

A Thesis
on
An Empirical Analysis of Profitability on Commercial Banks: A
Study of Bangladesh

*This thesis is submitted to the Department of Finance and Banking, Faculty of Business Studies,
Hajee Mohammad Danesh Science and Technology University, Dinajpur for the partial fulfilment of
the degree of Master of Business Administration*



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Acknowledgement

This study entitled “An Empirical Analysis of Profitability on Commercial Banks: A Study of Bangladesh” has been prepared to fulfill the partial requirement for the MBA degree course of Hajee Mohammad Danesh Science and Technology University, Dinajpur.

First of all, I would like to express our gratitude to our creator almighty ALLAH for such great opportunity and every help and encourage at hard times. I acknowledge with gratitude to my honorable supervisor Professor Shahnaz Parvin and co-supervisor Dr. Md. Main Uddin Ahammed, Associate Professor from the core of my heart for their kind support, guidance, supervision, instructions and advice and for motivating me to do this study. I will never forget the kind cooperation I received from my honorable supervisor and co-supervisor.

At last but not least, I am fully indebted to of Hajee Mohammad Danesh Science and Technology University, Dinajpur for giving me an opportunity to complete my MBA in finance and for giving a scope to opportunity to work independently on a research project of my own design.

I have tried heart and soul to gather all relevant documents regarding this topic. I don't know how far I am able to do so. There may be shortcoming, mistaken opinion which are all mine and I alone am responsible for those but I will try to give a better volume in future.

.....

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Certificate of Supervisor

I hereby declare that the concerned study on entitled “An Empirical Analysis of Profitability on Commercial Banks: A Study of Bangladesh” is a work done by Sabnaj, bearing Student ID: 1703010, MBA in Finance, Department of Finance and Banking, Faculty of Business Studies, Hajee Mohammad Danesh Science and Technology University, Dinajpur-5200. She has performed her analyzing performance under my supervision and submitted this thesis for the partial fulfillment of the requirement of the degree of Bachelor of Business Administration.

I wish her every success in life.

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Professor Shahnaz Parvin

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I hereby declare that the concerned report on “An Empirical Analysis of Profitability on Commercial Banks: A Study of Bangladesh” is a work done by Sabnaj, bearing Student ID: 1703010, MBA in Finance, Department of Finance and Banking, Faculty of Business Studies, Hajee Mohammad Danesh Science and Technology University, Dinajpur-5200. She has performed her analyzing performance under my supervision and submitted this thesis for the partial fulfillment of the requirement of the degree of Bachelor of Business Administration.

I wish her every success in life.

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Student's declaration

I hereby declare that the concerned study on “An Empirical Analysis of Profitability on Commercial Banks: A Study of Bangladesh” has prepared by me during my thesis program which is supervised by Shahnaz Parvin, Professor, Department of Finance and Banking, Faculty of Business Studies, HSTU, Dinajpur.

I further affirm that work and information presented the study is original and part or whole has been submitted to, in any form, any other University or Institution for any degree or any other purpose.

.....

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Abstract

The main objective of the study is the empirical analysis of profitability of commercial bank through evaluating the effect of leverage, operating efficiency, non-performing loan and capital adequacy. For accomplishing this objective, secondary data have been used which have been collected from annual reports of 20 commercial banks during the period of 2013-2022. To obtain more efficient results the present study has used three profitability indicators earnings per share (EPS), return on equity (ROE) and return of asset (ROA); as dependent variables and Debt to Equity Ratio (DER), Operating Expenses to Operating Profit (BOPO), Non-Performing Loan and Capital Adequacy Ratio (CAR); as independent variables. To analyze the data three analytical techniques (pooled ordinary least square model; fixed-effect model and random-effects model) has been used to run regression model and to select the appropriate results F Test, Breusch and Pagan LM Test and Hausman Test have ben employed. Descriptive statistics, correlation matrix, regression method and hypothesis testing have been used to analyze the data. Among the three profitability indicators EPS has cooperatively high mean value than ROE and ROA which indicates that the banks have miss opportunities. The analytical results of the study show that DER has significant negative effect on ROE insignificant negative effect on ROA and EPS. CAR has significant negative effect on ROE, ROA while CAR has insignificant negative effect on EPS. NPL has insignificant negative effect on ROE while NPL has significant negative effect on ROA, EPS. BOPO has insignificant positive effect on ROE, ROA and EPS. Banks should give special focus to increase the profit to improve bank profitability and also should be careful of selecting borrowers.

Keywords: Profitability, Leverage, Operating efficiency, Non-performing loan and Capital Adequacy Ratio.

Table of Contents

CHAPTER	TITLE	PAGE
	Acknowledgement	i
	Certificate of Supervisor	ii
	Certificate of Co-supervisor	iii
	Student's Declaration	iv
	Abstract	v
	Table of Contents	vi-vii
	List of Figures	viii
	List of Tables	viii
CHAPTER 1	INTRODUCTION	1-6
1.1	Overview of the study	1
1.2	Background of the study	1
1.3	Research Question	2
1.4	Objectives of the study	2
1.5	Limitations of the study	3
1.6	Concept of Profitability	3
1.7	Concept of Return on Equity (ROE)	3
1.8	Concept of Return on Asset (ROA)	4
1.9	Concept of Earnings per Share (EPS)	4
1.10	Concept of Leverage	4
1.11	Concept of Operating Efficiency	5
1.12	Concept of Non- Performing Loan (NPL)	5
1.13	Concept of Capital Adequacy Ratio (CAR)	5
CHAPTER 2	LITERATURE REVIEW	7-13
CHAPTER 3	DATA AND METHODOLOGY	14-21
3.1	Nature of the study	14
3.2	Data and Sample	14
3.3	Variables	14
3.4	Analytical Techniques	16
3.5	Regression Model	16
3.6	Hypothesis Development	19

CHAPTER 4	RESULT AND DISCUSSIONS	22-35
4.1	Normality Test	22
4.2	Multicollinearity Analysis	22
4.3	Heteroskedasticity Test	23
4.4	Autocorrelation Test	24
4.5	Descriptive Statistics	24
4.6	Correlation Matrix	25
4.7	Regression Analysis	26
4.7.1	Effect of DER, BOPO, NPL and CAR on ROE	26
4.7.2	Effect of DER, BOPO, NPL and CAR on ROA	27
4.7.3	Effect of DER, BOPO, NPL and CAR on EPS	29
4.8	Selecting appreciate Panel Data Regression Models	30
4.9	Hypothesis Testing	33
CHAPTER 5	FINDINGS AND SUGGESTIONS	36-37
5.1	Summary of findings	36
5.2	Suggestions	37
CHAPTER 6	CONCLUSIONS, POLICY IMPLICATIONS AND FUTURE WORK	38-39
6.1	Conclusions	38
6.2	Policy Implications	39
6.3	Future work	39
	REFERENCES	40-44
	APPENDICES	45-52

List of Figures

FIGURE No.	TITLE	PAGE NO
Fig 3.1	Selection of Panel Data Regression Estimation Model	18
Fig 3.2	Conceptual Framework of Hypothesis Testing	21

List of Tables

Table No.	TITLE	PAGE NO
3.1	List of variables	14
4.1	Kolmogorov-Smirnov test for Normality testing	22
4.2	Multicollinearity test	22
4.3	Breusch-Pagan / Cook-Weisberg test for heteroscedasticity	23
4.4	Durbin-Watson test for autocorrelation test	24
4.5	Descriptive Statistics	24
4.6	Pearson Correlation Matrix	25
4.7	Effect of DER, BOPO, NPL and CAR on ROE	26
4.8	Effect of DER, BOPO, NPL and CAR on ROA	27
4.9	Effect of DER, BOPO, NPL and CAR on EPS	29
4.10	F Test for Selecting Between Ordinary Least Square Model (OLS) and Fixed Effect (FE) Model	30
4.11	Breusch and Pagan LM Test for Selecting Between Ordinary Least Square Model (OLS) and Random Effect	31
4.12	Hausman Test for Selecting Between Ordinary Fixed Effect (FE) Model And Random Effect (RE) Model	32
4.13	Hypothesis Testing	33

CHAPTER 1: INTRODUCTION

1.1 Overview of the Study

Commercial banks encourage and mobilize savings and also channel such savings into productive investment. So, banks are considered as most relevant financial institution in many countries. Banks are the financial institutions who work as the intermediaries between the depositors and borrowers. Banks are circulating and creating money for the economy by collecting funds from the surplus unit and lending it to the deficit unit. According to Sante et al., (2021) Banks are financial institutions that mediate between parties who have capital and those who need capital, besides that banks also provide other financial services.

The financial prosperity of a financial institution is dependent on the financial performance. The performance of the company is measured by evaluating the financial statement. Rahman (2014) stated one of his study that managerial competence and operational efficiency, credit worthiness, return on investments, profits of the business and return on assets are the financial performance indications. To reach the extreme production efficiency in the banking industry it is necessary to anticipate and maintain internal factors that affect performance of the bank. Demsetz & Lehn, (1985) stated that Profitability is an important measure of firms' performance and Return on Assets (ROA) and Return on Equity (ROE) are the mostly used accounting measures of firm performance. Profitability ratio analysis is one of the many ratios that can be used to assess a company's success (Bharathi, et al, 2022).

Jolevski and Dicevska (2019) stated in their study that the performance banks is of interest to the bank's shareholders as well as to other market participants such as depositors, lenders, regulators and competitors. There are many factors such as internal factors as well as external factors that influenced the Bank profitability. Liquidity, Non-Performing loan, leverages, capital adequacy ratio and operating efficiency are the internal factors that affect the bank's profitability while various macroeconomic indicators, competition and economic growth are the external factors that also effect the bank profitability.

1.2 Background of the Study

Upon completion of all the courses required for getting a Master of Business Administration (MBA) degree from HSTU, it is necessary to complete an at least 6-month thesis program. Thesis program provides a student an opportunity to work independently on a research project of his/ her own design and contribute to the scholarly literature in his/her field. Thesis

work represents thoughtful engagement in new academic scholarship. After completing my Masters of Business Administration (MBA) as a student I wanted to complete my thesis work which would be helpful for to get a new academic scholarship and my future professional career. As a Finance student I have chosen the topic “An Empirical Analysis of Profitability on Commercial Banks: A Study of Bangladesh”. I have completed this study based on the financial data collected from commercial banks websites of Bangladesh. This study is prepared on “An Empirical Analysis of Profitability on Commercial Banks: A Study of Bangladesh” under the guidance of Shahnaz Parvin, Professor, Department of Finance and Banking, HSTU, Dinajpur.

1.3 Research Questions

- (i) Have leverage, operating efficiency, non-performing loan and capital adequacy any negative or positive effect on profitability of commercial bank of Bangladesh?
- (ii) Are leverage, operating efficiency, non-performing loan and capital adequacy any significantly correlated with profitability of commercial bank of Bangladesh?

