



The Effect of COVID-19 on the Profitability of Commercial Banks in Bangladesh

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ABSTRACT

Purpose: Every component of the global financial system has suffered serious harm due to the present COVID-19 pandemic, and Bangladesh is not an exception. The banking sector's performance and profitability have been impacted as a result. In this paper, we analyze the effect of COVID-19 pandemic on the financial performance of banking sector in Bangladesh before and throughout the present era of COVID-19.

Methodology: In this regard, the study considered the 14 banks over the period of 2014-2021. The random-effects regression model is utilized to identify the profitability drivers. The random effect model investigates the influence of bank-specific variables and macroeconomic variables on the profitability of banks.

Findings: During the pandemic era of COVID-19, our article found that a high degree of nonperforming loans, retaining more liquid assets, and a significant amount of hedging funds reduced banks' profitability. In contrast, a suitable bank size, non-interest revenue, inflation rate, and population growth increased the bank's performance indicators throughout this time.

Practical Implications: This study's findings will aid financial policymakers in identifying profit-enhancing loopholes and implementing preventative actions during crisis periods such as COVID-19.

Originality: The profit influencing factor include both bank and economic oriented, some of which were not previously considered in Bangladesh-specific studies. Incorporating these additional criteria and the independent examination of the pandemic era helps us to get new perspectives on the elements that influence commercial banks' profitability.

1. Introduction

Bangladesh's banking system is the most vital component of its economic structure (Deb, Deb & Roy, 2019). The importance of the banking industry to the performance and operations of contemporary economies cannot be overstated (Dietrich & Wanzenried, 2010; Rahman &

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Islam, 2018). Besides, the banking industry, being one of the most important and well-known financial institutions, plays a vital role in the dynamic expansion of an economy. Various worldwide natural and political crises have an impact on the operational mechanism of the financial system. The pandemic of COVID-19 is the most difficult and life-threatening catastrophe confronting the planet today. Bangladesh's banking industry has been severely impacted by the present economic crisis. In December 2019, Wuhan, is where the initial instance was found and afterward, the whole world was presented with a devastating tragedy in all areas, most notably an unsolvable economic crisis (Layne, 2020).

In light of this worldwide crisis, few research has been carried out to analyze the influence of present pandemic on the profitability of Bangladesh's banking sector. The bulk of research has sought to estimate the special COVID-19's ramifications on a variety of banking sector areas, including bank stability, solvency, and finances during a pandemic. This is why the research attempted to examine the effect of the COVID-19 epidemic on the profitability of a Bangladeshi commercial bank. The research combines both bank-specific and macroeconomic factors to understand the profitability drivers of commercial banks in Bangladesh. Researchers split the overall sample into two subsamples: the pre-pandemic period from 2014 to 2019 and the pandemic crisis period from 2020 to 2021 in order to analyze the impact of the COVID-19 pandemic crisis on bank profitability. By dividing the two- time periods, we can better understand how the financial crisis has affected the conduct of financial institutions and their profitability trend.COVID-19 in Bangladesh creates macroeconomic and microeconomic disruption.

The worldwide pandemic problem hurts the majority of macroeconomic variables, including the GDP rate, the price change proportion, the conversion rate, and the unemployment rate (Gazi, Nahid, Rahman, & Hossain, 2021). In 2020, Bangladesh's GDP increased by 2.91 percentage points less than predicted because of the impact of covid-19. The increase in headline inflation to 6.2% in 2021 (ADB, 2021) is a sign of the negative impacts of a epidemic. Bangladesh has a high percentage of NPL relative to other nations, and the rate of NPL increase in the first quarter of 2021 compared to the fourth quarter of 2020 is 7%. Additionally, covid-19 affects the lending function of the banking industry. Again, many bankers affected by COVID-19 who conduct financial operations efficiently. According to the Bangladesh Bank Statistics report, 27,237 bankers have been infected and 143 have died as a result of this life-threatening illness during the epidemic. All things considered, the financial stability of the banking sector was negatively obstructed by the present epidemic. At this time, it is necessary to analyze the drivers of bank profitability based on bank-specific individualities as well as macroeconomic factors.

Consequently, both internal and external influences have impacted the financial performance of the banking industry. To develop bank-specific processes, it is necessary to identify the primary determinants of the financial soundness of the banking industry and how they have changed throughout the global financial crisis. Therefore, this research examines

the effects of capital adequacy, asset quality (as defined by ROA), management efficiency, and bank risk for both phases of COVID-19. The conclusions of this study provide not only the banking industry's responsible parties with the means to construct a solid institution but also policymakers with the means to take remedial action in the event of a similar economic catastrophe in the future. For these reasons, the drivers of bank profitability are of interest to scholars, the boards of banks, and regulatory agencies of the banking sector.

2. The Theoretical Background

This section examines the literature on the factors that influenced bank profitability during the COVID-Pandemic crisis.

