

Capital Adequacy, Risk and Bank Performance: Evidence from India

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Abstract

This paper is aimed to assess the impact of bank capital and risk on the performance of Indian banks controlling for banks' specific factors, banks' ownership, banking regulations, financial events, and macroeconomic variables. Panel Regression Technique was used to analyze the performance of a sample of 65 Commercial Banks in Indian Banking sector from three different ownership structure that is private, public and foreign for a period of 14 years from 2005 to 2018. It was found that Capital adequacy ratio had a negative relationship with the performance of the banks. Net Non-performing assets negatively impacted banks' profitability and productivity. The rapid increase in the Non-Performing Assets has impacted lending capacity as well as the profitability of the banks.

Keywords: *Capital adequacy, Credit risk, Non-Performing assets, Banks' Performance*

Introduction

A strong financial system of a country is based on a stable banking system which needs an effective capital adequacy, liquidity, asset and risk management of banks. The banking business is very risky because of its spillover effect. Failure of one banking institution affects the overall economy. Basel Committee on Banking Supervision (BCBS) introduced Basel norms for promoting harmony and stability in the banking system of all the countries in the world. Basel norms were adopted the first time in 1988 but in India, Basel I norms were adopted in the year 1999. Basel I was later replaced by Basel II as the former was not sufficient to measure risk exposures. Basel Committee on Banking Supervision (Bank for

International Settlements) introduced Basel III in 2010 as a response to the financial crisis of 2007–2008 (Bhoora & Jangra, 2018). A substantial increase in NPAs of banks in recent years, especially Public Sector Banks (PSBs), is alarming for the Economy (Masood & Pervez, 2019). However, the profitability of foreign banks was comparatively less affected by Non-performing assets (Shaban, 2018).

This study examines the relationships of Capital adequacy ratio and Bank risk with bank performance. A considerable body of literature investigated the relationships of bank performance with bank risk and bank capital, however, the earlier literature has not investigated that to what extent the bank performance is influenced by credit risk and banks capital in the presence of banking regulations, financial events and other macroeconomic variables viz. Basel eras, financial crises, and demonetization. Therefore, this research attempts to fill this gap by investigating the relationships between bank capital, risk & performance controlling various bank-specific characteristics, banking regulations and macroeconomic factors. The present study used a panel regression analysis on selected 65 Banks in Indian Banking Sector to study the relationship of capital & risk with the performance of commercial banks in India.

Review of Literature

Ly (2015) examined the relationship between Liquidity, risk, supervision, regulation and bank performance using panel data from 2001 to 2011 for 27 countries and concluded that increasing power to official supervisors and capturing capital requirements were more preferred in the market-based compared to bank-based countries. Ozili (2015) investigated the factors affecting bank profitability. The research found an insignificant impact of Basel capital on bank performance. The factors affecting bank profitability rely on the profitability metric used. He also found that the bank capital adequacy ratio was a major determinant of bank profitability. Kayode et. Al. (2015) found that increased exposure to credit risk reduces bank profitability and suggested an aggressive deposit mobilization, a reliable credit risk management strategy and adequate punishment for defaults. Suganya & Kengatharan (2018) found that bank capital had a positive impact on bank profitability while operating cost efficiency and Non-Performing loans showed a negative relationship with profitability. Rahman (2018) examined the relationships of capital regulation, risk, and performance of banks in Bangladesh. He found a negative relationship of capital regulation with risk-taking, positive relation of performance with capital regulation and negative relation between

performance and risk. Chen (2018) investigated the dependence of liquidity risk on external funding, macroeconomic factors, and supervisory and regulatory factors, and found the reverse impact of Liquidity risk on bank performance in a market-based financial system. Majumder & Li (2018) examined the effect of bank capital requirements on the risk and performance of the Bangladeshi banking sector. The study found a positive and significant impact of bank capital on bank performance, on the other hand, negative and significant impact on risk. They also found an inverse relationship between performance and risk. Sarkar et. al (2019) investigates the relationship of risk, capital, and efficiency of Indian banks and found an association of lower efficiency with higher credit risk in private sector banks and public sector banks but the association of higher efficiency with more credit risk in of foreign banks. They conclude that more efficient institutions comprising in public sector possess more capital and that better-capitalized banks comprising public sector has lower risks. Kaur & Sharma (2019) Studied the liquidity risk and credit risk of commercial banks in India and found that bank size and profitability had impacted liquidity risk and credit risk in the case of public and foreign banks.

