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IMPACTS OF COVID-19 PANDEMIC ON OPERATIONAL RESILIENCE OF INDIAN BANKS

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Abstract: COVID-19 pandemic continues to impact economies worldwide, including financial markets. For banks, the pandemic generated multifaceted crises, primarily by increases in default rates. This paper aims to investigate the COVID-19 pandemic's impact on banking resilience in India. The comparative analysis is done during pre-pandemic and post-pandemic periods. Data of Indian banks are extracted from publicly available sources from 2008 to 2020, and Pearson correlation and regression analysis are used. Banks' return on assets (ROA) and return on equity (ROE) are dependent variables and EAGLES are independent variables. Based on findings, most EAGLES factors were significant at the 10% level. Equity and strategy were substantial at the 10% level, whereas asset quality and growth were relevant at the one percent level. Findings suggest that EAGLES liquidity was not a significant factor in evaluating banks' financial capabilities. EAGLES framework's other components were vital in assessing bank financial capability and resilience. However, NPL-determined asset quality has a detrimental impact on financial ability and was substantial at a 1% level. The study sheds light on India's economic situation and post-pandemic recovery strength.

Key words: *Indian banks, Operational resilience, resilience of banks, COVID-19 pandemic, EAGLE, Pearson correlation, Linear regression, liquidity risk, mortgage defaults, economic crisis , stock market*

1. INTRODUCTION

In 2019, the world was shocked by the emergence of a new kind of virus which changed the entire way people used to live on the earth. This virus was first reported from Wuhan-China and named Coronavirus Disease 2019 or better known as COVID19 (Disemadi and Saleh, 2020; Elnahas et al, 2021). Though the virus initially was only within China but very soon started spreading across different countries and was pronounced as a pandemic by the world health Organization (WHO). The Covid-19 pandemic has been continuously spreading all around the world causing an unprecedented human, economic, and social crisis, whose consequences are still unpredictable (Kuqja, 2020). In a response to 'flatten the curve' of the infection spreading numbers and impacting human lives, governments have enforced border shutdowns, travel restrictions, quarantine, and lock downs of regular activities in countries that constitute the world's largest economies, which is sparking fears of an impending economic crisis and recession (Nicola, 2020). Covid-19 has caused global collapse inactivity and loss of jobs that is probably unprecedented in its scale and speed. Small and large businesses across every country in the world have had to close their doors to customers and employees (Giese

and Haldane, 2020). As the pandemic pushes aggregate demand, production, trade, and economic activities to slow down which further resulted in unemployment to rise across every country and location, Financial Institutions (FIs) in almost every country fear an increasing risk of fallout without government support (Barua and Barua, 2021). Faced with severe contractions in corporate revenues and profit margins together with disruptions in the production process and the supply chain, many companies and organizations have risked running into a liquidity shortage to cover their fixed costs and debt payments (Anastacia et al 2022). Bank revenues and profitability have been negatively affected with simultaneous situations of even political instability (Elfeituri, 2022). The COVID-19 pandemic has significantly affected across major industries, resulting in the transformation of the business landscape, and majority of the small businesses have taken a particularly severe impact (Bartik et al 2020). In comparison to other industries the service-oriented industry and organizations have been devastated by the COVID-19 pandemic. They have experienced a sudden sharp decrease in their revenues, which in turn triggered them to enact massive layoffs, furloughs, and pay cuts (Huang and Jahromi, 2021). The impact of COVID-19 on business and consumer behavior change is a topic of great importance for companies and financial industries around the world this will not only help to take action in the short-term but, even more importantly, to reconsider and re-evaluate their strategy in the medium and long term periods (Baicu et al 2020). The financial services sector as a whole is becoming more complex, this is triggered since the larger firms providing a significantly large number of services to clients. The delivery and execution of these services is supported by a very significant amount of operational infrastructure (Leo, 2020). A decade ago, the financial system, and in particular banks, was the epicentre of the global financial crisis, both as its key cause and also its key catalyst. A report of the Financial Stability Board (2021) held that this time a pandemic is at the epicentre of the crisis where the banking sector is now seen as part of the solution assisting in recovery rather than the problem. The impacts of the pandemic on the banking system are shown in figure 1.