2.1. Literature on COVID-19's Impact on the Global Economy

In March 2020, the World Health Organization (WHO) recognized COVID-19 as a pandemic around the world (Golubeva, 2021; Jackson, Weiss, Schwarzenberg, Nelson, & Sutter, 2021). This worldwide epidemic has generated ripples in the global economy and in human existence that have never been seen before (Padhan & Prabheesh, 2021). As a direct consequence of the COVID-19 epidemic in 2020, worldwide trade experienced significant losses, and economists anticipate that the expansion rate of the global economy will continue to be significantly lower than it was before the pandemic (Pak, Adegbeye, Adekunle, Rahman, McBryde, & Eisen, 2020). According to projections made by the International Monetary Fund (IMF), COVID-19 will cause a loss of 3.86 trillion US dollars to the global GDP in the year 2020 (McKibbin & Fernando, 2021; Rasheed, Rizwan, Javed, Sharif, & Zaidi, 2021). The WB Report forecasted that the global economy expansion would be capped at 5.2 percent owing to the beginning phase of the pandemic (Rasul, Nepal, Hussain, Maharjan, Joshi, Lama, & Sharma, 2021). This prediction was based on the fact that the epidemic was expected to last for an extended length of time.

By 2020, it is anticipated that major economies would see a loss of 2.9% of their GDP (Mishra, 2020). As a consequence of this, the pandemic caused by COVID-19 had an impact of USD 90 trillion on economies all over the world (Ozili, 2020). Despite the challenges, the economy of the entire world is showing signs of improvement (The World Bank, 2021).

2.2 Global study of the banking industry during the COVID-19 pandemic

Enough research has been carried out to concentrate on the effects that COVID-19 will have on the banking sector. Some of these studies include the impact that COVID-19 will have on a nation's macroeconomic conditions (IMF, 2022), on the stability of banking performance (Elnahass, Trinh, 2022), on bank lending throughout the globe (Colak & Öztekin, 2021), about the profitability of banks' stocks throughout the world (Claeys, 2022), and on conventional and alternative forms of banking (Shen, Fu, Pan, Yu, & Chen, 2020). The

outbreak of COVID-19 was a surprise for the economy of the entire world, and it had a tremendous impact on the economy (Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2022).

Furthermore, (Korzeb & Niedziółka, 2021) compared pre-pandemic era consequences with pandemic period circumstances to estimate the cost of Polish commercial banks' credit risk. In the COVID-19 era, they discovered that higher return capital pre-pandemic was more circumspect and had to deal with a significantly lower cost associated with credit risk. To put things another way, during the COVID-19 pandemic, a small percentage of loans considered to be in default from the pre-pandemic era had a slightly quicker risk cost rise. Moreover, compared to other financial institutions, the banking industry was more severely affected by COVID-19's negative consequences, which persisted for a longer period of time (Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2021). Although larger, publicly traded banks had more liquidity and stronger cooperative skills, their stock returns decreased as a consequence of having to cope with the COVID-19 shock. Additionally, Katusiime (2021) came to the conclusion that Covid-19 has a detrimental impact on banks' profits in a low-income nation like Uganda when taking into consideration bank-specific and macroeconomic circumstances.

2.3. During COVID-19, carry out research on Bangladesh's banking sector.

Due to the virus's impacts, the COVID-19 epidemic has had a negative impact on Bangladesh's economy. (Karim, Shetu, & Razia, 2021). The resilience and sustainability of Bangladesh's commercial banks during the pandemic era were evaluated and predicted (Ghosh & Saima, 2021). Using the TOPSIS and HELLWIG techniques, the authors showed how a high number of nonperforming loans (NPL) with subpar performance, a lack of liquidity, and inadequate capital increased bank risk. Karim et al. 2021 obtained similar conclusions who observed that the COVID-19 epidemic in Bangladesh aggravated the already poor financial status of banks and lowered their liquidity ratios. They conducted a lengthy analysis of the solvency and financial stability of commercial banks operating in Bangladesh.

Furthermore, Barua and Barua (2021) emphasized the Covid-19 effects on the banking sector's capital adequacy, valuation, and interest revenue using a state-designed stress-testing model under multiple NPL shock scenarios. During the pandemic, they discovered that comparatively larger banks were more susceptible to the disease than smaller banks. The research uncovered a significant volume of material that was analyzed to comprehend the consequences of pandemic on financial institutions throughout the globe. While very few studies investigated the significant influence that COVID-19 had on the banking industry from the viewpoint of Bangladesh (Ghosh & Saima, 2021; Karim, et.al. 2021; Barua & Barua, 2021). In addition to that, academics also offered insightful information on the perspective of the banks as well as the perspectives of the other stakeholder. However, during the time of the pandemic, we felt that the study on banking in Bangladesh might use some further insight, therefore we conduct this report. After doing the appropriate checks and making the necessary adjustments, finally we draw the conclusion that COVID-19 has a

unique impact on banks' overall performance. Due to this, we made the decision to look into how the COVID-19 directive would impact bank profitability.