1.4 Objectives of the Study

The objectives of the study are follows:

- (i) To evaluate to what extent Leverage, and (DER) effect on profitability (ROE, ROA, EPS).
- (ii) To evaluate to what extent Operating Efficiency (BOPO) effect on profitability (ROE, ROA, EPS).
- (iii) To evaluate to what extent Non-Performing Loan (NPL) effect on profitability (ROE, ROA, EPS).
- (iv) To evaluate to what extent Capital Adequacy Ratio (CAR) effect on profitability (ROE, ROA, EPS).
- (v) To measure correlation among different elements of DER, BOPO, NPL, CAR, ROE, ROA, and EPS.

1.5 Limitation of the Study

Here are some barriers that I have faced in preparing this report:

- (i) This thesis work has been prepared based on only few months experience.
- (ii) Access to confidential information about the banks was restricted.
- (iii) For the lack of practical knowledge, some imperfection may be available in the paper.
- (iv) Most of the time financial statements do not reveal information necessary to prepare the paper.
- (v) All the employees of the bank are very busy. So, they do not have much time to share information.
- (vi) There is various information the bank officials cannot provide due to security and other corporate obligations.

1.6 Concept of Profitability

The progress and growth of a bank are excessively dependent on the performance of the bank. The performance of the company is measured by evaluating the financial statement. To determine the financial performance of a bank the level of profitability is one of the main indicators and the main objective of bank operations is to maximize the levels of profitability. Rahmah, (2020) stated in a study that Profitability shows the good or bad financial condition of a bank which will affect the trust of the parties are with the bank. The word profitability is the combination of profit and ability. Thus, profitability denotes ability to generate income or operating performance. Ruslan et al., (2019) stated in a study that Profitability is the ability of a commercial bank to generate profit from the regular business operation for a certain period. Profitability can be measured by Return on Equity (ROE), Return on Assets (ROE), Price Earning (PE) ratio, Earning Per Share (EPS) and Tobin's Q etc.

1.7 Concept of Return on Equity (ROE)

ROE is the profitability ratio which demonstrates the bank's ability to generate profit after tax by utilizing it possess capital owned by the Bank. There are several factors that caused good or bad condition of bank performance which can be measured by ROE (Widyakto, 2019).

1.8 Concept of Return on assets (ROA)

Return on assets (ROA) is one of the profitability ratios that focuses on a bank's ability to generate profits by utilizing its assets. By utilizing assets ROA measures the company's effectiveness in generating profits (Sekarwati, 2019). This ratio of a bank indicates the return of all funding provided by the bank. Fahmi, (2016), Wild et al., (2005) stated in a study that if bank had greater ROA value, it indicates that the bank's performance is getting better. This is because the greater ROA indicates the greater rate of return on investment. Conversely, the lower ROA value indicates the poor performance and management conditions. Brealey et al. (2011) stated in one of his study that higher value of ROA indicated that a business is more profitable.

1.9 Concept of Earnings per Share (EPS)

The profitability ratio, Earnings per share or (EPS) measures the extent to which a bank earns profit. In other words, it is the percentage of a bank's net income per share if all profits are distributed to shareholders. (Hasan, 2016), (Molla 2020) were used this ratio as the profitability indicator in their previous studies.

This ratio helps to understand whether a company's profits are increasing or decreasing over time. Thus, based on the present ratio, this ratio predicts the future profitability of a company. The higher EPS implies is considered to be more profitable for the company while the lower EPS indicates the poor performance and management conditions.

1.10 Concept of Leverage

Levered banks are relied on debt capital than equity capital. Optimal mixture of debt and equity would minimize the cost of capital and maximize the firm profitability which in turn enhances the market value of the firm. Mawlood, (2022) stated in his study that optimal debt lessens the cost of capital in a company while capitalizing on the company's value. The author also added that the optimal debt ratio is identified as one which improves a company's profitability. DER value is between 1-1.5 is considered good (British Business Bank, 2023).

Inappropriate combination of debt and equity have negative impact on the profitability of the banks. According to Siddik et al. (2017) to maximize the firm value, the manager has to be careful to choose the blend of debt and equity. If banks relying heavily on debt capital than the equity capital, these banks would be highly levered company.

1.11 Concept of Operating Efficiency

Operating Efficiency is the proportion of operating costs in relation to operating profit. Operating efficiency ratio refers to how well a company uses its resources to produce revenue. According to Sahajwala and Bergh (2000) and Sarker (2006) stated in their previous studies Operating efficiency is the proportion of operating expenses to operating income ratio (OEIO) which is used to measure management soundness. Many researchers in their previous studies proxied the operating efficiency variables by BOPO.

Sabir (2012) stated that the lower the level of BOPO ratio indicates that management is more efficient in using resources which lead to better management performance of the bank. Parisi (2017) added in his study that the lower the BOPO ratio means that the bank's performance is getting better.

1.12 Concept of Non-Performing Loan (NPL)

(Al-Amin et al., 2021) demonstrates Non-performing loan as the irregular loan wherein both interest and principle amount are remained unpaid regularly for a particular phase of time. NPL (Non-Performing Loan) is a ratio between the number of non-performing loans caused by the debtor due to not pay principal and interest and the amount of credit owned by the bank and then given to the debtor. If bank has greater NPL value, it will be worse for banks because of the greater number of non-performing loans that may lead to a decrease in the profitability ratio ROA (Laryea et al., 2016).

According to the International Monetary Fund, “a non-performing loan is any loan in which: interest and principal payments are more than 90 days overdue; or more than 90 days' worth of interest has been refinanced, capitalized, or delayed by agreement; or payments are less than 90 days overdue but are no longer anticipated. In other words, if the borrower has ceased to pay the principal value and interest, as stated in the loan repayment contract, it is referred to as non-performing loan. Patwary and Tasneem (2019) found in his study that NPL is substantial to explain ROA.

1.13 Concept of Capital Adequacy Ratio (CAR)

Capital Adequacy Ratio (CAR) is the comparison between a bank's core capital (tier-1) and supplementary capital (tier-2) to its risk-weighted assets and current liabilities which measure of a depositor's ability to absorb insolvency losses. Central bank is the regulate capital adequacy decision of commercial bank. If commercial bank is more dependent on excess

leverages than the equity capital which may lead to the commercial bank's insolvent in the process. Central banks regulate to prevent commercial banks from taking excess leverage. According to (Bangladesh Bank, 2021) Basel III guidelines and legislation which is disclosed by Bangladesh Bank, banks require to minimum capital requirement at 10%, as well as also to maintain additional Capital Conservation Buffer (CCB) at 2.5% in form of Common Equity Tier -1 (CET1) to their risk- weighted assets. A bank with a greater CAR is considered to be above the minimum requirements needed to suggest solvency. In the banking industry, insolvency risk means that the bank can no longer solvent enough to fulfill its financial obligations to depositors. Generally, a bank with a high capital adequacy ratio is considered safe and it is solvent to meet its financial obligations (Dabo et al., 2018). Dendawijaya (2005) stated that the Capital Adequacy Ratio (CAR) is the ratio measures the adequacy of capital owned by a bank to support assets that contain or generate risk, such as loans.

The CAR in banking industry may differ from time to time or from firm to firm due to various reasons. Long term financing and investment decisions are related to long term capital. (Paudel and Khanal) stated one of his study a wrong financing decision leads to wrong capital structure decision which resulting in high debt ratio while a wrong investment decision leads to loan default and profit decrement.

CHAPTER 2: LITERATURE REVIEW

Nabella et al. (2023) conducted a study by using secondary data obtained from the official website of the Financial Services Authority (OJK) to aims to determine whether there is a partial influence and how moderation forms on disbursed financing (PYD) on Islamic Banking Assets with Non-Performing Finance (NPF) as a moderating variable. MRA (Moderated Regression Analysis) method was employed and the finding revealed that there is a partial influence of PYD variables on Islamic Banking Assets.

Destiani et al. (2023) performed a study by collecting data from Sharia Rural Banks in Indonesia for the 2014-2021 period to determine the effect of Capital Adequency Ratio (CAR), Non-Performing Financing (NPF), Financing to Deposit Ratio (FDR), and Operating Efficiency Ratio (OER) on profitability as measured by Return On Assets (ROA) and Return On Equity (ROE). Multiple linear regression analysis method was used and the result was showed CAR and NPF have no effect on ROA. FDR has a positive effect on ROA while BOPO has a negative effect on ROA. Then CAR has a positive effect on ROE. NPF and FDR have no effect on ROE, while BOPO has a negative effect on ROE.

Sirait et al. (2023) performed a study by using the data from commercial banks on the BEI for the 2017-2021 period to explore the effect of the loan to deposit ratio, capital adequacy ratio, non performing loan, operational efficiency ratio, total asset turnover on the return on assets. Multiple regression analysis techniques were used and the results showed that partially operational efficiency ratio had a positive and significant effect on return on assets. Loan to deposit ratio and non-performing loan have a positive and do not have a significant effect on return on assets while Capital adequacy ratio and the total asset turnover had a negative and do not significant effect on return on assets.

Al-Sharkas and Al-Sharkas (2022) conducted a study by using static panel data for a sample of 24 banks covering the period 2008–2018 to examine the potential impact of capital adequacy ratios on bank profitability in a Jordanian context. Fixed- and random-effects estimation were developed and descriptive statistics and regression analysis were employed. The results showed that ROA was negatively correlated with the four capital adequacy ratios and ROE was positively related with core capital to risk weighted asset but negatively related with core capital to total asset and total equity to total asset.

Mawlood, (2022) conducted a study based on secondary data for the period from 2009 to 2020 to examine the impact of capital structure decisions on the profitability of commercial

banks. The results revealed that commercial banks with higher debt ratios tend to have lower profitability in Iraq. The author also added that the findings robust against a series of control variables, including different debt ratios and profitability measures

Kalbuana et al. (2022) conducted a study by using the sample of 18 companies with the period 2016-2020. The traditional assumption test of heteroskedasticity multicollinierity, normality test, correlation and determination coefficient test, simultaneous test, and partial test were employed. The findings revealed that company age had a significant positive impact on earnings management, audit quality had a significant negative impact on earnings management, leverage had no significant impact on earnings management and profitability had a positive impact on earnings management.

Uddin (2022) performed a study by using the panel data for a period of four years from 2017 to 2020 to analyze the influence of leverage, operating efficiency, non-performing loan, and capital adequacy ratio on the profitability of commercial banks in Bangladesh. Panel data regression model employed to meet the research questions and hypotheses and the result showed that debt-equity ratio (DER) has a negative and insignificant influence on profitability (ROA) while Non-performing loan (NPL) has also a negative and insignificant effect on ROA. BOPO ratio has a positive and insignificant impact on ROA while capital adequacy ratio (CAR) has a positive and significant effect on ROA.