Figure 1: Impacts of the pandemic on the banking system

The Covid-19 pandemic has been an unusual crisis for the global banking system. Despite an unprecedented stop in global economic activity, the banks losses have been modest and all through lending has remained strong (Ikeda, 2021). However, with the increased use of derivative assets like mortgage backed and asset backed securities, and also collateralised debt

obligations, etc., bank assets have become more complex and it is difficult to gauge the true value of banks assets and the risk associated with various bank activities (Brune et al 2021). The pandemic has shown that critical infrastructures and providers are essential, even more, essential during a crisis. The industry must become more resilient so that a crisis cannot affect them. From the COVID-19 pandemic, much can be learned to be more resilient in terms of preparation, response, and recovery (Hofbauer and Quirchmayr, 2021). Understanding how the Coronavirus (COVID-19) pandemic affects the financial markets and institutions, and in turn, the real economy, are important research questions for academics and policymakers. A well-functioning banking system stimulates economic growth through multiple dimensions like increase in demand for goods and services which in turn leads to employment generation and development (Çolak and Oztekin, 2021). In this paper, a research methodology is carried out to understand the impacts of COVID-19 on Indian banking resilience. The data of 15 Indian banks are extracted from publicly available sources, and the popular tools are used to identify the impacts of a pandemic on banking resilience. The pandemic impacts have been also identified by comparing the resilience of banking sectors for two scenarios: before the pandemic (pre-pandemic) and after the pandemic (post-pandemic).

The structure of the paper includes the following: section 2 presents the related work and available literature reviews; section 3 presents the research methodology with their results and section 4 concludes the paper.

2. RELATED WORK

Demir and Danisman (2021) examined the impact of bank-specific factors and variations in the context of stringency of government policy responses on bank stock returns because of the COVID-19 pandemic. A sample of 1,927 publicly listed banks from 110 countries was used for the period of the first major wave of COVID-19, that was, January to May 2020. The review findings indicated that stock returns of banks with higher capitalization and deposits, more diversification, lower non-performing loans, and larger size were more resilient to the pandemic. While banks' environment and governance scores do not have a significant impact but higher social and corporate social responsibility strategy scores intensify the negative stock price reaction to COVID-19.

Talbot & Ordonez-Ponce (2020) explored how Canada's banks were supporting their personal and business clients, as well as their communities, during the COVID-19 pandemic. Content analysis was conducted to analyze Canada's ten largest banks' supporting actions towards managing through the pandemic. Through the efforts, more than 125 documents leading to 19 different actions have been reviewed and consulted. Based on the data, a combination of hierarchical clustering and multidimensional scaling was conducted. Following a CSR approach, three clusters of banks were identified: sweeping actions, cautious actions, and wait & see. The results highlighted that while most banks were doing little to help their stakeholders in these times of need, three of them have a proactive and strong commitment to their clients and communities.

Muparadzi and Rodze (2021) focused on emerging trends in Business Continuity Management (BCM) approaches in the commercial banking sector in Zimbabwe and seeks to establish if existing BCM models provide an adequate response to the risks posed by the Covid-19 pandemic, establish strategies adopted by commercial banks in Zimbabwe to ensure an

adequate response to the impact of the Covid-19 pandemic and to establish the likely implications of these strategies on the future of BCM in Zimbabwean commercial banks. Using a qualitative research approach, it was concluded that existing BCM models among banks in Zimbabwe are not sufficient and are a more adaptable and agile towards building permanent models are needed which has the capacity to anticipate and accommodate "surprises".

Danisman *et al.* (2021) examined whether differences in banking market structures and its related areas across countries influenced the local stock market resilience to the COVID-19 pandemic. Using a sample of 66 countries for the period January 2020 to July 2020, the findings demonstrated that countries with more concentrated banking systems, with a higher presence of foreign banks, and a higher share of Islamic banks were more resilient to the pandemic. Given that the banking regulatory expectations are different between countries, it was observed that equity markets of countries with stricter regulatory requirements on capital and liquidity were more resilient to COVID-19. Finally, regarding banking sector performance indicators, the findings showed that while stock reactions of countries with more stable banking systems were more resilient to the pandemic; countries with more credit to deposit ratio, overhead costs, high provisions, and nonperforming loans were more vulnerable and suspectable to impact of such a pandemic situation.

