	-0.02	-0.02	0.00	1.50	0.60

Macroeconomic Variables

Year	IRS	GDPG	Inf	FRG
2010	0.0501	0.0557	0.0813	0.09183
2011	0.0448	0.0646	0.114	0.22763
2012	0.0373	0.0652	0.0622	0.13511
2013	0.0187	0.0601	0.0753	-0.04378
2014	0.0315	0.0606	0.0699	0.07604
2015	0.0347	0.0655	0.0619	-0.01795
2016	0.0421	0.0711	0.0551	-0.13485
2017	0.0393	0.0659	0.057	0.21817
2018	0.0299	0.0732	0.0554	0.12059
2019	0.0278	0.0788	0.0559	0.11844
2020	0.0223	0.0345	0.0569	0.36138
2021	0.0228	0.0694	0.0555	-0.13587