3. Research Methodology

3.1. Sources of Data and Research Sample

The financial statements of each bank's website were sourced for panel data. This study's model was estimated using annual data from fourteen commercial banks for the sample period 2014 to 2021. In addition, current data provided by the Bangladesh Bank, the Bangladesh Bureau of Statistics, and the Ministry of Finance have been used for macroeconomic indicators in particular. This study also considered online data which were retrieved from the websites of the World Bank, ADB, OECD, and IMF. Moreover, STATA 14.2 was used to estimate ratios and relationships among the dependent and independent variables to meet study objectives.

3.2. Research Design

Pre-pandemic and pandemic periods were the two phases of this period that spanned from 2014-2019 and 2020 to 2021 respectively. For the sake of the regression analysis, we defined the pre-pandemic period as the years 2014 to 2019. Additionally, we expanded the data set that covered the years 2014 to 2021 where the data of 2020 and 2021 to further examine the banks' level of profitability during the COVID-19 era.

3.3. Models:

These are the regression models for the bank-specific aspects and macroeconomic factors of banks that have been shown to have an impact on the banks' profitability. The analysis of panel data makes use of three distinct but equally common types of models: Model 1 (random-effect model), Model 2 (fixed-effect model), and Model 3 (pooled ordinary least square model). However, the unquestionable presumptions include error terms, intercept, and regression coefficients (Kennedy, 2008). Besides, the preference for the fixed effect and the random effect model, the specification test was conducted in the current study using the Hausman test. While the models' accuracy was validated using Breusch-Pagan Lagrange (LM) Test. To assess each model and test, the econometric program STATA 14.2 was utilized. The following regression models were considered for this study that was given below.

Model-1:

$$ROA_{it} = \alpha_i + \beta_1(SIZE)_{it} + \beta_2(CAR)_{it} + \beta_3(LA)_{it} + \beta_4(NPL)_{it} + \beta_5(DP)_{it} \\ + \beta_6(NII)_{it} + \beta_7(IR)_{it} + \beta_8(INFL)_{it} + \beta_9(GDP)_{it} + \beta_{10}(MCAP)_{it} \\ + \beta_{11}(PGRT)_{it} + \mu_{it}$$

Model-2:

$$ROE_{it} = \alpha_i + \beta_1(SIZE)_{it} + \beta_2(CAR)_{it} + \beta_3(LA)_{it} + \beta_4(NPL)_{it} + \beta_5(DP)_{it} \\ + \beta_6(NII)_{it} + \beta_7(IR)_{it} + \beta_8(INFL)_{it} + \beta_9(GDP)_{it} + \beta_{10}(MCAP)_{it} \\ + \beta_{11}(PGRT)_{it} + \mu_{it}$$

Model-3:

$$NIM_{it} = \alpha_i + \beta_1(SIZE)_{it} + \beta_2(CAR)_{it} + \beta_3(LA)_{it} + \beta_4(NPL)_{it} + \beta_5(DP)_{it} + \beta_6(NII)_{it} + \beta_7(IR)_{it} + \beta_8(INFL)_{it} + \beta_9(GDP)_{it} + \beta_{10}(MCAP)_{it} + \beta_{11}(PGRT)_{it} + \mu_{it}$$

Where, α = Intercept of the model; i = Index f Banks; t = Time index.

β_k =Regression Coefficient to be estimated

ROA= Return on Asset; ROE=Return on Equity; NIM=Net Interest Margin; SIZE= Bank Size; CAR= Capital to risk-weighted assets; LA= Loan to Asset ratio; NPL= Non Performing loan; DP=Deposit to Asset ratio; NII= Non Interest Income; IR=interest Rate; INFL= Inflation Rate; MCAP= Market Capitalization; GDP=GDP growth rate; PGRT= Population growth rate.

Table-1: Theoretical Framework					
	Variable	Description	Proxy	Hypothesized Relationship	
Dependent Variable	ROA	The ratio of total assets to net profit after taxes	Profitability	Not applicable	
	ROE	Divide the net profit after taxes by the shareholders' equity	Profitability	Not applicable	
	NIM	By dividing the difference between a bank's interest income and expense by all of its assets	Profitability	Not applicable	
Independent Variable	Bank Specific	CAR	Capital to risk-weighted assets	Capitalization	+/-
		NPL	Non-performing loans as a percentage of total loans	Asset quality	+/-
		SIZE	Log of Total assets	Bank size	+/-
		NII	Non-interest income as a percentage of total assets	Non-traditional activities	+
		LA	Total loans over total assets	Liquidity	+/-
		DP	Deposit to Total Asset ratio	Liquidity	+/-
	Macroeconomic	IR	Interest Rate	Real Interest	+/-
		GDP	GDP growth rate per year	Economic growth	+/-
		INFL	CPI inflation rate for the year	Inflation	+/-
		MCAP	Listed share price about GDP	Market capitalization	-
		PGRT	Yearly change of regional population	Population growth rate	+/-

4. Results and Discussions

4.1. Descriptive Statistics

Before the pandemic period, the ROA, ROE, and NIM results were 0.82%, 10.67%, and 2.55% (mean values), respectively. ROA, ROE, and NIM, on the other hand, were 0.785%, 10.11%, and 2.2% during in the Covid-19 epidemic, respectively. This shows that the banking industry in Bangladesh did not perform well in terms of profitability during the pandemic. The study's findings also revealed Bangladesh's macroeconomic environment, and nearly all of the variables' means fell throughout the epidemic phase.