Acciarini and Boccardelli (2021) discussed the ability of specific companies to increase their level of organizational resilience when unexpected events happen. Semi-structured interviews were conducted with target CEOs of four major companies operating in Italy in different industries. Especially, the authors focused on multiutilities, media and communications, investment banking, and mobile telecommunications. The interviews were based on questions dealing with Covid-19 implications and strategic responses to navigate this complex scenario. Based on the CEOs' contributions, the research model presented short-term actions and long-term strategies planned and implemented by each Italian company. In particular, the authors emphasized similarities and dissimilarities in terms of strategic responses and future business development.

Clichici and Zeldea. **C** (2021) analyzed the impact of the pandemic event on Central and Eastern European(CEE) banking systems, in the light of the most relevant indicators of banking stability. Both qualitative and quantitative research methods were used to achieve the goal. The results of the analysis helped in revealing that the pandemic crisis did not affect the quality of banking assets in the CEE, the rate of non-performing loans remained at a fairly low level in most of the states within the CEE network. At the same time, due to major reforms that followed at the back of the international financial crisis of 2008, banks had a sufficiently high level of capitalization and a reasonable level of indebtedness, reflecting a high resilience to the shock of CEE banking systems. However, extremely low level of interest rates in the pandemic had determined a deterioration in asset performance in most banking systems in the CEE.

Most of the existing studies focused on identifying the impacts of covid-19 on banking system but the studies regarding how the banking system manages their financial abilities during pandemic are not yet addressed through these studies. Hence through the findings of this paper, a methodology is developed to identify the impacts of covid-19 on Indian banking resilience system.

3. RESEARCH METHODOLOGY

The study uses secondary data collected from open sources for the analysis. Financial data was extracted from audited financial statements from the top 10 Indian public sector banks from 2008 to 2020. The banks taken for consideration includes State Bank of India (SBI), Punjab National Bank (PNB), Bank of Baroda (BoB), Canara Bank, Union Bank of India (UBI), Bank of India (BoI), Indian Bank, Central Bank of India, Indian Overseas Bank, UCO Bank, Bank of Maharashtra, and Punjab & Sindh Bank. The audited financial statement of the banks is extracted from their corresponding official websites. The sample was complemented with economic data over the same period. The sample used here is an unbalanced panel. The panel contains cross-section and time-series data. The sample panel's cross-section consists of Indian banks with a time component of years. The panel data consist of 165 different observations. However, using the observation period of 2008 to 2019 there were many changes including bank mergers, new banks entering the market, and data issues from changes in financial reporting. After removing the necessary outliers, the resulting sample is an unbalanced panel with 165 different observations. The framework namely EAGLES are used in this study. EAGLES model, just like the CAMELS model, is based on financial ratios which have proven to be very useful in determining the financial soundness of banks. In 1979, the Federal Deposit Insurance Corporation (FDIC) established the Uniform Financial Institutions Rating System, often referred to as CAMEL, and in 1997 updated it to CAMELS which includes sensitivity to market risk component (Federal Deposit Insurance Corporation, 1997).

The model examines six areas that mostly affected the financial soundness of banks. These areas are earning, assets quality, growth, liquidity, equity, and strategic responsiveness. In the EAGLES framework, the earnings variables of ROA and ROE are used as dependent variables to measure financial capability. Bank profitability is widely measured by Return on Assets (ROA) and Return on Equity (ROE). ROA is an indicator of how profitable a company is relative to its total assets. It gives an idea of the efficiency of the management in using its assets to generate earnings. Whereas ROE is a ratio relating net profit (net income) to shareholders' equity. Here equity refers to share capital reserves and surplus of the bank. For independent variables, the remaining EAGLES segments, supplemented with macroeconomic variables are used to understand drivers of financial capability in Indian banks. The dependent and independent variables used in the EAGLES model are shown in table 1.