Al-Amin et al. (2021) performed a study by using the previous twenty-three years, from 1997 to 2019 to determine the impact of non-performing loans (NPLs) on the financial performance of all Bangladeshi listed banks. OLS and VAT models, along with Test of Heteroscedasticity, Test of Normal Distribution and also Unit Root Test were employed. The results revealed that found that all independent variables i.e. NPLR, CAR, INF and PMR are statistically noteworthy to explain the dependent variable i.e. ROA.

Aprilyani et al. (2021) conducted a study by using the data of 14 companies listed and traded on the Indonesia Stock Exchange for the period of 2015-2019 to determine the effect of ERM, firm size, leverage, profitability, and dividend policy on firm value either simultaneously and partially. The results showed that leverage and profitability have a significant positive effect on firm value. On the other hand, ERM & firm size have a negative coefficient and have no significant effect, while dividend policy has a positive coefficient but does not have a significant effect on firm value.

Bunyaminu et al. (2021) conducted a study by using the bank data over the period 2008-2017 to examine the impact of financial leverage on profitability of recapitalized banks in Ghana. Random effects and fixed effects estimation strategies are employed. The results revealed that leverage have a significant negative effect on banks' profits regardless of the proxy of profitability.

Lambey et al. (2021) conducted a study using data from 65 manufacturing companies listed at the Indonesian Stock Exchange for the period of 2012 to 2019. Data were analysed by Path Analysis. The results revealed that profitability and firm size influence firm value significantly and positively. While the value of the firm is affected by profitability and firm, it is not influenced significantly and positively by firm age.

Afriyanto et al. (2021) performed a study by using a sample for the period 2016-2020 to examine the influence of the Capital Adequacy Ratio (CAR) and Loan Deposit Ratio (LDR), both partially and simultaneously, on Non-Performing Loans (NPL) in Conventional Commercial Banks in Indonesia. Using a data regression panel was employed. The results revealed that simultaneous hypothesis testing where CAR and LDR jointly have a significant effect on NPL while LDR has no effect on NPL of Conventional Commercial Banks with the calculation result.

Swandewi and Purnawati (2021) conducted study by using a sample of 24 banks to analyze the effect of non-performing loans on return on assets with a capital adequacy ratio as a mediator. Path analysis was employed and the results revealed that there is a negative and significant relationship between non-performing loans and capital adequacy ratio. The capital adequacy ratio has a positive and significant relationship with return on assets while Non-performing loan has a negative and significant relationship with return on assets.

Anggriani and Muniarty (2020) conducted a study based on the sample of 9 (nine) years for the period of 2010 to 2018 to find out and analyze whether there is an influence between Non-Performing Loans and Capital Adequacy Ratio both partially and simultaneously on the Profitability (ROA) of PT. method is a purposive sampling method. Multiple linear regression, hypothesis testing (t-test and F test) and the coefficient of determination was employed and the findings showed that that Non-performing Loans do not affect the Return on Assets (ROA) while Capital Adequacy Ratio has a significant effect on Return on Asset. As well as, simultaneously it proves that Non-Performing Loans and Capital Adequacy Ratio has impact ROA at PT.

Wicaksono and Yulianto (2020) conducted a study by using the data of 61 agricultural and mining sector companies listed on the Indonesia Stock Exchange for the period of 2014 to 2018 to evaluate the effect of profitability, leverage, and company size on environmental disclosure with the proportion of independent directors as moderator. Descriptive statistics and regression analysis had been employed. The results revealed that profitability does not influence on environmental disclosure. Leverage has a negative effect but company size has a positive effect on environmental disclosure.

Budhathoki et al. (2020) conducted a study to examine the impact of liquidity, leverage, and total assets size of the bank on profitability by collecting from 28 commercial banks operating in Nepal during the period of 2010/11 to 2016/17. Three ordinary-least-squares models were applied. The results showed that higher equity to assets ratio (lower leverage) positively affected to ROA and NIM, and was statistically significant—but was negatively related to ROE and statistically insignificant. The results also revealed that the higher bank size appeared favorable to the Nepalese commercial banks and was found to have positive effects on all three profitability measures: ROA, ROE, and NIM.

RAHMAN et al. (2020) present an empirical a study with an objective to find the impact of financial leverage on firm's profitability. Pooled Ordinary Least Squares (OLS), Fixed Effect (FE), and Generalized Method of Moments (GMM) models were employed. The finding of the Pooled OLS method revealed that a significant negative relationship between leverage and firm's profitability and that result was also consistent with the fixed effect and GMM method.

Anggari and Dana (2020) performed a study to examine the effect of Capital Adequacy Ratio (CAR), Third Party Fund, Loan to Deposit Ratio (LDR), and Bank Size to Profitability in banking companies listed in Indonesia Stock Exchange. The sample was collected from the Annual report for the period of 2016 to 2018. The results revealed that the Capital Adequacy Ratio, Third Party Fund, Bank Size have a positive and significant effect on profitability, while Loan to Deposit Ratio has a positive and insignificant effect on the Profitability of Banking Companies.

Khan et al., (2020) performed a study to scrutinize the determinants of NPLs observing a case of the banking sector in Pakistan over the period from 2005 to 2017. Random and fixed effects technique was used for regression model through STATA software and the findings revealed that the operating efficiency and profitability indicators have a negative association

with NPLs but were statistically significant, while capital adequacy and income diversification have a negative association with NPLs but were statistically insignificant.

NGUYEN (2020) performed a study by using a sample of 22 Vietnamese commercial banks for the period 2010-2018 to explore the impact of capital adequacy on bank profitability in the context of Basel II Accord implementation in Vietnam. Using panel data regression analysis was employed and the results revealed that bank capital adequacy, net interest margin, and non-interest income measures are positively correlated with profitability while non-performing loan and state ownership measure negatively effect on bank profitability.

Patwary and Tasneem (2019) conducted a study using the last twenty-one years data to examine the impact of non-performing loan ratio, capital adequacy ratio and provision maintenance ratio on the return on asset (ROA) of all banks. Ordinary Least Square (OLS) method and Vector Auto Regression (VAR) model were employed. The results showed that non-performing loan ratio and provision maintenance ratio are statistically significant to return on asset (ROA).

Risalah et al. (2018) performed a study by collecting data from annual report from Sharia Commercial Bank for the period of 2012 up to 2016. Multiple linear regression model and hypothesis testing was employed and the results revealed that CAR, Operational Expense to Operating Income, FDR, NPF, Third-Party Funds, and Profit Sharing simultaneously have a positive influence on Return on Assets (ROA) while the CAR, Operational Expense to Operating Income, FDR, and Profit Partially affect the ROA, for the variable NPF, and the Third-Party Fund partially no significant effect on ROA of Sharia Commercial Banks.

Kingu et al. (2018) conducted a study using panel data (2007 to 2015) of 16 commercial banks in Tanzania to examined the impact of Non-performing loans on bank's profitability. Descriptive statistics and multiple regression analysis estimation methods were employed. The study found that occurrence of non-performing loans is negatively associated with the level of profitability in commercial banks in Tanzania. The findings extend further the information asymmetry theory and bad management hypothesis.

Radivojevic and Jovovic (2017) conducted a study to examine the determinants of NPL ratio. Using the panel data from the sample of 25 emerging countries for the period from 2000 to 2011 pooled OLS estimation, fixed effects and random effects are employed. The results showed that NPLs rate can be mainly explained by crucial macroeconomic factors and bank-

specific factors. The dynamic estimation approach showed that the highly significant and positive effect of lagged NPLs ratio.

Jolevski (2017) conducted a study by using the panel data for the period 2007-2015 to investigate the influence of the non-performing loans ratio on profitability indicators in the banking system of the Republic of Macedonia. The correlation matrix and regression were employed between the nonperforming loan ratio of non-financial entities and profitability indicators. The results showed that negative correlation between the non-performing loans and profitability. The regression analysis showed that non-performing loans ratio has influence by reducing bank profitability.

Vinh (2017) conducted a study using bank-level data for 34 Vietnamese commercial banks over the period from 2005 to 2015 to investigate the impact of non-performing loans on profitability and lending behavior. Descriptive statistics and correlation matrix are employed. The results showed that that the nonperforming loan has a statistically significant negative effect on Vietnamese commercial banks profitability and lending behavior.

Rajha (2017) conducted a study by using the panel data during the period 2007-2012 to investigate the determinants of non-performing loans in the Jordanian banking sector. Descriptive statistics and regression analysis were employed and the results showed that large banks are not necessarily more effective to loan customers when compared to their smaller counterpart and economic growth and inflation rate have a negative and significant effect on non-performing loans.

Ugoani (2016) conducted a study by using the data from 20 Deposit Money Banks (DMBs) in Nigeria to examine the effects of nonperforming loan on bank profitability in Nigeria. The exploratory research design was adopted and descriptive and regression statistical methods were employed. The results showed that nonperforming loans portfolio has negative effect on bank profitability.

Adebisi and Matthew (2015) conducted a study to examine the impact of non-performing loans on firms' profitability of banks in Nigeria. Using the secondary data obtained from the Annual Report and Statement of Accounts of the NDIC for a period of 2006 to 2012 regression analysis was employed. One result revealed that there is no relationship between the Non-performing Loans (NPL) and Return on Assets (ROA) of Nigerian Banks and the second result showed that there is a relationship between the Non-performing Loan (NPL) and Return on Equity (ROE) of Nigerian Banks.

Janvisloo and Muhammad (2013) conducted a study using a dynamic panel data model on Malaysian commercial banking system for the 1997-2012 periods to examine relationship between banks loans quality and macroeconomic variables. The findings showed that there is a strong evidence of cyclical sensitivity of loan quality in Malaysia's commercial banking system.

A lot of work has been done on this topic in the above studies but a few studies has been done by using all the three analytical techniques that have been used in the present study by using the commercial banks data of Bangladesh as before. So far, no work has been done by using all the three-profitability ratio in one study as before. In this present study, I have used three profitability indicators to obtain more efficient results. This study is prepared by collecting 10 years data from 20 commercial banks of Bangladesh during the period of 2013-2022.

CHAPTER 3: DATA AND METHODOLOGY

3.1 Nature of the study

This study is an empirical research since the study has been done based on secondary data and some other empirical works. In other sense, this study is analytical because the aims of the study is to explore the cause and effects relationship among variables. To measure the variables the quantitative approach has been used in this study.

3.2 Data and Sample

The present study depends on secondary data of 20 Bangladeshi commercial bank. The data of this study has been collected from the annual reports for the period of 2013 to 2022.