Variables	Pre-Pandemic Period (2014–2019)					Considering Covid-19 period (2020–2021)				
	N	Min	Max	Mean	Std.	N	Min	Max	Mean	Std.
ROA	112	-.08	2.02	.842	.444	28	.1	1.3	.785	.355
ROE	112	-1.15	22.16	10.677	5.059	28	1.08	19.9	10.114	4.358
NIM	112	-2.17	8.03	2.553	1.943	28	-.96	6.46	2.206	1.75
SIZE	104	-.545	2.083	.877	.597	26	-.545	1.866	.708	.631
CAR	112	6.27	663	18.187	61.521	28	6.27	16.42	12.938	3.054
LA	112	32.03	843.56	75.348	74.8	28	36.84	90.5	68.535	15.015
NPL	111	2	35.28	6.803	6.662	27	2	20.32	5.884	5.321
DP	112	50.13	96.8	74.073	10.089	28	53.81	91.09	74.02	10.042
NII	112	.38	77	2.58	9.455	28	.49	2.22	1.139	.566
IR	112	3.1	6.9	4.581	1.182	28	4	5.05	4.525	.535
GDP	112	3.51	8.2	6.523	1.421	28	3.51	5.47	4.49	.998
INFL	112	5.5	6.992	5.842	.485	28	5.5	5.7	5.6	.102
MCAP	112	9	34.511	19.309	9.793	28	9	10	9.5	.509
PGRT	112	1	1.1	1.063	.049	28	1	1	1	0

These data suggest that during the crisis period, when banks sanction a lot of loans, nonperforming loans as a percentage of loans increased. This occurred because the volume of LA increased while the volume of NPL increased. In addition, CAR, DP, and bank size all witnessed significant decreases during this period. However, capital adequacy and loan distribution were both positive; despite this, the nonperforming loan rate was dropping in the crisis period.

4.2. Correlation Analysis

Pearson's Correlation Coefficient was utilized in this research to determine the correlations between the variables (Table 3) from 2014 to 2021. If a variable's correlation coefficient is

greater than 0.80, Multicollinearity occurs (Abdelsalam, El-Masry, & Elsegini, 2008). The findings of this investigation supported the threshold of Multicollinearity and did not exceed 0.80 (Kennedy, 2008).

Moreover, the results indicate a positive correlation between the explanatory factors SIZE, RI, GDP, INFL, MCAP, and PGRT and the dependent factors ROA, ROE, and NIM. As opposed to that, CAR, LA, DP, and NPL correlated negatively with ROA, ROE, and NIM. Additionally, we observed that NII had a negative influence on ROE and NIM, but a substantial impact on ROA.

Table-3: Correlation coefficients Matrix

Variables	ROA	ROE	NIM	SIZE	CAR	LA	NPL	DP	NII	IR	GDP	INFL	MCAP	PGRT
ROA	1.000													
ROE	0.780	1.000												
NIM	0.406	0.368	1.000											
SIZE	0.430	0.441	0.450	1.000										
CAR	-0.217	-0.244	-0.010	0.019	1.000									
LA	-0.023	-0.021	0.016	0.058	-0.017	1.000								
NPL	-0.335	-0.460	-0.042	-0.139	0.082	0.013	1.000							
DP	-0.240	-0.078	-0.040	-0.052	-0.018	-0.060	0.155	1.000						
NII	0.059	-0.026	-0.030	-0.003	-0.021	0.019	0.028	-0.122	1.000					
IR	0.160	0.072	-0.002	-0.012	-0.125	-0.073	-0.018	0.031	-0.146	1.000				
GDP	-0.009	0.012	0.197	0.212	0.051	0.099	0.106	-0.004	0.063	-0.150	1.000			
INFL	0.163	0.097	-0.052	-0.032	-0.033	-0.069	-0.026	0.033	-0.054	0.781	-0.152	1.000		
MCAP	-0.034	0.004	0.024	0.065	0.151	0.094	0.049	-0.020	0.199	-0.672	0.537	-0.262	1.000	
PGRT	0.127	0.078	-0.011	0.035	0.070	0.072	0.052	is	0.123	-0.041	0.431	0.388	0.709	1.000

4.3. Panel Data Analysis

In order to specify the proposed models, the Hausman Test, the Breusch-Pagan Lagrange Multiplier (LM), and the F-test were utilized in this study. Table 4 displays the findings of the tests that evaluated the model's needs. F-tests are conducted to determine whether the pool square model and the fixed effects method are better. The findings suggested using the fixed effects model instead of the pooled square model, suggesting cases in the models (I, II, and III) for both pre-pandemic periods and pandemic periods. The LM test determines which pooled and random effects models best fit the data. At the 1% level of significance in the pandemic period model and the 5% level of significance in the pandemic period model, the results indicated that the random effects model is preferable to the pooled model. Consequently, both the F-test and the LM test suggest rejecting the pooled model in favor of the fixed and random effects model.