Mostly, the sample is modelled using static, dynamic linear models, or both. Static linear models include pooled OLS, Fixed Effect (FE), and Random Effect models (RE) while dynamic models can be solved with different GMM or system GMM models. The researchers mostly preferred GMM models however it mostly works for a small amount of sample. So static model is preferred. But this static model also has drawbacks. The sample of the study is heterogeneous like it has bank-specific and time components. The pooled OLS assumes homogeneity, FE models treat heterogeneity by accounting for differences between companies and RE models account for variation across banks. To overcome breaking model assumptions, robust standard errors were used in this research. Subsequently, OLS assumptions are broken, the remaining models are FE and RE. The better FE and RE models are typically determined by testing whether unique errors are correlated with regressors using the Hausman test. The model used in this study is mathematically expressed as

$$E_b = \alpha_i + \chi_1 NPL_{it} + \chi_2 LG_{it} + \chi_3 DG_{it} + \chi_4 LDR_{it} + \chi_5 CAR_{it} + \chi_6 SRQ_{it} + \chi_7 GDP_{it} + \chi_8 INF_{it} + \varepsilon_{it}$$

In the above expression, E_b denotes the dependent variables such as ROA and ROE, the right side of the equation denotes the independent variables namely $NPL_{it}, LG_{it}, DG_{it}, LDR_{it}, CAR_{it}, SRQ_{it}, GDP_{it}, and\ INF_{it}$, α_i indicates the intercept, $\chi_1 to \chi_8$ denotes the slopes, and ε_{it} denotes the residual (error).

Figure 2 highlighted banks that have different mean ROAs and ROEs by banks and over time. FE and RE models used robust standard errors because of the failure of model assumptions. Table 2 shows the descriptive statistics of Indian banks' sample. To diagnose the present model used in this research there were three different tests conducted namely the Augmented Dickey-Fuller, Lagrange Multiplier, and Wald tests were used (the results are tabulated in Table 3). In addition, Pearson correlation methodology is used to identify the relationship between independent and dependent variables that were identified through the secondary data gathering. The Pearson's correlation results show that it does not obtain any highly correlated variables above 0.5. However, the model failed autocorrelation and heteroskedasticity tests as it rejects the null hypothesis in both Lagrange Multiplier and Wald tests for ROE and ROA. Both FE and RE models are significant for ROE and ROA, the Sargan-Hansen test symbolizes that FE was the best model. Between ROE and ROA, ROE had a stronger R-squared of 0.589 vs 0.389. So, the discussion for FE ROE was focused. Table 5 shows the regression model results for the current sample of data. The sample includes a total of 165 observations from 15 Indian banks. The period covers the years from 2012to 2020. In table 5, the values in brackets indicate the robust standard errors. Coefficients that are significantly different from zero at the 1%, 5%, and 10% levels are marked with ***, **, and * respectively.

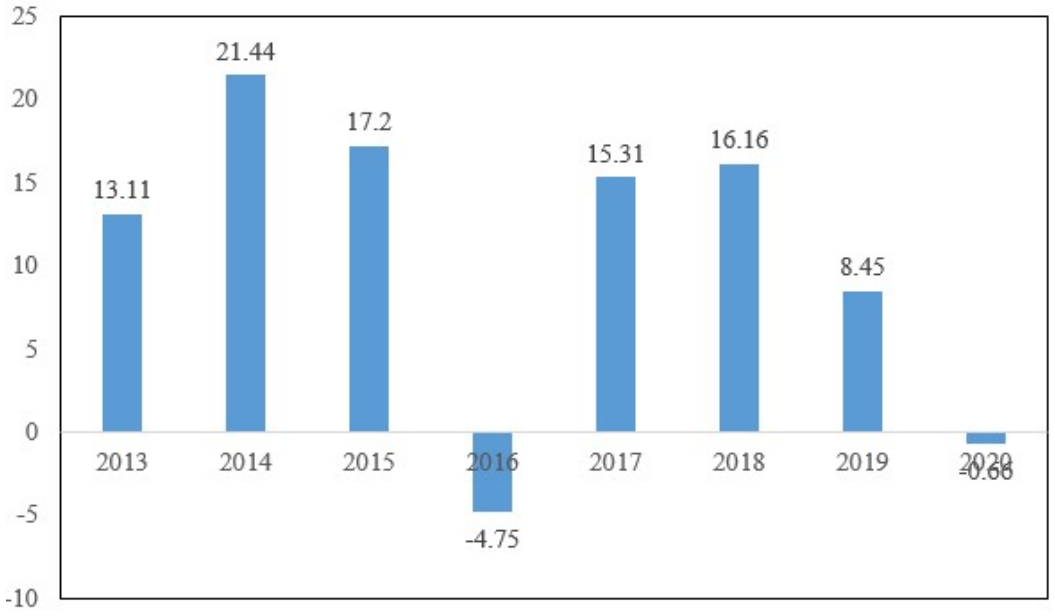
Table 1: Descriptive statistics for a sample of Indian banks