Research Objectives

The study was aimed to achieve these objectives.

- To examine the relationship of bank capital with the profitability of banks.
- To assess the relationship of bank capital with the productivity of banks.
- To investigate the relationship of credit risk with the profitability of banks.
- To find the relationship of credit risk with the productivity of banks.

Research Hypotheses

For achieving the objectives of the study these hypotheses were framed.

- H01: There is no significant relation of Capital adequacy ratio (CAR) with return on Assets (ROA)
- H02: There is no significant relation of Capital adequacy ratio (CAR) with return on equity (ROE)
- H03: There is no significant relation of Capital adequacy ratio (CAR) with Operating profit ratio (OPR)

- H04: There is no significant relation of Capital adequacy ratio (CAR) with Net Interest Margin (NIM)
- H05: There is no significant relation of Capital adequacy ratio (CAR) with Business per employee (BPE)
- H06: There is no significant relation of Capital adequacy ratio (CAR) with profit per employee (PPE)
- H07: There is no significant relation of Net Non-Performing Assets to Net Advance (NNPANA) with return on Assets (ROA)
- H08: There is no significant relation of Net Non-Performing Assets to Net Advance (NNPANA) with return on equity (ROE)
- H09: There is no significant relation of Net Non-Performing Assets to Net Advance (NNPANA) with Operating profit ratio (OPR)
- H010: There is no significant relation of Net Non-Performing Assets to Net Advance (NNPANA) with Net Interest Margin (NIM)
- H011: There is no significant relation of Net Non-Performing Assets to Net Advance (NNPANA) with Business per employee (BPE)
- H012: There is no significant relation of Net Non-Performing Assets to Net Advance (NNPANA) with profit per employee (PPE)

Research Methodology

Data sources and sample

The present study is mainly based on secondary sources of data. The Reserve bank of India database was the main source of the data. Apart from the RBI database, various journals, books, websites, and studies were used as secondary sources of data. A sample of 65 banks has been considered for the present study, consisting of three ownership structures, with 21 public, 19 private and 25 foreign banks in the Indian banking sector. The period of the study is from 2005 to 2018.

Variables of the study

Table 1 highlights various variables used in the study including proxies for performance variables, independents variables, Dummy variables to capture the impact of banking

regulations and other financial events, bank-specific variables for the impact of bank-specific characteristics and macroeconomic variables.

Performance variables:

Various measures of bank performance have been used by earlier studies such as return on equity, return on assets, Business per employee, earning per share, net interest margin, etc. This study uses these five measures of bank performance following the study of Majumdar & li, 2018, Ozili (2015), Rahman et. al (2018), Chen at. Al (2018), Roy (2014), Tanna (2018), Ozili (2015), Ly (2015).

Risk variable:

This paper used credit risk with Net non-performing advance to total advance ratio as proxy measure following the study of Majumdar & li, 2018, Abdrahamane et. al (2017), Ozili (2015), Rahman et. al (2018).

Bank capital variable:

This paper used the capital adequacy (regulatory capital) following the study of Majumdar & li, 2018, Ozili (2015), Rahman et. al (2018).

Bank-specific variables:

Liquidity: In this paper, Liquid assets to Total Assets Ratio was used as a measure of liquidity following the study of Chen at. Al (2018), Ly (2015).