Finally, the Hausman experiment was undertaken to select between fixed and random effects models. The results indicate that both models support the random effect hypothesis since the p-values of the chi-square statistic are very high at the 1% significance

level. Therefore, researchers determined that the random effect model should be adopted for Model-I (ROA-Return on Asset), Model-2 (ROE-Return on Equity), and Model-3 (NIM-Net Interest Margin).

Table-4: Multidimensional test to identify the robustness

Pre-Epidemic Timeframe (2014–2019)		Epidemic Timeframe (2014–2021)					
Test		Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
F-test	F value	3.86	4.97	66.81	5.87	6.61	88.11
	P-value	0.0003	0.0000	0.0000	0.00009	0.0000	0.0000
Breusch-Pagan Test	Chi-Sq. statistic	29.38	20.48	8.34	51.05	10.8576	4.7673
	P-value	0.0000	0.0000	.0019	0.0000	0.0000	.0290
Hausman test	Chi-Square statistic	4.24	4.85	.70	2.69	7.1857	1.8101
	P-value	.9723	.9383	1.0000	.9943	.3040	1.000

5. Regression Result Interpretation

5.1 Empirical Outcomes Relating Bank Profitability (ROA as dependent variable)

Table 5 displays the findings of empirical research on banks' profitability as determined by ROA. Research suggests that model 1 in two distinct temporal dimensions. The first time dimension was the pre-pandemic phase from 2014 to 2019 when models I (a) and 2 (b) were based. In the second time dimension, the analysis included the COVID-19 pandemic phase wherever models I(c) and I(d) were set..

Table-5: Random effects estimation results (dependent variable: ROA)

Variable	Pre-Epidemic (2014–2019)		Including Epidemic (2014–2021)	
	Model I(a)	Model 1(b)	Model 1(c)	Model I(d)
	Coef.	Coef.	Coef.	Coef.
SIZE	.0559 (.1018)	.152 (.113)	.153 (.067)**	.1800 (.069)***
CAR	-.0012 (.0000)***	-.001 (.0000)***	-.0013 (.0000)***	-.001 (.000)***
LA	-.0002 (.0000)***	0 (.000)*	-.0002 (.0003)***	0 (.000)**
NPL	-.0170 (.0052)***	-.013 (.008)*	-.01139 (.0089)**	-.011 (.005)**
DP	-.0030 (.0096)	-.007 (.009)	-.0048 (.0059)	-.006 (.006)
NII	-.0030 (.0019)*	0 (.002)	.0021 (.0004)***	.003 (.001)**

IR		.22 (.217)		.137 (.079)*
GDP		-.158 (.185)		-.054 (.034)
INFL		-.483 (.404)		-.259 (.152)*
MCAP		.008 (.017)		0 (.007)
PGRT		1.814 (1.612)		2.954 (1.024)***
CONS	1.2268 (.7616)*	-.483 (.404)		-.665
Observations	78	78	103	103
Adjusted R-squared	.2630	.359	.3010	.379
F-statistic	5.58	3.86	8.32	5.69
Prob(F-statistic)	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Durbin-Watson	1.9403	1.9603	1.8706	1.8890

Note:*** p<.01, ** p<.05, * p<.1

When we looked at the model I(a), we noticed that CAR, LA, and NPL had a considerable, unfavorable impact on the ROA (Gazi et. al. 2022). Consequently, a decrease in the percentage of nonperforming loans relative to the total amount of loans might increase profitability as a measure of ROA. However, retaining more money to limit risk exposure would diminish their profitability. Besides, Olson and Zoubi (2011) discovered a negligible impact of bank size on performance. Gazi, et al. 2021 revealed an insignificantly favorable association between bank size and profitability from the standpoint of Bangladesh. Matin (2022) showed a substantial inverse link between bank size and NPL and ROA. NPL's detrimental effect on ROA is consistent with (Rahman et. al. 2015). Additionally, we observed that the association between Bank size and ROA was statistically negligible before to the pandemic but significant after it. DP also has a negligible negative correlation with bank ROA. Again, there was a strong inverse link between ROA and the bank loan to total assets. According to these findings, preserving liquid assets, allowing more loans, or taking more deposits do not affect the return on assets of a bank.