Variable	Abbreviation	Variable type	Expected Sign
Earnings			
ROA	Return on Assets (%)	Dependent	
ROE	Return on Equity (%)	Dependent	
Asset quality			
NPL	Non-Productive Loans (%)	Independent	-
Growth			
LG	Loans Growth (%)	Independent	+
DG	Deposits Growth (%)	Independent	+
Liquidity			
LDR	Liquidity Debt Ratio or Loan to Deposit Ratio (%)	Independent	+
Equity	Capital Adequacy Ratio	Independent	-

CAR		Independent	-
Strategic Response			
SRQ	Strategic Response Quotient	Independent	+
Macroeconomic			
GDP	GDP (%)	Independent	+
INFLATION	Inflation rate	Independent	+

Table 2: Descriptive statistics for Indian banks' sample

Variable	N	Mean	Standard Deviation	P25	Median	P75
ROE		19.56	8.147	12.478	18.962	24.56
ROA		2.458	1.0123	1.587	3.654	3.258
NPL		1.254	0.789	0.478	0.874	2.147
LDR		92.36	12.587	86.987	90.541	96.325
LG		16.98	13.562	7.852	14.278	25.854
DG		10.32	12.547	6.154	20.174	20.65
CAR		20.36	4.524	14.789	0.921	22.69
LDR		0.874	0.125	0.856	0.821	0.987
SRQ		0.925	0.258	0.721	0.963	1.254
NIISC		3.625	0.897	2.987	3.698	5.236
GDP		5.258	0.547	4.879	5.632	6.241
INF		4.925	2.547	3.124	4.251	6.987



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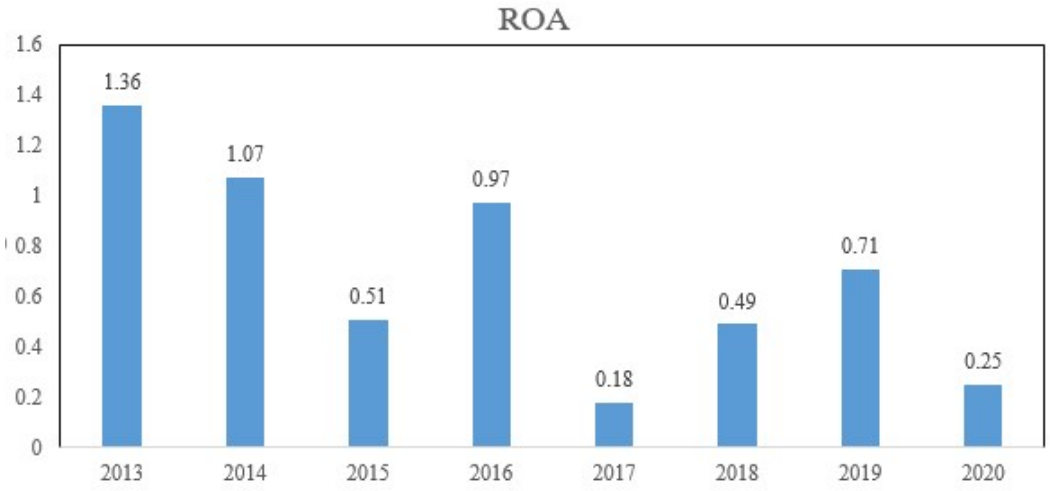

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Figure 2: Average of ROE and ROA over time

Table 3: Model diagnostic tests

ROE				
Augmented Dickey-Fuller	Inverse normal	-0.2278	p-value=	0.148
Lagrange Multiplier	LM test	5632.21	p-value>	0
Wald Test		32547	p-value<	0

ROA				
Augmented Dickey-Fuller	Inverse normal	-0.5478	p-value=	0.325
Lagrange Multiplier	LM test	2785.23	p-value>	0
Wald Test		6222.78	p-value<	0