Table 1: Variables of the study

Variables	Proxy Measures	Acronym	References
<i>Performance Variables</i>			
Profitability	Return on assets	ROA	Majumdar & li, 2018, ozili (2015), Rahman et. al (2018), Chen at. Al (2018), Roy (2014)
	Return on Equity	ROE	Chen at. Al (2018), Tanna (2018), Roy (2014)
	Operating Profit Ratio	OPR	Tanna (2018), Roy (2014)
	Net Interest Margin	NIM	Ozili (2015), Chen at. Al (2018), Ly (2015)

Productivity	Business Per Employee	BPE	Tanna (2018), Roy (2014)
	Profit Per Employee	PPE	Tanna (2018)
<i>Independent Variables</i>			
Bank Capital	Capital Adequacy Ratio	CAR	Majumdar& li, 2018, Ozili (2015), Rahman et. al (2018)
Credit Risk	Net Non-Performing Assets to Net Advance	NNPANA	Majumdar& li, 2018, Abdrahamane et. al (2017), Ozili (2015), Rahman et. al (2018)
<i>Bank Specific Variables</i>			
Liquidity	Liquid assets to Total assets Ratio	LATA	Chen at. Al (2018), Ly (2015)
Priority sector lending	Priority sector advance to total advance	PSATA	Tanna (2018), Roy (2014)
Investment Pattern	Investment in Government Securities to total Investments	GSTI	Tanna (2018)
Bank Size	Log of assets	LNA	Rahman et. al (2018), Ly (2015), Roy (2014)
<i>Bank Ownership</i>			
	Private Ownership (Dummy)	D5_Pvt	Rahman et. al (2018), Roy (2014)
	Foreign Ownership (Dummy)	D6_Fgn	Rahman et. al (2018), Ly (2015), Roy (2014)
<i>Banking Regulations</i>			
	Basel II Era (Dummy)	D3_B2	Roy (2014)
	Basel III Era (Dummy)	D4_B3	Rahman et. al (2018), Roy (2014)
<i>Macroeconomic variables</i>			
Economic Growth	Gross Domestic Growth Rate	GDP	Rahman et. al (2018), Chen at. Al (2018)
<i>Financial events</i>			
	Financial Crises (Dummy)	D1_FC	Author's Own
	Demonetization (Dummy)	D2_Dem	Author's Own

Priority sector lending: Priority sector advance to total advance was used in the study for controlling the impact of priority sector lending by the banks following Tanna (2018) and Roy (2014).

Investment Pattern: Investment in Government Securities to total Investments was used in the study to control for the investment patterns of the banks following Tanna (2018).

Bank Size: Natural log of total assets of the bank were used to control for bank size following the studies by Rahman et. al (2018), Ly (2015), Roy (2014)

Bank Ownership

This study analyzed the Performance of Banks from three different ownership structure that is private, public and foreign. Two Dummy variables, each for private and foreign banks, were included in the equation controlling for ownership (Rahman et. al 2018, Ly 2015, Roy 2014). For private bank dummy variable, one was used for a private bank and zero for other banks, similarly, for public bank dummy variable, one was used for public banks and zero for other banks was used.

Banking regulation

Two Dummy variables, each for the Basel II era and the Basel III era, were included in the equation controlling for banking regulation (Rahman et. al 2018, Roy 2014). For private bank dummy variable, one was used for the private bank and zero for other banks, similarly, for public bank dummy variable, one was used for public banks and zero for other banks was used.

Financial events:

Two Dummy variables, each for financial crises of 2008 and demonetization, were included in the equation controlling for financial events and any possible structure break in time series. For financial crises dummy variable, one was used for years 2008 & 2009 and zero for other years, similarly, for demonetization dummy variable, one was used for the year 2017 and zero for other years.

Macro-economic variables

Economic growth: This paper used the annual GDP growth rate as economic growth (Rahman et. al 2018, Chen at. Al 2018).