3.3 Variables

In the present study there are three dependent variables and four independent variables have been used.

TABLE 3.1: List of variables

Determinants	Variables	Notation
Dependent Variables	Return on Equity	ROE
	Return on Asset	ROA
	Earnings per Share	EPS
Independent Variables	Leverage (Debt to Equity Ratio)	DER
	Operating Efficiency	BOPO
	Non-Performing Loan	NPL
	Capital Adequacy Ratio	CAR

Return on Equity (ROE)

This ratio is measured by dividing the after-tax net profit on total equity.

ROE=after tax net profit/total equity

The same ratio has been used by (SUNDAS and BUTT, 2021), (RAHMAN et al., 2020), (Awwad, 2022); (Al-Sharkas and Al-Sharkas, 2022) and (Bharathi, et al., 2022).

Return on Asset (ROA)

This ratio is measured by dividing the after-tax net profit on total asset.

$ROA = \text{after tax net profit} / \text{total asset}$

The same ratio has been used by (SUNDAS and BUTT, 2021), (Ramadhanti et al., 2021) (Sonia and Khafid, 2020), Uddin (2022) (Awwad, 2022), (Al-Sharkas and Al-Sharkas, 2022), (Alshebmi et al., 2020) and (Bharathi, et al, 2022).

Earnings per Share (EPS)

This ratio is measured by dividing the after-tax net profit on No. of share outstanding.

$EPS = \text{after tax net profit} / \text{No. of share outstanding}$

The same ratio has been used by (Awwad, 2022) and (Bharathi., et al, 2022).

Leverage (DER)

Leverage is measured by Debt to Equity ratio.

$\text{Debt to Equity ratio} = \text{Total debt} / \text{Total Equity}$.

The same ratio has been used by (Ramadhanti et al., 2021), (Sonia and Khafid, 2020) and Uddin (2022)

Operating Efficiency (BOPO)

Operating Efficiency is measured by BOPO.

$BOPO = \text{Total Operating Cost} / \text{Total Operating Income}$.

The same ratio has been used by Uddin (2022)

Non-Performing Loan (NPL)

Non-Performing Loan is measured by dividing Non-Performing Loans on Total Loans and Advances.

$NPL = \text{Non-Performing Loans} / \text{Total Loans and Advances}$.

The same ratio has been used by (SUNDAS and BUTT, 2021) Uddin (2022), (Al-Sharkas and Al-Sharkas, 2022), (Alshebmi et al., 2020)

Capital Adequacy Ratio

Capital Adequacy Ratio is measured by dividing Bank's Capital on Total Risks Weighted Assets.

$CAR = (\text{Tier 1 Capital} + \text{Tier 2 Capital}) / \text{Total Risks Weighted Assets}$.

The same ratio has been used by, (Al-Sharkas and Al-Sharkas, 2022)

3.4 Analytical Techniques

Using the secondary data, the following are the three types of panel analytic technique has been used to estimate the effects of capital adequacy ratio, non-performing loan operating efficiency ratio and debt equity ratios on profitability.

- (i) Pooled Ordinary Least Square (OLS) model;
- (ii) Random-Effects (RE) model;
- (iii) Fixed-Effect (FE) model;

Based on the results of F test, Breusch and Pagan (BP) LM test and Hausman test; the best analytical model has been selected. Uddin (2023) had used OLS model, RE model and FE model in his study and to select the appropriate model he had used Breusch and Pagan (BP) LM test and Hausman test. F test, LM test and Hausman test are used to select the appropriate model. Park (2011)

3.5 Regression Model

The regression model that I have used to estimate the effects of capital adequacy ratio, non-performing loan, operating efficiency ratio and debt equity ratios on profitability. The model is given below:

$$Y_{it} = \alpha + X_{it}\beta + \varepsilon_{it}$$

$$Y_{it} = \alpha + X_{it}\beta + u_{it} + \varepsilon_{it}$$

$$Y_{it} = \alpha + X_{it}\beta + \varepsilon_{it}$$

Here, $i = 1, 2, \dots, N$; $t = 1, 2, \dots, T$

Where; Y_{it} is the dependent variable (bank's profitability) of bank i in period t . X_{it} is the independent variable (DER, BOPO, NPL and CAR) of bank i in period t ; α is constants or intercept; u_{it} is the errors within entities; β is the regression coefficient and ε_{it} is the error term.

$$ROE_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + u_i + \varepsilon_{it} \quad (2)$$

$$ROE_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + \varepsilon_{it} \quad (3)$$

$$ROA_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + \varepsilon_{it} \quad (4)$$

$$ROA_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + u_i + \varepsilon_{it} \quad (5)$$

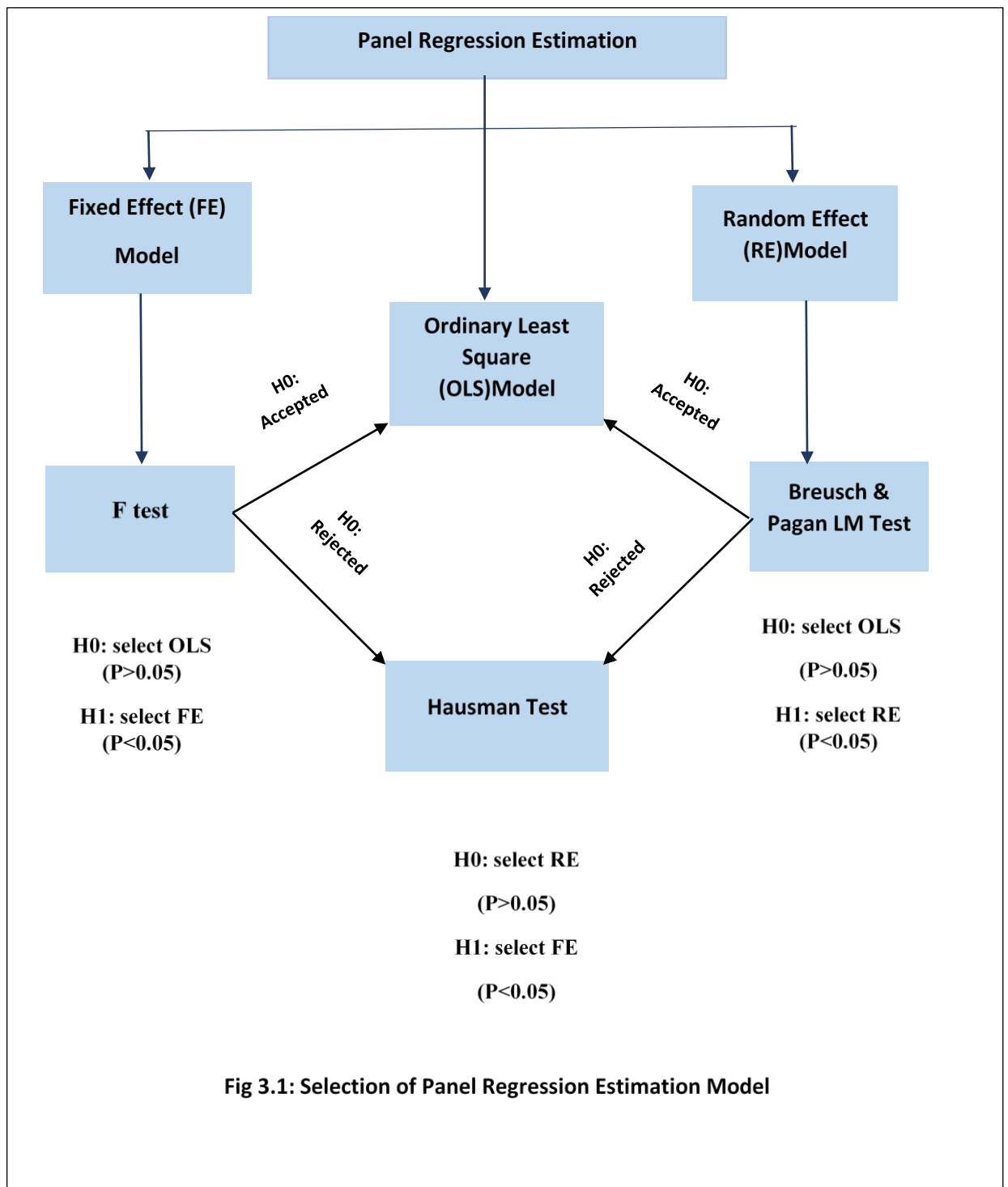
$$ROA_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + \varepsilon_{it} \quad (6)$$

$$EPS_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + \varepsilon_{it} \quad (7)$$

$$EPS_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + u_i + \varepsilon_{it} \quad (8)$$

$$EPS_{it} = \alpha_{it} + DER_{it}\beta_0 + BOPO_{it}\beta_1 + NPL_{it}\beta_2 + CAR_{it}\beta_3 + \varepsilon_{it} \quad (9)$$

Here, ROE_{it} (Return on equity), ROA_{it} (Return on asset), and EPS_{it} (Earning per share) are financial profitability measure for bank i in year t . DER_{it} , $BOPO_{it}$, NPL_{it} and CAR_{it} indicate Leverage, Operating Efficiency Ratio, Non-Performing Loan and Capital Adequacy ratio for bank i in year t , respectively. α is constants or intercept. β_{0-3} is the regression coefficient; u_{it} is the errors within entities and ε_{it} is the error term. Using these regression model OLS model; RE model and FE model have been performed. Microsoft Excel, Microsoft Word, and STATA software have been used to estimate all the statistical computations.



3.6 Hypothesis development

Based on the review of related literatures and research questions and regression model the following hypotheses have undertaken for the present study:

Destiani et al. (2023) revealed in his study that CAR has a positive effect on ROE while BOPO has a negative effect on ROE. Do et al. (2020) Found NPL has negative effect on profitability.

For convergence of such information and proper decision making by the researchers the following hypothesis are taken into consideration:

H1: There prevails a negative and significant association between Leverage (DER) and ROE.

H2: There prevails a negative and significant association between Operating Efficiency (BOPO) and ROE.

H3: There prevails a negative and significant association between Non-Performing Loan (NPL) and ROE.

H4: There prevails a positive and significant association between Capital Adequacy Ratio (CAR) and ROE.

Uddin (2022) revealed in his study that DER and NPL have negative effect on ROA while CAR has a positive and significant effect on ROA. Destiani et al. (2023) revealed in his study that BOPO has a negative effect on ROA. Swandewi and Purnawati (2021) revealed in his study that CAR has positive and significant effect on ROA while NPL has negative and significant effect on ROA.

For convergence of such information and proper decision making by the researchers the following hypothesis are taken into consideration:

H5: There prevails a negative and significant association between Leverage (DER) and ROA.

H6: There prevails a negative and significant association between Operating Efficiency (BOPO) and ROA.