Table 3 shows the results of three test models, the Augmented Dickey-Fuller test, Lagrange Multiplier test, and Wald Test for ROE and ROA. These tests are used to find out if explanatory variables in a model are significant or not. In this paper, both ROE and ROA are the explanatory variables. If the test results show that the parameters for certain explanatory variables are zero, then the variables can be removed from the model. If the test shows the parameters are not zero, then the variables can be included in the model. For all tests, the parameters (ROE and ROA) obtain the non-zero values (p-values), which indicate the strong fit of explanatory variables for the model. For the augmented Dickey-Fuller test, the model attains the p-value of 0.148for ROE and 0.325 for ROA which are greater than 0.05, so it failed to reject the null hypothesis, the data has a unit root and is non-stationary.

Table 4: Pearson correlation matrix

	ROE	NPL	LG	DG	NPLG	LDR	CAR	SRQ	GDP	INF
ROE	1									
NPL	-0.424	1								

LG	0.389	-0.078	1							
DG	0.223	-0.049	0.489	1						
NPLG	0.156	0.032	0.325	0.178	1					
LDR	-2.897	0.287	0.247	-0.182	0.085	1				
CAR	-0.325	-0.123	-0.365	-0.125	0.092	0.208	1			
SRQ	0.168	-0.209	-0.118	-0.128	0.056	-0.185		1		
GDP	0.389	0.008	0.489	0.198	0.193	0.165	-0.425	-0.062	1	
INF	0.369	0.052	0.358	0.123	0.152	-0.054	-0.412	-0.148	-0.426	1

Table 4 shows the results of the Pearson correlation analysis applied to the dependent and independent variables. Pearson's correlation coefficient is the test statistics that measures the statistical relationship, or association, between two continuous variables. It is known as the best method of measuring the association between variables of interest because it is based on the method of covariance. It gives information about the magnitude of the association, or correlation, as well as the direction of the relationship. The results show that the most of independent variables NPL (-0.424), LG (0.389), CAR (-0.325), and GDP (0.389) have a moderate correlation with ROA. The variables NPLG and SRQ attain a strong correlation with the ROE. Comparing all, LDR shows a small correlation with ROE; however, the results prove that most of the independent variables considered for analysis have a strong correlation with ROE.

Table 5: Model Results

Variables	**ROE**		**ROA**	
	Fixed Effects	Random Effects	Fixed Effects	Random Effects
NPL	-5.214***(1.325)	-5.6547***(1.203)	-0.452**(0.231)	**-0.489**(0.200)**
LG	0.082 (0.071)	0.087(0.078)	0.004(0.015)	0.004
DG	0.123***(0.034)	0.123***(0.032)	0.004(0.005)	0.004
NPLG	-0.0042(0.002)	-0.003(0.0048)	-0.002 (0.002)	-0.002
LDR	8.254(6.789)	0.321(8.456)	3.452***(0.752)	**3.456***(0.786)**
CAR	-0.456**(0.224)	-0.456*(0.224)	0.0289 (0.025)	0.027
SRQ	-6.785*(3.808)	-3.254*(3.456)	-0.789 (0.625)	-0.785
NIISC	1.524(1.058)	1.478(1.325)	0.256 (0.158)	0.256
GDP	4.587***(0.856)	2.698***(1.2005)	**0.528*** (0.148)**	0.578
Intercept	6.789(7.895)	12.365(9.854)	-3.587 (1.089)	0.516***
R-squared	0.632	0.589	0.389	-3.589(1.087)
F test	0		0.005	
Chi-squared		0		0

SarganHansen (P-value)		0		0

The model results show that all EAGLES variables, except liquidity, were significant at the 10% level. It was particularly noted, equity and strategy were significant at the 10% level whereas asset quality and growth were significant at the 1% level. The results show that the liquidity of EAGLES was not significant for determining the financial capability of Indian banks. This is because ROE does not account for Liquidity risk. The other factors of the EAGLES framework were found to be highly significant for determining bank financial capability and resilience. The asset quality determined by NPL has a negative impact on financial capability and was significant at a 1% level. NPL indicates how well the banks manage the risk of their loans or assets through acquisitions, portfolio management, and collections. The NPL of Indian banks over some time is shown in figure 3.