In Model, I(b) the combined effect of the independent variable is shown. We observed that the GDP growth rate had a negligible and negative effect on the ROA. The coefficient values for interest rate indicate that interest rate has a negligible and positive impact on banks' ROA. In this model, the fact that banks may manage inflationary pressures expected to boost their efficiency is referred to as inflation's negative influence on banks'

return on assets. Moreover, a larger stock market capitalization has a beneficial effect on bank profits, at least before the epidemic. Before the pandemic and overall, commercial banks in Bangladesh were able to gain from a rise in the value of their listed shares (relative to GDP), which fits our expectations.

When macroeconomic variables were added to the bank's particular variables, two modifications occurred in the bank's specific variables. NII had a negligible negative influence on the ROA of banks in this instance. By combining the two period, we discovered that NII had a significantly negative impact on banks' ROA. The outcomes are revealed in model I(c). The other variables, except the exception of bank size, behaved identically to their pre-pandemic states. During the pandemic, bank size had a 5% meaningful effect on ROA. When we incorporated economic factors as predictors of the bank's performance throughout the pandemic times, bank size has a favorable impact on ROA at a 1% significant level.

After combining the two periods and accounting for other macroeconomics variables affecting bank profitability, Model I (d) indicates that CAR had a significant and negative effect on banks' ROA. This annual population change (PGRT) had a favorable and substantial impact on banks' profitability during the pandemic. During such a moment of crisis, banks may convert an expanding market potential into more profits. In addition, we observed that in the model I (d), inflation had a negligible and negative influence on banks' ROA. This suggests that the profitability of banks during the pandemic was very vulnerable to inflation. When we used macroeconomic parameters to forecast bank profitability during the pandemic, we found that bank size had a substantial positive effect on ROA at a 1% significance level.

At the 1% significance level, these constant of the independent variables are statistically significant, as is the F-statistic coefficient value. In addition, the DW (Durbin-Watson) test result for this model demonstrates that there is no autocorrelation according to the general rule (Miklaszewska, 2021). Overall, it seems that the model matches the data very well indeed.

5.2 Empirical Result (ROE as a Dependent variable)

Table 6 shows the effects of the factors on the profitability of the banks as determined by the return on equity (ROE).

Table-6: Random effects estimation results (dependent variable: ROE)				
Variable	Pre-Epidemic		Together with Epidemic Period	
	Model 2 (a)	Model 2 (b)	Model 2(c)	Model 2 (d)
	Coef.	Coef.	Coef.	Coef.
SIZE	2.721 (1.124)**	3.19 (.001)***	1.8112 (.57520)***	2.199 (.751)***
CAR	-.016 (.000)***	-.016*** (.002)	-.0169 (.00057)***	-.017 (.002)***
LA	-.002 (.001)*	-.003 (.08)	-.0021 (.001)**	-.003 (.002)
NPL	-.235 (.061)***	-.237*** (.096)	-.277 (.037)***	-.308 (.058)***
DP	.015 (.098)	.002 (.025)	-.043 (.086)	-.039 (.084)
NII	-.067 (.021)***	-.06** (2.307)	-.008 (-.006)	-.014 (.015)
IR		1.088 (1.949)		-.086 (.955)
GDP		.777 (3.806)		-.119 (.378)
INFL		-.478 (.249)		.525 (1.002)
MCAP		.068 (27.569)		-.012 (.163)
PGRT		20.778 (49.945)		11.889 (21.103)
CONS	9.608 (1.618)**	-21.578 (.193)	14.688 (6.856)***	.012 (19.985)
Observations	78	78	103	103
Adjusted R-squared	.416	.441	.424	.45
F-statistic	9.5985	17.16083	6.08	8.09
Prob(F-statistic)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Durbin-Watson	1.5567	1.6872	1.38971	1.4564

Note: *** p<.01, ** p<.05, * p<.1

Where the link between dependent variable ROE and explanatory factors as predictors of bank profitability is shown. Here, we similarly used model 2. We discovered that CAR,

LA, NPL, and NII considerably and adversely impacted the banks' return on equity based on the model 2(a). In contrast, DP had a negligibly favorable effect on ROE whereas bank size had a considerable and positive influence. According to Hasanov, Bayramli, and Al-Musehel (2018), financing and liquidity risk significantly impacted the profitability of banks. Therefore, we wholeheartedly concur with the idea that the commercial banks' profitability during the pre-epidemic era was substantially and adversely sensitive to capital adequacy and the rate of default loans. When the macroeconomic factors are taken into account with bank-specific variables, deposits as a percentage of total assets and loan approval did not have a substantial impact on the bank's effectiveness.