H7: There prevails a negative and significant association between Non-Performing Loan (NPL) and ROA.

H8: There prevails a positive and significant association between Capital Adequacy Ratio (CAR) and ROA.

Do et al. (2020) Found NPL has negative effect on profitability.

For convergence of such information and proper decision making by the researchers the following hypothesis are taken into consideration:

H9: There prevails a negative and significant association between Leverage (DER) and EPS.

H10: There prevails a negative and significant association between Operating Efficiency (BOPO) and EPS.

H11: There prevails a negative and significant association between Non-Performing Loan (NPL) and EPS.

H12: There prevails a positive and significant association between Capital Adequacy Ratio (CAR) and EPS.

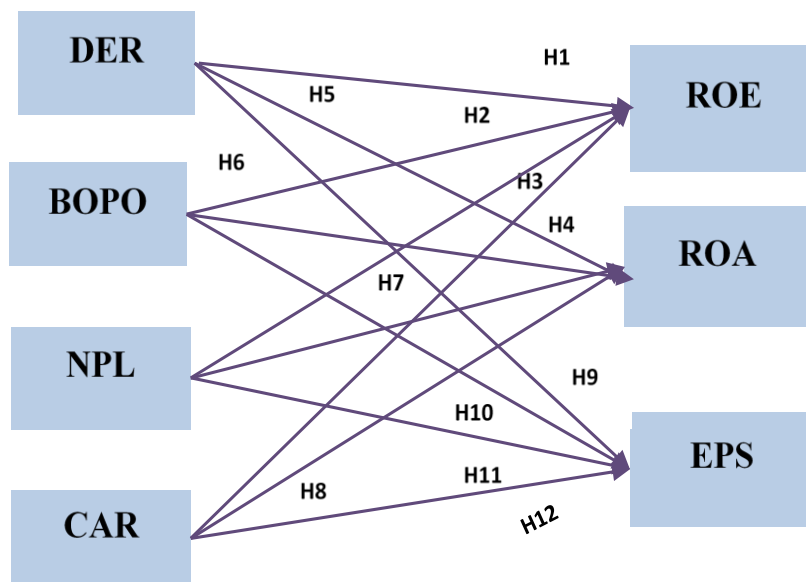


Fig 3.2: Conceptual Framework of Hypothesis Testing

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1 Normality test

Table: 4.1 Kolmogorov-Smirnov test for Normality testing

	Kolmogorov-Smirnov ^a		
	Statistic	df	sig
ROE	.009	197	.200*
ROA	.008	197	.200*
EPS	.010	197	.200*

(Source: output STATA 15)

*. This is a lower bound of the true significance

a. Lilliefors Significance Correction

Okeniyi and Okeniyi (2012) stated that normality K-S p-value could be applied if the dataset of up to $n \leq 2000$. Table 4.1 represent a summary of normality test. Kolmogorov-Smirnov has been used to test normality of the data. Kolmogorov-Smirnov show statistic value of ROE, ROA and EPS .009,.008 and .010 respectively with a significant value of $.200 > .05$. Thus, it can be concluded that the data has been in this study normal distribution data. Suroso (2022); Sukmadewi (2020) had used Kolmogorov- Smirnov Test in their previous study.

4.2 Multicollinearity Analysis

Table: 4.2 Multicollinearity Test

	ROE		ROA		EPS	
	1/VIF (TOLERANCE)	VIF	1/VIF (TOLERANCE)	VIF	1/VIF (TOLERANCE)	VIF
DER	.962	1.039	.917	1.091	.917	1.091
BOPO	.909	1.100	.910	1.099	.909	1.100
NPL	.822	1.216	.764	1.310	.763	1.310
CAR	.871	1.148	.883	1.132	.884	1.132

(Source: output STATA 15)

Table 4.2 represent Multicollinearity testing result. Oke et al., (2019) stated in their study that multicollinearity among independent variables can cause significant complications with the

estimation of β as well as the interpretation and also emphasized to concentrate on correlation, tolerance and variance inflation factor to detect multicollinearity issues. Jamal (2017) stated in his study that if the value of VIF exceeds 5 or 10, it means that the regression coefficients are poorly calculated and it happens due to the presence of multicollinearity. This table indicates that the tolerance value of DER, BOPO, NPL and CAR is higher than 0.10 and the VIF value of such variables is less than 10. So, it can be concluded that there is no presence of multicollinearity problem from the independent variables. Sukmadewi (2020) had used this test in his previous study.

4.3 Heteroscedasticity Test

Table: 4.3 Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

	chi2	Prob > chi2
ROE	0.62	0.4304
ROA	0.39	0.5313
EPS	11.50	0.0007

(Source: output STATA 15)

Table 4.3 represent the result of heteroscedasticity test. Breusch-Pagan / Cook-Weisberg test is used for heteroscedasticity testing. While ROE and ROA is used as profitability indicators the chi2 is .62 and .39. Whereas the P value of chi2 (.4304 and .5313) are greater than .05. So, it can be concluded that there is no heteroscedasticity problem in the model. While EPS is used as profitability indicator the chi2 is 11.50 and p value of chi2 is 0.0007 which is less than .05. So, it can be concluded that there is a heteroscedasticity problem in this model. Griffiths and Surekha (1985) stated that the presence of heteroscedasticity of error variances lead to insufficient parameter estimates and biased variance estimates.

4.4 Autocorrelation Test

Table 4.4: Durbin-Watson test for autocorrelation test

	d- statistics
ROE	1.040
ROA	1.156
EPS	0.856
Independent variables: DER, BOPO, NPL, CAR	

Source: STATA output

Table 4.4 represent Durbin-Watson test to test autocorrelation. Uyanto (2020) states that Durbin-Watson value d- statistics lies between 0 and 4. Durbin-Watson, $d=2$ indicates no autocorrelation; $d < 2$ indicates positive serial correlation; $d > 2$ indicates negatives serial correlation. In the present table, d-statistics value of ROE, ROA and EPS are 1.040, 1.156 and 0.856 respectively. Thus, it can be concluded that there is positive serial correlation. Andhika et al., (2021); Sukmadewi (2020) have used durbin-watson test in their previous study to test autocorrelation.

4.5 Descriptive Statistics

Table : 4.5 Descriptive Statistics

	N	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
ROE	199	-1.20	1.42	.1076	.49885	.000	.172	-.230	.343
ROA	199	-.03	.05	.0073	.01533	.000	.172	-.230	.343
EPS	199	-20.09	25.40	2.6558	8.64938	.000	.172	-.230	.343
DER	200	-341.1602	52.25522	11.16204	26.89708	-11.610	.172	150.383	.343
BOPO	200	-2.71404	167.85110	1.45453	11.8913	13.919	.172	195.539	.343
NPL	200	.00000	.59797	.09672	.12302	2.575	.172	6.607	.343
CAR	200	-.28401	1.96438	.13787	.17529	8.087	.172	77.508	.343
Valid N (list wise)	197								

(Source: output STATA 15)

TABLE: 4.5 represents a summary of Descriptive statistics of dependent and independent variable. The table represents mean, minimum, maximum value, standard deviation, skewness, and kurtosis of the observed value of 20 commercial bank of the year 2013-2022. The mean of ROE, ROA and EPS are .1076, .0073 and 2.6558 respectively and standard deviation of .49885, .01533 and 8.64938. On the other hand, the mean of DER, BOPO, NPL and CAR are 11.16204, 1.45453, .09672 and .13787 respectively and standard deviation of 26.89708, 11.8913, .12302 and .17529. The highest value of mean is 11.16204 of DER and lowest value of mean is .0073 of ROA. The highest value of standard deviation is 26.89708 of DER and lowest value of standard deviation is 0.01533 of ROA. The value of skewness and kurtosis are .000 and -230 which are same value for all profitability ratio. On the other hand, the skewness of DER, BOPO, NPL and CAR are -11.610, 13.919, 2.575 and 8.087 respectively and kurtosis are 150.383, 195.539, 6.607 and 77.508.

4.6 Correlation Matrix

Table 4.6: Pearson Correlation Matrix

	ROE	ROA	EPS	DER	BOPO	NPL	CAR
ROE	1						
ROA	.738**	1					
EPS	.580**	.440**	1				
DER	-.342**	.031	.116	1			
BOPO	-.165*	-.153*	-.130	.054	1		
NPL	-.437**	-.622**	-.292**	-.241**	.268**	1	
CAR	-.042	.146*	-.066	-.012	-.038	-.323**	1

(Source: output STATA 15)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.6 represents correlation between independent variables and dependent variables. The table shows that ROE is positively correlated with ROA and EPS at 1% significant level and while negatively correlated with DER, BOPO, NPL and CAR at 1% and 5% significant level. ROA is positively correlated with EPS, DER and CAR while negatively correlated with BOPO and NPL. EPS is positively correlated with DER and negatively correlated with NPL,

BOPO and CAR. DER is positively correlated with BOPO and negatively correlated with NPL and CAR. BOPO is positively correlated with NPL at 1% significant level and negatively correlated with CAR. NPL is negatively correlated with CAR at 1% significant level.

4.7 Regression Analysis

4.7.1 Effect of DER, BOPO, NPL and CAR on ROE

Table 4.7: Effect of DER, BOPO, NPL and CAR on ROE

	Model 1			Model 2			Model 3		
	Ordinary Least Square (OLS) Model			Random Effects (RM) Model			Fixed Effects (FE) Model		
	Coef.	t	P value	Coef.	t	P value	Coef.	t	P value
DER	-.0175517	-5.85	0.000***	-.0197403	-6.98	0.000***	-.0201763	-6.97	0.000***
BOPO	-.0000903	-0.04	0.970	.000304	0.14	0.887	.0007246	0.34	0.733
NPL	-2.079878	-7.68	0.000***	-1.543992	-4.17	0.000***	-.8479864	-1.60	0.111
CAR	-.7396956	-4.18	0.000***	-.4549389	-2.94	0.003***	-.3883959	-2.51	0.013**
Constant	.6330772	9.75	0.000***	.569725	7.01	0.000***	.5010984	6.71	0.000***
R square	0.3452			0.2255			0.2336		
F statistics	0.000						0.000		

Note. *significant at 0.10, ** significant at 0.05 and *** significant at 0.01 level

(Source: output STATA 15)

Table: 4.7 represents the effect of DER, BOPO, NPL and CAR on the profitability ratio ROE. OLS model represents DER, NPL and CAR have significant negative effect on ROE while BOPO has insignificant negative effect on ROE. R square value is 0.3452 which means that the independent variables (DER, BOPO, NPL and CAR) explain 34.52% of the changes in the dependent variable Return on Equity (ROE) and the rest is attributed to other factors. F statistics indicate the significant results and Durbin-Watson value is 1.040 which reveals positive autocorrelation.