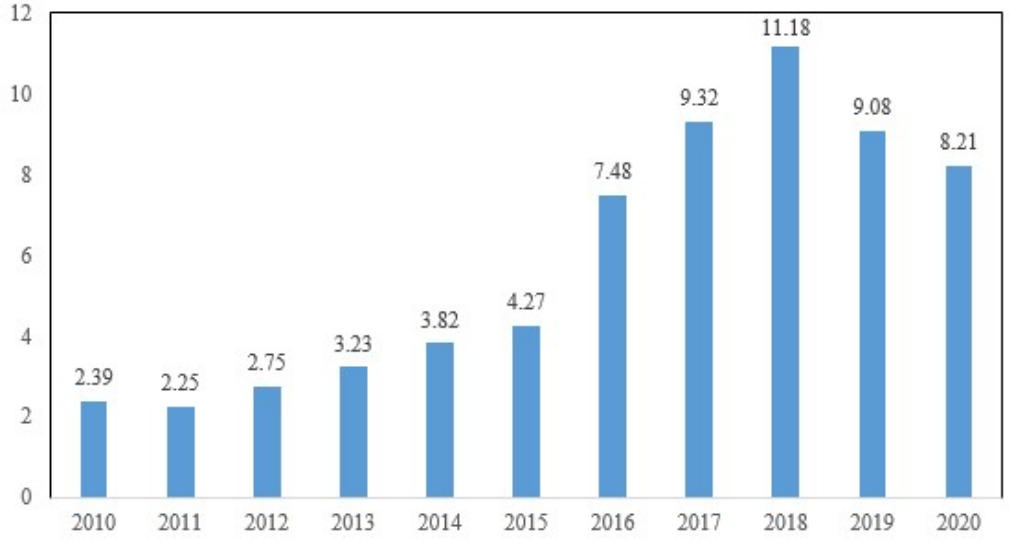
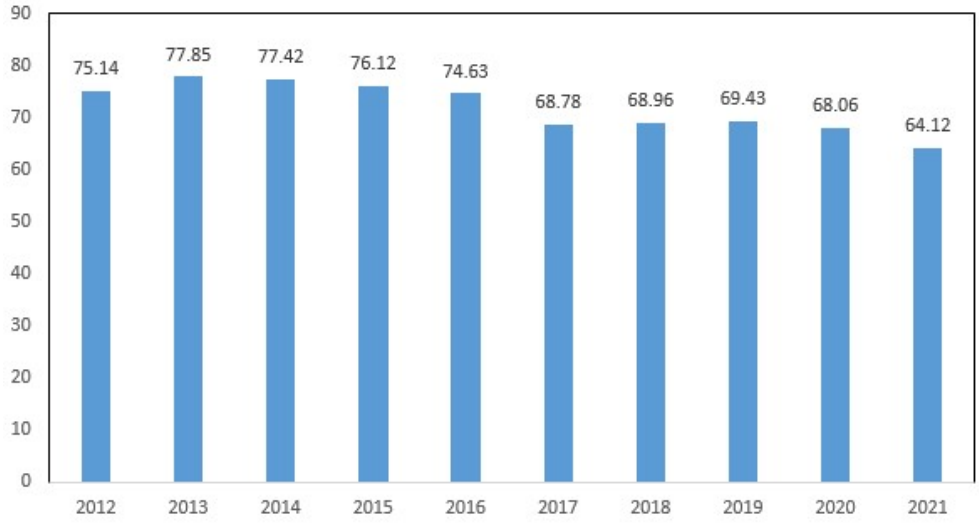


Figure 3: NPL of Indian banks

India's Non-Performing Loans Ratio stood at 8.2 % in Mar 2020, compared with the ratio of 9.1 % in the previous year. Reserve Bank of India provides an annual Non-Performing Loans Ratio. NPLs are defined as loans overdue for more than 90 consecutive days. Directionally, NPL was performing as expected, negatively impacting ROE. A higher NPL increases increased the strain on the Indian banks hence negatively impacting their financial capability. Growth represented by DG had a positive impact on financial capability and was also significant at the 1% level. The results of DG show that it performed as expected, a higher DG resulted in a higher ROE. It allows Indian banks to increase their lending. Equity proxied by CAR had a negative impact on ROE at the 10% significance level. The Capital Adequacy Ratio (CAR) is a measure of how much capital a bank has available, reported as a percentage of a bank's risk-weighted credit exposures. Having sufficient CAR acts as a cushion to absorb losses before banks become insolvent. The results of the CAR metric show that it has a negative impact. Strategic Response determined by SRQ had a negative impact on financial capability and was significant at the 10% level. SRQ indicates the time's coverage of net interest income over net non-interest income. The results obtained for SRQ indicate that it was not performing as expected as it had a negative impact on ROE. SRQ has been decreasing across the industry