Model 2 (b) demonstrates the influence of economic as well as bank-specific variables on the Return on Equity (ROE). However, it demonstrates that all macroeconomic factors had a negligible influence on the return on equity of banks. We discovered the same conclusion in Table 6, with a negligible beneficial influence of the interest rate on bank profitability. Other variables in model 2 (b), except LA, were unaffected by model 2 (a). Surprisingly, when we looked at macroeconomic indicators as determinants of a bank's profitability, we found that that LA is associated with ROE negligibly negative. When the study added the epidemic time to the pre-epidemic time, the study got different results. Model 2(c) demonstrates that, at the 5% significant scale, LA had an adverse association with ROE. While at the 10% significant level, this parameter had a negative link with ROE during the pre-epidemic era.

In addition, model 2(c) revealed that NII had a negative and negligible impact on ROE during the pandemic, but it had a large impact on ROE before the pandemic period. Model 2(d) indicates that CAR and NPL have substantial negative effects on the bank's ROE. In addition, Model 2(d) shows that the banks' GDP and other macroeconomic factors did not have a significant influence on ROE throughout a catastrophe era. The rate of inflation, however, had a favorable influence during epidemic times. Moreover, it should be emphasized that the nonperforming loan rate relative to total loans in models 1 and 2 throughout both eras had a negative and considerable impact on the profitability of banks. Furthermore, according to the corrected R2 values, the explanatory variables of all models are consistent with the dependent variables. The statistical findings of the Durbin–Watson test (Miklaszewska, 2021) indicate that the aforementioned models do not have an autocorrelation problem.

5.3 Empirical Result on Banks' Profitability Measured by NIM

The empirical findings of the independent effects of specific bank variables on bank profitability as determined by NIM are displayed in Table 8.

Table-7: The estimation outcomes for random effects (NIM)
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Variable	Pre-Epidemic (2014–2019)		During Epidemic (2020–2021)	
	Model 3(a)	Model 3 (b)	Model 3 (c)	Model 3(d)
	Coef	Coef	Coef	Coef
SIZE	2.828 (.304)***	2.80 (.297)***	2.695 (.241)***	2.701 (.225)***
CAR	-.001 (.000)***	0 (.000)***	-.001 (.0000)***	-.001 (.0000)***
LA	0 (.0000)**	0 (.0000)**	-.001 (.0000)***	-.001 (.0000)***
NPL	.04 (.011)***	.04 (.012)***	.042 (.011)***	.043 (.011)***
DP	.001 (.009)	.002 (.01)	-.002 (.006)	-.002 (.007)
NII	-.004 (.003)	-.004 (.004)	-.005 (.001)***	-.004 (.001)***
IR		.016 (.187)		.017 (.151)
GDP		-.163 (.126)		.008 (.072)
INFL		-.304 (.238)		-.135 (.27)
MCAP		-.007 (.022)		-.005 (.019)
PGRT		-1.615 (3.09)		-.197 (3.082)
CONS	.073 (.715)	4.885 (3.701)		1.464 (2.781)
Observations	78	78	103	103
Adjusted R-squared	.767	.789	.807	.813
F-statistic	127.89	66.81	151.32	80.10
Prob(F-statistic)	(0.0000)***	(0.0000)***	0.0000	0.0000
Durbin-Watson	1.71217	1.96395	1.7879	1.5149

Note:*** p<.01, ** p<.05, * p<.1

Model 3 (a) demonstrates that the bank's size has a positive and considerable impact on the net interest margin concerning earning assets. In contrast, nonperforming loans and

charge-off ratios have an adverse and significant influence on NIM. In addition, the data suggest that DP had a weakly positive correlation with the bank's NIM. Conversely, NII exhibited a negligible negative association with NIM. In model 3 (b), when macroeconomic factors were incorporated, we observed that all bank-specific variables influenced NIM in the same manner as model 3 (a). The interest affects NIM insignificantly and positively. This indicates that a rise in interest increases banks' interest revenue on earnings generate assets. However, a rise in interest rates is detrimental to bank borrowers, while banks earn more money by extending loans at higher rates. We integrated the epidemic era into the pre-epidemic time period in model 3(c). We observed that, in the case of the pandemic data set and in conjunction with the other bank-specific factors, NII had a substantial and negative effect on NIM, as evaluated by ROA. Aside from this, Size and NPL had a substantial negative influence on NIM at the 1% level, whereas CAR and LA had a substantial positive impact on NIM. The considerable adverse effects of LA on NIM indicate that a high lending rate position harmed the profitability of banks throughout the time of the pandemic. We similarly noticed that DP had no major impact on NIM, similar to the pre-pandemic era. Switching to model 3 (d), researchers observed that all macroeconomic factors had a negligible influence on the NIM of banks throughout the pandemic era, as well as during the pre-pandemic era. The findings of Model 3 (d) likewise indicate that NII had a large and negative influence on NIM, but a negligible effect before the pandemic era. Before the Covid-19 era, the GDP degree had a negative influence on the NIM, whereas, during the epidemic era, the GDP growth rate had a positive impact on the NIM. Researchers discovered no appreciable impact of GDP on the ROA and ROE during the pandemic in model 1 and 2, respectively. While the identical was true for NIM as an indicator for the Bank's performance assessment.