Random effect model (RE) also reveal significant negative effect of DER, NPL and CAR on ROE. On the other hand, BOPO has insignificant positive effect on ROE. R square value is 0.2255 which means that the independent variables (DER, BOPO, NPL and CAR) explain 22.55% of the changes in the dependent variable Return on Equity (ROE) and the rest is attributed to other factors

Fixed Effect (FE) model reveal significant negative effect of DER and CAR on ROE while insignificant negative impact of NPL on ROE. On the other hand, BOPO has insignificant positive effect on ROE. R square value is 0.2336 which means that the independent variables (DER, BOPO, NPL and CAR) explain 23.36% of the changes in the dependent variable Return on Equity (ROE) and the rest is attributed to other factors. F statistics indicate the significant results.

The result of CAR is consistent with (ALNAJJAR and Othman, 2021), (Youssef, 2016), (Hersugondo et al., 2021).

4.7.2 Effect of DER, BOPO, NPL and CAR on ROE

Table 4.8: Effect of DER, BOPO, NPL and CAR on ROA

	Model 4			Model 5			Model 6		
	Ordinary Least Square (OLS) Model			Random Effects (RM) Model			Fixed Effects (FE) Model		
	Coef.	t	P value	Coef.	t	P value	Coef.	t	P value
DER	-.0000652	-.1.93	0.055*	-.0000275	-0.90	0.368	-4.41406	-0.15	0.880
BOPO	.0000525	0.69	0.494	.0000263	0.39	0.698	.0000324	0.51	0.614
NPL	-.0838951	-10.38	0.000***	-.0692232	-6.78	.000***	-.0194116	-1.21	0.228
CAR	-.0066002	-1.25	0.212	-.0110006	-2.26	0.024*	-.0145103	-3.10	.002***
Constant	.0170336	10.59	0.000***	.0158218	8.13	.000***	.011221	5.78	.000***
R square	0.3840			0.0301			0.0575		
F statistics	0.0000						0.0338		

Note. *significant at 0.10, ** significant at 0.05 and *** significant at 0.01 level

(Source: output STATA 15)

Table: 4.8 represents the effect of DER, BOPO, NPL and CAR on the profitability ratio ROA. OLS model represents DER and CAR have insignificant negative effect on ROA while NPL has significant negative effect on ROA. BOPO has insignificant positive effect on ROA. R square value is 0.3840 which means that the independent variables (DER, BOPO, NPL and CAR) explain 38.40% of the changes in the dependent variable Return on Asset (ROA) and the rest is attributed to other factors. F statistics indicate the significant results. Durbin-Watson value is 1.156 which reveals positive autocorrelation.

Random effect model (RE) reveal insignificant negative effect of DER and insignificant positive effect of BOPO on ROA while NPL and CAR have significant negative effect on ROA. R square value is 0.0301 which means that the independent variables (DER, BOPO, NPL and CAR) explain 3.01% of the changes in the dependent variable Return on Asset (ROA) and the rest is attributed to other factors.

Fixed Effect (FE) model reveal insignificant negative effect of DER and NPL on ROA, while insignificant positive effect of BOPO on ROA. On the other hand, CAR has significant negative effect on ROA. R square value is 0.0575 which means that the independent variables (DER, BOPO, NPL and CAR) explain 5.75% of the changes in the dependent variable Return on Asset (ROA) and the rest is attributed to other factors. F statistics indicate the significant results

The result of BOPO, NPL and CAR is inconsistent with (Sukmadewi, 2020) (Silitonga 2020). The result of CAR is consistent with (ALNAJJAR and Othman, 2021), (Youssef, 2016), (HERSUGONDO et al., 2021). The results of leverage are inconsistent with (Silitonga 2020). The result of CAR is inconsistent with the result of (Risalah, 2018). The result of BOPO is inconsistent with the result of (Destiani et al., 2023).

4.7.3 Effect of DER, BOPO, NPL and CAR on ROE

Table 4.9: Effect of DER, BOPO, NPL and CAR on EPS

	Model 7			Model 8			Model 9		
	Ordinary Least Square (OLS) Model (Robust)			Random Effects (RM) Model			Fixed Effects (FE) Model		
	Coef.	t	P value	Coef.	t	P value	Coef.	t	P value
DER	0.0125403	0.96	0.338	-.0108395	-0.69	0.489	-.014098	-0.92	0.357
BOPO	-.0376375	-1.64	0.103	.0154353	0.45	0.655	.0228666	0.68	0.497
NPL	-22.72121	-3.29	0.001***	-21.44067	-3.15	0.002***	-20.16835	-2.40	0.018**
CAR	-8.454539	-5.77	0.000***	-4.081394	-1.63	0.104	-3.503424	-1.43	0.155
Constant	5.926735	7.49	0.000***	5.428876	3.72	0.000***	5.206263	5.13	.000***
R square	0.1170			0.0415			0.0423		
F statistics	37.82		0.000				1.93		0.1073

Note. *significant at 0.10, ** significant at 0.05 and *** significant at 0.01 level

(Source: output STATA 15)

Table: 4.9 represents the effect of DER, BOPO, NPL and CAR on the profitability ratio EPS. OLS model represents DER has insignificant positive effect on EPS while BOPO has insignificant negative effect on EPS. On the other hand, NPL and CAR have significant negative effect on EPS. R square value is 0.1170 which means that the independent variables (DER, BOPO, NPL and CAR) explain 11.70% of the changes in the dependent variable Earning per Share (EPS) and the rest is attributed to other factors. F statistics indicate the significant results and Durbin-Watson value is 1.040 which reveals positive autocorrelation.

Random effect model (RE) also reveal insignificant negative effect of DER and CAR on EPS while insignificant positive effect of BOPO on EPS. NPL has significant negative effect on EPS which indicates that any increase in NPL will have an impact on the decrease in EPS. R square value is 0.0415 which means that the independent variables (DER, BOPO, NPL and CAR) explain 4.14% of the changes in the dependent variable Earning per Share (EPS) and the rest is attributed to other factors.

Fixed Effect (FE) model reveal insignificant negative effect of DER and CAR on EPS while insignificant positive impact of BOPO on EPS. NPL has significant negative effect on EPS

that indicate any increase in NPL will have an impact on the decrease in EPS. R square value is 0.0423 which means that the independent variables (DER, BOPO, NPL and CAR) explain 4.23% of the changes in the dependent variable Earning per Share (EPS) and the rest is attributed to other factors. F statistics indicate the significant results.

4.8 Selecting appropriate Panel Data Regression Models

Table 4.10: F Test for Selecting Between Ordinary Least Square Model (OLS) and Fixed Effect (FE) Model

Dependent Variables	F value	P-value	Ho Rejected/ Accepted	Decision
ROE	6.68	0.0000	H0 rejected (0.0000 < 0.05)	Fixed Effect (FE)
ROA	6.33	0.0000	H0 rejected (0.0000 < 0.05)	Fixed Effect (FE)
EPS	16.18	0.0000	H0 rejected (0.0000 < 0.05)	Fixed Effect (FE)

(Source: output STATA 15)

Table 4.10 shows selection of appropriate panel data regression model between ordinary least square (OLS) Model and fixed effect (FE) model. F test has been used to select between pooled ordinary least square and fixed effect model. Park (2011) stated in his study that Fixed Effect Model is tested by F test which is based on loss of goodness- of-fit. Furthermore, he concluded that the rejection of null hypothesis indicates the significant increment of goodness-of -fit in fixed effect model. According to this literature the hypothesis can be formulated as,

H0: OLS Model is appropriate

H1: FE Model is appropriate.

The F test results of model ROE, ROA and EPS are show that the calculated p-value is lower than significance level α 0.05 (0.0000<.05) which implies that null hypothesis is rejected. Thus, Fixed Effect (FE) model is appropriate.

The same test has been used by Park (2011), Andhika et al., (2021).

Table 4.11: Breusch and Pagan LM Test for Selecting Between Ordinary Least Square Model (OLS) and Random Effect (RE) Model

Dependent Variables	Chi2	P-value	Ho Rejected/ Accepted	Decision
ROE	87.93 (sigmamore)	0.0000	H0 Rejected (0.0000<0.05)	Random Effect (RE)
ROA	58.42	0.0000	H0 Rejected (0.0000<0.05)	Random Effect (RE)
EPS	287.4 (sigmamore)	0.0000	H0 Rejected (0.0000<.05)	Random Effect (RE)

(Source: output STATA 15)

Table 4.11 represents Breusch and Pagan LM Test. Breusch and Pagan LM test is used to select between ordinary least square (OLS) Model and random effect (RE) model (Zulfikar, 2018). Park (2011) stated in his study that Fixed Effect Model is tested by Breusch and Pagan LM test and also concluded that the rejection of null hypothesis indicates the significant Random Effect in the panel data. According to this literature the hypothesis can be formulated as,

H0: OLS Model is appropriate

H1: RE Model is appropriate.

The BP test results of model ROE, ROA and EPS are show that the calculated p-value is lower than significance level α 0.05 (0.0000<.05) which implies that null hypothesis is rejected. Thus, random effect model is appropriate.

The same test has been used by Park (2011).

Table 4.12: Hausman Test for Selecting Between Ordinary Fixed Effect (FE) Model And Random Effect (RE) Model

Dependent Variables	Chi2	P-value	Ho Rejected/ Accepted	Decision
ROE	11.35	0.0229	H0 Rejected (0.0229<.05)	Fixed Effect (FE)
ROA	5.54	0.2362	H0 Accepted (0.2362>0.05)	Random Effect (RE)
EPS	16.29	0.0026	H0 Rejected (0.0026<0.05)	Fixed Effect (FE)

(Source: output STATA 15)

Table 4.12 represents Hausman Test. Hausman Test has been applied to select between Fixed Effect (FE) Model and random effect (RE) model. Hausman test is used to select between Fixed Effect (FE) Model and random effect (RE) model (Zulfikar, 2018). Park (2011) stated that if the individual effects un correlated with others regressors then null hypothesis is not rejected. According to this literature the hypothesis can be formulated as,

H0: RE Model is appropriate

H1: FE Model is appropriate.

The Hausman test results of model ROE and EPS are that the calculated p-value is lower than significance level α 0.05 (0.0229<.05 and 0.0026<0.05) which implies that null hypothesis is rejected. Thus, Fixed effect model is appropriate while Hausman test results of model ROA is that the calculated p-value is greater than significance level α 0.05 (0.2362>0.05) which implies that null hypothesis is accepted. Thus, Random effect model is appropriate.

The same test has been used by Park (2011); Andhika et al., (2021).