over time in line with ROE indicating a focus on non-interest income by Indian banks. The LDR and GDP obtained for India for the past 10 years are shown in figure 4.



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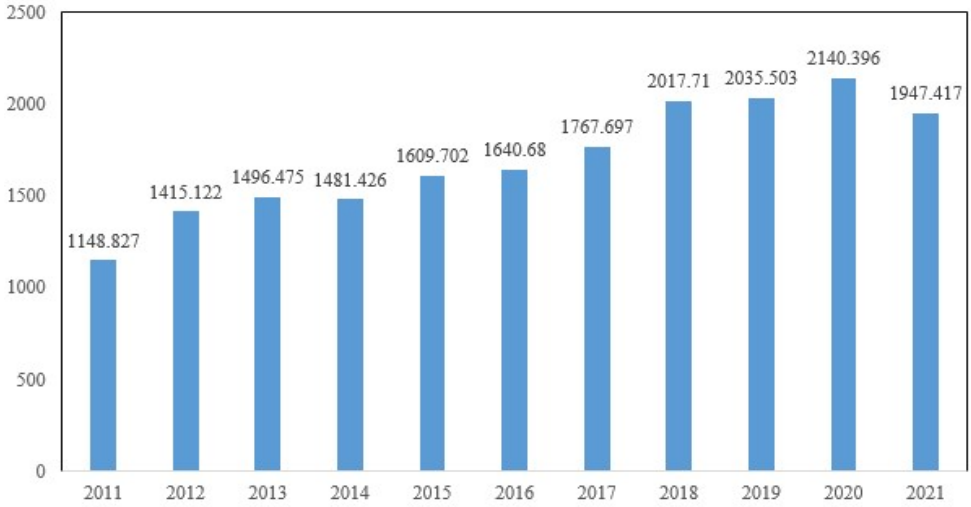

(b)

Figure 4: Average LDR and GDP of India

It is but evident that Indian banks are significantly impacted by GDP. As expected, a higher GDP resulted in a higher ROE for all of them. The significance of GDP tells us two significantly important things: banks provide funding to all industries within the Indian economy and banks are also central to the growth of the Indian economy. Banks typically are industry agnostic in their lending and deposit facilities provided to customers to meet credit criteria. Without banks, there is insufficient capital for growth hence GDP is significant in bank ROE. Therefore, Indian banks are well-positioned as GDP has been averaging 5.4% from 2011 to 2021.

4. CONCLUSION

In this paper, a research model is developed to identify the impacts of covid-19 on Indian banking resilience. The financial capability of Indian banking sectors in a pandemic is identified with the help of popular research models such as Pearson correlation, and Regression analysis. The results show the importance of the financial capability of Indian banks to quickly recover from Covid-19. The framework used is the proved EAGLE model, which provides a significant archetypal for Indian banks' financial capability. The two significant components of EAGLES determinants of financial capability are Asset Quality and Growth. In particular, it is easily concluded from the above analysis that the Indian banks want to focus on increasing DG and reducing NPLs for improving their financial capability and liquidity. Strategy and Equity, particularly CAR and SRQ, indicate the significance of EAGLES in determining financial capability. The results show that the GDP strongly affects the financial capability of Indian banks. To overcome the issues obtained because of COVID-19, the banks should focus on improving these key factors of EAGLES. The findings of the study are useful for the Indian economy for improving productivity and growth above the inflation rate as of 2021, and the focus need to be on maintaining economic growth and resilience. As seen above, the EAGLES liquidity interestingly was not a significant factor in evaluating Indian banks' financial capabilities. The EAGLES framework's other components were shown to be extremely important in assessing bank financial capability and resilience.

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