6. Results and Discussions of the Hypotheses

Almazari (2014) measured the important similarities and differences of bank-specific variables from distinct viewpoints using the hypothesis approach. Gemar and Guzman (2019) used the hypothesis's outcome to evaluate the effects of several bank-specific factors affecting banks' performance. The findings of the study are shown in Table 8. We used an independent sample T-test to see if there was a statistically significant disparity between the normal period and crisis periods. We contrasted the COVID-19 epidemic era with the normal timeframe.

Variables	t_Statistic	p_Value	Interpretation
SIZE	.532	.623	Failed to reject Ho
CAR	-5.119	0.000***	Ho rejected
LA	-3.398	.002***	Ho rejected
NPL	-2.265	.028**	Ho rejected
DP	.603	0.549	Failed to reject Ho

NII	1.689	0.0421**	Ho rejected
ROA	-2.601	.012**	Ho rejected
ROE	1.704	.005***	Ho rejected
NIM	6.803	.005***	Ho rejected

Note:*** p<.01, ** p<.05, * p<.1

To display the p-value and t-statistic in line with the equal variance assumption rule, we did not violate the normality requirements of the independent sample T-test. According to Levene's test for the equality of variances assumption, researchers assume that variances are equal if the significance level is more than 0.05; otherwise, they believe variances are not equal. The results show a statistically significant difference between COVID-19's pre-pandemic and pandemic phases for CAR, LA, NPL, NIM, ROA, and ROE at a 1% and 5% probability level. During this COVID-19 period, DP and Bank Size did not see any noteworthy changes. We utilized ROA, ROE, and NIM as proxies to measure the profitability of the banks, and the findings show that the COVID-19 pandemic scenario had a significant impact on their profitability. In addition, our hypothesis testing supports the conclusion that CAR and NPL had a significant detrimental effect on banks' performance while COVID-19 was in the air. Thus, we may conclude that the worldwide pandemic outbreak has had a extensive consequences on Bangladesh's banking sector performance.

7. Conclusions and Future Research Directions

The COVID-19 pandemic had a noteworthy influence on the world economic system and will undoubtedly go down in history. It has held up global economic expansion by causing a constant state of lockdown, limits on public mobility, manufacturing halts, a reduction in product and service demand, and trade hurdles on a worldwide scale. It has hindered all economic sectors, but the financial sector has suffered the most harm. During the COVID-19 pandemic, the liquidity, economic health status, and resilience of Bangladeshi banks were all evaluated; however, there have been few studies accompanied to evaluate the influence of the worldwide pandemic on banking performance. As a result, the primary objective of this study is to analyze the impact of COVID-19 on the overall financial health of the banking sector in Bangladesh.

Moreover, bank performance during these periods was the primary focus of the study, which sought to determine how bank-specific variables and economic variables interacted with one another to influence the profitability condition of the banks. In this study, the dependent variables included ROA, ROE, and NIM, whereas Bank Asset Size, CAR, LA, NPL, DPNII, GDP, IR, INFL, MCAP, and PGRT as independent variables, with GDP, IR, INFL, MCAP, and PGRT as the macroeconomic variables. CAR and NPL had a negative effect on the ROA, ROE, and NIM before and during the epidemic of the Bangladesh's listed privately held commercial banks. This was true even when the study included the COVID-19 epidemic time in the pre-epidemic time frame. Alternatively, Bank Size just had a similar

impact on the banks' ROE and NIM, while NII considerably reduced both NIM and ROA throughout the COVID-19 period. Moreover, it should be said that GDP impacted the ROE of the bank and NIM adversely and substantially throughout the pre-pandemic era. Besides, at the time of the pandemic period, it had a negligible negative impact on ROA and ROE, whereas GDP had a negligible positive impact on NIM. Despite the absence of a substantial positive correlation between MICR and NIM over both periods, MICR enhanced the ROA and ROE of banks during both periods. Moreover, at the time of the pre-pandemic period, the IR rate had a significant impact on banks' NIM and ROE, however, our analysis found no significant correlation among INTR and ROE, ROA.

In a nation like Bangladesh, it's critical to develop and put into action pertinent laws and regulations, expand service offerings, assure high service quality, and last but not least, ensure that banks are properly maintained at all times. Bangladesh's banking industry is going through a crisis. Besides, high NPL, the retention of more liquefied assets, and the retention of considerable amounts of hedging capital were noted to be impeding the overall performance of commercial banks at this time. As a result, Bangladesh's banking industry should be aware of the need of diversifying its holdings, preserve cash on hand when it's needed, and effectively authorize and administer loans. In addition, our research suggests that maintaining the bank size boosts banks' profitability; as a result, banks should raise the necessary cash via stock shares. According to our advice, future research should explore the effects of the pandemic on Bangladesh's government and overseas commercial banks using a wide range of data.

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