4.13 Hypothesis Testing

Table 4.11: Hypothesis Testing

Hypothesis	Results	Decision
H1: There prevails a negative and significant association between Leverage (DER) and ROE.	Based on the fixed effect technique represents on table: 7 the coef. value of DER is -.0201763 which indicating a negative association between DER and ROE. The P- value of DER is 0.000 which is less than the significance level implying that there is a significant effect of DER on ROE. Thus, the hypothesis testing shows the significant negative result.	Accepted
H2: There prevails a negative and significant association between Operating Efficiency (BOPO) and ROE.	Based on the fixed effect technique represents on table: 7 the coef. value of BOPO is .0007246 which indicating a positive association between BOPO and ROE. The P- value of BOPO is 0.733 which is higher than the significance level implying that there is a insignificant effect of BOPO on ROE. Thus, the hypothesis testing shows the insignificant positive result.	Rejected
H3: There prevails a negative and significant association between Non-Performing Loan (NPL) and ROE.	Based on the fixed effect technique represents on table: 7 the coef. value of NPL is -.8479864 which indicating a negative association between NPL and ROE. The P- value of NPL is 0.111 which is higher than the significance level implying that there is a insignificant effect of NPL on ROE. Thus, the hypothesis testing shows the insignificant negative result.	Rejected
H4: There prevails a positive and significant association between Capital Adequacy Ratio (CAR) and ROE.	Based on the fixed effect technique represents on table: 7 the coef. value of CAR is -.3883959 which indicating a negative association between CAR and ROE. The P- value of CAR is 0.013 which is less than the significance level implying that there is a significant effect of CAR on ROE.	Rejected

	Thus, the hypothesis testing shows the significant negative result.	
H5: There prevails a negative and significant association between Leverage (DER) and ROA.	Based on the Random effect technique represents on table: 6 the coef. value of DER is -.0000275 which indicating a negative association between DER and ROA. The P- value of DER is 0.368 which is higher than the significance level implying that there is a insignificant effect of DER on ROA. Thus, the hypothesis testing shows the insignificant negative result.	Rejected
H6: There prevails a negative and significant association between Operating Efficiency (BOPO) and ROA.	Based on the Random effect technique represents on table: 6 the coef. value of BOPO is .0000263 which indicating a positive association between BOPO and ROA. The P- value of BOPO is 0.698 which is higher than the significance level implying that there is a insignificant effect of BOPO on ROA. Thus, the hypothesis testing shows the insignificant positive result.	Rejected
H7: There prevails a negative and significant association between Non-Performing Loan (NPL) and ROA.	Based on the Random effect technique represents on table: 6 the coef. value of NPL is -.0692232 which indicating a negative association between NPL and ROA. The P- value of NPL is 0.0000 which is higher than the significance level implying that there is a significant effect of NPL on ROA. Thus, the hypothesis testing shows the significant negative result	Accepted
H8: There prevails a positive and significant association between Capital Adequacy Ratio (CAR) and ROA.	Based on the Random effect technique represents on table: 6 the coef. value of CAR is -.0110006 which indicating a negative association between CAR and ROA. The P- value of CAR is 0.024 which is less than the significance level implying that there is a significant effect of CAR on ROA. Thus, the hypothesis testing shows the significant	Rejected

	negative result.	
H9: There prevails a negative and significant association between Leverage (DER) and EPS	Based on the fixed effect technique represents on table: 8 the coef. value of DER is -.014098 which indicating a negative association between DER and EPS. The P- value of DER is 0.357 which is higher than the significance level implying that there is a insignificant effect of DER on EPS. Thus, the hypothesis testing shows the insignificant negative result.	Rejected
H10: There prevails a negative and significant association between Operating Efficiency (BOPO) and EPS.	Based on the fixed effect technique represents on table: 7 the coef. value of BOPO is .0228666 which indicating a positive association between BOPO and EPS. The P- value of BOPO is 0.497 which is higher than the significance level implying that there is a insignificant effect of BOPO on ROE. Thus, the hypothesis testing shows the insignificant positive result.	Rejected
H11: There prevails a negative and significant association between Non-Performing Loan (NPL) and EPS.	Based on the fixed effect technique represents on table: 7 the coef. value of NPL is -20.16835 which indicating a negative association between NPL and EPS. The P- value of NPL is 0.018 which is less than the significance level implying that there is a significant effect of NPL on EPS. Thus, the hypothesis testing shows the significant negative result	Accepted
H12: There prevails a positive and significant association between Capital Adequacy Ratio (CAR) and EPS.	Based on the fixed effect technique represents on table: 7 the coef. value of CAR is -3.503424 which indicating a negative association between CAR and EPS. The P- value of CAR is 0.155 which is higher than the significance level implying that there is a insignificant effect of CAR on EPS. Thus, the hypothesis testing shows the insignificant negative result.	Rejected

CHAPTER 5: FINDINGS AND SUGGESTIONS

5.1 Summary of Findings

- i. The descriptive statistics results display that DER has largest mean and standard deviation. On the other hand, ROA has lowest mean and standard deviation. Furthermore, BOPO has the largest skewness and kurtosis.
- ii. The correlation matrix displays both positive and negative correlation of independent with dependent variables. The multicollinearity testing results displays there is no multicollinearity problem in the independent variables.
- iii. For the Regression Model (1,2,3) while the profitability indicator is ROE, Breusch-Pagan LM test rejects Ordinary Least Squares (OLS) and accepts Random Effect (RE) model while Hausman Test (sigmamore) rejects Random Effect (RE) model and accepts Fixed Effect (FE) model. The result shows that DER and CAR have significant negative effect while NPL has insignificant negative effect on ROE. Furthermore, BOPO has insignificant positive effect on ROE.
- iv. For the Regression Model (4, 5, 6) while the profitability indicator is ROA, Breusch-Pagan LM test rejects Ordinary Least Squares (OLS) and accepts Random Effect (RE) model. Furthermore, Hausman Test rejects Fixed Effect (FE) and accepts Random Effect (RE) model. Random Effect (RE) model shows that insignificant negative effect of DER and insignificant positive effect of BOPO on ROA while NPL and CAR have significant negative effect on ROA.
- v. For the Regression Model (7,8,9) while the profitability indicator is EPS, Breusch-Pagan LM test rejects Ordinary Least Squares (OLS) and accepts Random Effect (RE) model while Hausman Test rejects Random Effect (RE) model and accepts Fixed Effect (FE) model. The result shows that insignificant negative effect of DER and CAR on EPS while insignificant positive impact of BOPO on EPS. NPL has significant negative effect on EPS.
- vi. The hypothesis testing shows that ROE has significant negative relation with DER while ROE has insignificant positive relation with BOPO. Furthermore, ROE has insignificant negative relation with NPL while significant negative relation with CAR.

- vii. The hypothesis testing shows that ROA has insignificant negative relation with DER while ROA has insignificant positive relation with BOPO. Furthermore, ROA has significant negative relation with NPL and CAR.
- viii. The hypothesis testing shows that EPS has insignificant negative relation with DER and CAR while EPS has insignificant positive relation with BOPO. Furthermore, EPS has significant negative relation with NPL.

5.2 Suggestions

- (i) Banks should focus to improve their profitability ratio Return on Equity (ROE), and Return on Asset (ROA), Earning per Share (EPS), that have the lowest mean value.
- (ii) Banks should give special focus on debt financing to increase the profit to improve bank profitability but at the same time debt financing is also related with highest risks.
- (iii) Banks should be able to diminish the level of non-performing loans as it has negative impact on the level of profitability.
- (iv) Banking should be careful of selecting borrowers.
- (v) Banks operation management should be intact and competent in taking operating activities decisions.
- (vi) Banks should give focus on utilizing the resources efficiently.
- (vii) The commercial banks should focus on to maintain capital as per regulators guidelines.

CHAPTER 6: CONCLUSIONS POLICY IMPLICATION AND FUTURE WORK

6.1 Conclusions

The present study analyzes profitability of commercial banks of Bangladesh through evaluating the effect of leverage, operating efficiency, non- Performing loan and capital adequacy. For this purpose, the profitability ratios ROE, ROA and EPS have been as the dependent variables. On the other hand, DER, BOPO, NPL and CAR have been used as independent variables. To attain the objective secondary data has been collected from 20 commercial banks of Bangladesh during the period of 2013 to 2022. Using the panel data Ordinary Least Squares (OLS), Random Effect (RM) and Fixed Effect (FE) analytical techniques and to select the appropriate technique; F Test, Breusch and Pagan LM test and Hausman test have been employed.

The descriptive statistics shows that ROE and ROA have the low mean value which indicates that the banks have miss opportunities. Banks should focus on to increase the profit to improve bank profitability. On the other hand, DER has the highest mean value which indicates that banks are dependent on debt equity. The analytical results of the study show that DER has significant negative effect on ROE insignificant negative effect on ROA and EPS. CAR has significant negative effect on ROE, ROA while CAR has insignificant negative effect on EPS which indicates that the higher the value of CAR it will reduce the profitability. The result CAR is opposite of financial theory which indicates a weak financial condition of commercial banks. Moreover, many of the commercial banks of Bangladesh have reached a percentage that is higher than the minimum set according to the Basel Convention. NPL has insignificant negative effect on ROE while NPL has significant negative effect on ROA, EPS which indicate that any increase in NPL will have an impact on the decrease in profitability. The commercial of Bangladesh should be able to diminish the level of non-performing loans as it will have a negative impact on the level of profitability. BOPO has insignificant positive effect on ROE, ROA and EPS. Banks operation management should be intact and competent in operating activities.

6.2 Policy Implications

The present study is expected to be useful for the commercial banks to understand how to handle their present risks and to improve their profitability. This study is expected to be useful for the banks to understand the necessity to maintain the minimum capital requirement as per Basel III guidelines and reduce against potential risks without affecting shareholder returns. This study will provide insight not only banking sector but also will be useful for other financial institution of Bangladesh. It will be useful for both the manufacturing and no manufacturing industry.

6.3 Future Work

The present study is prepared based on only 10 years data of commercial bank of Bangladesh. Comparative study can be done on this topic in more details by adding more dimensions and extending the study period.

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Appendices

```
. regress ROE DER BOPO NPL CAR
```

Source	SS	df	MS	Number of obs	=	199
Model	17.0162743	4	4.25406858	F(4, 194)	=	25.57
Residual	32.2760191	194	.166371233	Prob > F	=	0.0000
Total	49.2922935	198	.248950977	R-squared	=	0.3452
				Adj R-squared	=	0.3317
				Root MSE	=	.40789

ROE	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
DER	-.0175517	.0029995	-5.85	0.000	-.0234675	-.0116358
BOPO	-.0000903	.0025514	-0.04	0.972	-.0051223	.0049417
NPL	-2.079878	.2708358	-7.68	0.000	-2.614039	-1.545718
CAR	-.7396956	.1770122	-4.18	0.000	-1.088811	-.3905802
_cons	.6330772	.0649066	9.75	0.000	.5050641	.7610903

```
. xtreg ROE DER BOPO NPL CAR, re
```

```
Random-effects GLS regression           Number of obs   =       199
Group variable: ID                     Number of groups =        20
```

```
R-sq:                                Obs per group:
    within = 0.2255                      min =          9
    between = 0.4468                     avg  =         9.9
    overall = 0.3265                     max  =        10
```

```
corr(u_i, X)   = 0 (assumed)           Wald chi2(4)      =       67.36
                                           Prob > chi2       =       0.0000
```

ROE	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
DER	-.0197403	.0028263	-6.98	0.000	-.0252798	-.0142009
BOPO	.000304	.0021413	0.14	0.887	-.0038929	.0045009
NPL	-1.543992	.3701316	-4.17	0.000	-2.269437	-.8185477
CAR	-.4549389	.1548112	-2.94	0.003	-.7583632	-.1515145
_cons	.569725	.0813118	7.01	0.000	.4103568	.7290932
sigma_u	.21804335					
sigma_e	.3269268					
rho	.30787243	(fraction of variance due to u_i)				

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{ROE}[\text{ID}, t] = \text{Xb} + u[\text{ID}] + e[\text{ID}, t]$$

	Var	sd = sqrt(Var)
ROE	.248951	.4989499
e	.1068811	.3269268
u	.0475429	.2180434

```
chibar2(01) =      87.93
Prob > chibar2 =      0.0000
```

Fixed-effects (within) regression
Group variable: ID

```
Number of obs      =      199
Number of groups   =       20
```

```
within    = 0.2336
between   = 0.3305
overall   = 0.2690
```

```
min = 9
avg = 9.9
max = 10
```

$$\text{corr}(u_i, Xb) = 0.1355$$

F(4,175)	=	13.33
Prob > F	=	0.0000

ROE	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
DER	-.0201763	.0028953	-6.97	0.000	-.0258905	-.0144621
BOPO	.0007246	.0021211	0.34	0.733	-.0034617	.0049109
NPL	-.8479864	.5291575	-1.60	0.111	-1.892338	.1963654
CAR	-.3883959	.1545177	-2.51	0.013	-.693354	-.0834378
_cons	.5010984	.0747316	6.71	0.000	.3536071	.6485896
sigma_u	.30762334					
sigma_e	.3269268					
rho	.46960741	(fraction of variance due to u_i)				

F test that all u i=0: $F(19, 175) = 6.68$

Prob > F = 0.0000

```
. hausman FEROE REROE,sigmamore
```

	— Coefficients —		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FEROE	(B) REROE		
DER	-.0201763	-.0197403	-.000436	.0008558
BOPO	.0007246	.000304	.0004206	.0003087
NPL	-.8479864	-1.543992	.6960058	.3928046
CAR	-.3883959	-.4549389	.066543	.0295211

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

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 11.35
 Prob>chi2 = 0.0229

```
. regress ROA DER BOPO NPL CAR
```

Source	SS	df	MS	Number of obs	=	199
Model	.018157782	4	.004539445	F(4, 194)	=	30.23
Residual	.029130661	194	.000150158	Prob > F	=	0.0000
				R-squared	=	0.3840
				Adj R-squared	=	0.3713
Total	.047288442	198	.000238831	Root MSE	=	.01225

ROA	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
DER	-.0000652	.0000337	-1.93	0.055	-.0001317	1.34e-06
BOPO	.0000525	.0000766	0.69	0.494	-.0000986	.0002035
NPL	-.0838951	.0080842	-10.38	0.000	-.0998393	-.0679509
CAR	-.0066002	.0052722	-1.25	0.212	-.0169984	.003798
_cons	.0170336	.0016092	10.59	0.000	.0138599	.0202073

```
. xtreg ROA DER BOPO NPL CAR, re
```

```
Random-effects GLS regression           Number of obs   =           199
Group variable: ID                     Number of groups  =            20

R-sq:                                Obs per group:
    within = 0.0301                      min =              9
    between = 0.6388                     avg =             9.9
    overall = 0.3749                      max =             10

corr(u_i, X) = 0 (assumed)              Wald chi2(4)      =           47.51
                                           Prob > chi2       =           0.0000
```

ROA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
DER	-.0000275	.0000306	-0.90	0.368	-.0000874	.0000324
BOPO	.0000263	.0000678	0.39	0.698	-.0001066	.0001592
NPL	-.0692232	.0102115	-6.78	0.000	-.0892374	-.0492091
CAR	-.0110006	.004864	-2.26	0.024	-.020534	-.0014673
_cons	.0158218	.0019462	8.13	0.000	.0120074	.0196363
sigma_u	.00464661					
sigma_e	.00993298					
rho	.17954355	(fraction of variance due to u_i)				

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

ROA[ID,t] = Xb + u[ID] + e[ID,t]

Estimated results:

	Var	sd = sqrt(Var)
ROA	.0002388	.0154541
e	.0000987	.009933
u	.0000216	.0046466

Test: Var(u) = 0

chibar2(01) = 58.42
Prob > chibar2 = 0.0000

```
. xtreg ROA DER BOPO NPL CAR, fe
```

```
Fixed-effects (within) regression      Number of obs   =      199
Group variable: ID                    Number of groups =      20
```

```
R-sq:                                Obs per group:
    within = 0.0575                      min =      9
    between = 0.3009                     avg  =     9.9
    overall = 0.1351                      max  =     10
```

```
corr(u_i, Xb) = 0.2544                  F(4,175)         =      2.67
                                          Prob > F         =     0.0338
```

ROA	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
DER	-4.41e-06	.0000291	-0.15	0.880	-.0000618	.000053
BOPO	.0000324	.0000641	0.51	0.614	-.0000941	.0001589
NPL	-.0194116	.0160456	-1.21	0.228	-.0510793	.0122562
CAR	-.0145103	.0046814	-3.10	0.002	-.0237497	-.005271
_cons	.011221	.0019425	5.78	0.000	.0073872	.0150548
sigma_u	.01153219					
sigma_e	.00993298					
rho	.57409131	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(19, 175) = 6.33                      Prob > F = 0.0000
```

```
. estimates store FEROA
```

```
. hausman FEROA REROA
```

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FEROA	(B) REROA		
DER	-4.41e-06	-.0000275	.0000231	.
BOPO	.0000324	.0000263	6.10e-06	.
NPL	-.0194116	-.0692232	.0498117	.0123768
CAR	-.0145103	-.0110006	-.0035097	.

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

```
Test: Ho: difference in coefficients not systematic
```

```
chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
          =      5.54
Prob>chi2 =      0.2362
(V_b-V_B is not positive definite)
```

```
. regress EPS DER BOPO NPL CAR, robust
```

```
Linear regression               Number of obs   =          199
                                F(4, 194)         =          37.82
                                Prob > F          =          0.0000
                                R-squared         =          0.1170
                                Root MSE       =          8.2109
```

EPS	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
DER	.0125403	.0130454	0.96	0.338	-.0131887	.0382693
BOPO	-.0376375	.0229836	-1.64	0.103	-.0829673	.0076923
NPL	-22.72121	6.899134	-3.29	0.001	-36.32814	-9.114269
CAR	-8.454539	1.464978	-5.77	0.000	-11.34387	-5.565211
_cons	5.926735	.7916033	7.49	0.000	4.365482	7.487989

```
. xtreg EPS DER BOPO NPL CAR, re
```

```
Random-effects GLS regression   Number of obs   =          199
Group variable: ID              Number of groups =           20
```

```
R-sq:                               Obs per group:
    within = 0.0415                      min =           9
    between = 0.1263                     avg  =          9.9
    overall = 0.1002                     max  =          10
```

```
corr(u_i, X) = 0 (assumed)           Wald chi2(4)     =          11.32
                                      Prob > chi2       =          0.0232
```

EPS	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
DER	-.0108395	.0156617	-0.69	0.489	-.0415358	.0198568
BOPO	.0154353	.0345387	0.45	0.655	-.0522592	.0831299
NPL	-21.44067	6.816484	-3.15	0.002	-34.80073	-8.080606
CAR	-4.081394	2.510102	-1.63	0.104	-9.001103	.8383147
_cons	5.428876	1.460765	3.72	0.000	2.565828	8.291923
sigma_u	4.9246492					
sigma_e	5.2073083					
rho	.47212392	(fraction of variance due to u_i)				

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{EPS}[\text{ID},t] = \text{Xb} + u[\text{ID}] + e[\text{ID},t]$$

Estimated results:

	Var	sd = sqrt(Var)
EPS	74.80886	8.649212
e	27.11606	5.207308
u	24.25217	4.924649

Test: Var(u) = 0

chibar2(01) = 287.48
Prob > chibar2 = 0.0000

```
. xtreg EPS DER BOPO NPL CAR, fe
```

Fixed-effects (within) regression
Group variable: ID

Number of obs = 199
Number of groups = 20

R-sq:

within = 0.0423
between = 0.1172
overall = 0.0947

Obs per group:

min = 9
avg = 9.9
max = 10

corr(u_i, Xb) = 0.0654

F(4,175) = 1.93
Prob > F = 0.1073

EPS	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
DER	-.014098	.0152541	-0.92	0.357	-.0442036	.0160076
BOPO	.0228666	.0335982	0.68	0.497	-.0434433	.0891765
NPL	-20.16835	8.411897	-2.40	0.018	-36.77017	-3.566523
CAR	-3.503424	2.454217	-1.43	0.155	-8.347096	1.340249
_cons	5.206263	1.013886	5.13	0.000	3.205245	7.207282
sigma_u	6.8079286					
sigma_e	5.2073083					
rho	.63089299	(fraction of variance due to u_i)				

F test that all u_i=0: F(19, 175) = 16.18

Prob > F = 0.0000

```
. estimates store FEeps
```

```
. hausman FEeps REeps,sigmamore
```

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FEeps	(B) REeps		
DER	-.014098	-.0108395	-.0032585	.0018689
BOPO	.0228666	.0154353	.0074313	.003742
NPL	-20.16835	-21.44067	1.272322	5.402776
CAR	-3.503424	-4.081394	.5779705	.3730806

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

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 16.29
 Prob>chi2 = 0.0026

```
. estat hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
 Ho: Constant variance
 Variables: fitted values of ROE

chi2(1) = 0.62
 Prob > chi2 = 0.4304

```
. estat hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
 Ho: Constant variance
 Variables: fitted values of ROA

chi2(1) = 0.39
 Prob > chi2 = 0.5313

```
. estat hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
 Ho: Constant variance
 Variables: fitted values of EPS

chi2(1) = 11.50
 Prob > chi2 = 0.0007