Panel Regression models

The study assessed the effect of bank risk and bank capital on performance of Indian Banking sector with reference to its profitability & productivity across the different ownership structure that is Foreign Banks, Private Sector banks and public sector banks, under a set of control variables to account for banks specific characteristics and macroeconomic impacts

using Panel Data Analysis. For this purpose, following equations was used based on previous literature.

$$P_{it} = \beta_1 + \beta_2 CAR_{it} + \beta_3 NNPANA_{it} + \beta_4 LATA_{it} + \beta_5 PSATA_{it} + \beta_6 GSTI_{it} + \beta_7 LNA_{it} + \beta_8 GDP_{it} + \beta_9 D1_FC_{it} + \beta_{10} D2_Demit + \beta_{11} D3_B2_{it} + \beta_{12} D4_B3_{kit} + \beta_{13} D5_Pvt_{it} + \beta_{14} D6_Fgn_{kit} + \epsilon_{it}$$

Here i denotes cross-sectional dimension, t indicates years and ϵ refers to the random error term. P_{it} indicates bank performance using ROA, ROE, NIM, OPR, BPE & PPE. β_1 is the constant term CAR is the bank capital measured by the Capital Adequacy Ratio. NNPANA is the Bank Risk has measured by Net Non-performing assets to total Advance. LATA is the liquidity measured by the liquid assets to total assets ratio. PSATA is priority sector advance to total advance, GSTI is Investment in government securities to total investment ratio, LNA is the natural log of Assets used for the size of the firm, GDP is used for economic growth. D1 to D6 are dummy variables used for qualitative data.

The methods used for estimating panel data equations are the Fixed and Random Effects model. For deciding the choice of Random Effects or Fixed Effects, generally Hausman's test is run, where the null hypothesis is that is random effects is an appropriate model.

Empirical Results

This section has been divided into three parts. The first part is about the descriptive statistics of 14 years of observations of all variables. The second shows the Pearson correlation matrix of the variables. The third highlights the panel regression analysis.

Table 2: Descriptive statistics

	ROA	ROE	OPR	NIM	BPE	PPE	CAR	NNPANALATA	PSATALNA	GSTI	GDP		
Mean	1.4066	12.388	2.6349	3.0293	150.71	2.4094	20.539	1.9317	13.079	34.547	12.308	81.100	6.9977
Median	1.1900	11.742	2.1920	2.8647	111.01	0.8000	13.820	0.9400	8.4188	33.270	12.699	82.406	7.6608
Maximum	10.230	70.061	15.615	7.3418	1045.4	36.328	295.68	98.790	79.944	100.00	17.357	100.00	8.4975
Minimum	0.0100	0.0458	0.0037	0.2158	5.4810	0.0060	7.5100	0.0000	1.3231	0.0000	5.7062	11.214	3.086
Std. Dev.	1.1463	7.4540	1.7512	1.0426	149.12	4.4412	20.78	4.1942	13.22	12.617	2.338	12.95	1.443

Source: Authors Calculation

Table 2 shows the mean, median, minimum, maximum & standard deviation. From the tables, it can be observed that the CAR has the highest variation among the sample's standard deviation with standard deviation of 20.78, followed by GSTI (12.95), PSATA (12.61) and others. Among the performance variables ROA, ROE, OPR & NIM are in percentage form while BPE & PPE are in million Rs. Among profitability measures, NIM has the lowest variation (standard deviation = 1.01) while ROE has the highest deviation with a standard deviation of 7.45. However, the mean value of ROE is 12.38 which is greater than that of ROA (1.4) & NIM (3.02). The mean value of ROA is 1.40. There is not much variation in ROA among the samples as the standard deviation of 1.146. Mean CAR has is 20.53, indicates maintenance of high capital adequacy by the sample banks with a standard deviation of 20.78. The variation in risk measure NNPA (4.19) shows variations of financial stability. The mean Value of LATA (13.07) indicates a better liquidity position of the banks. The mean value of PSATA shows that the banks have provided, on an average, 34.54% of their total advances to priority sectors with a variation of 12.61%. For GSTI, the mean value is 81.1, indicating a measure portion of total investment was made in government securities by the banks.

Table 3 highlights the correlation matrix of the variables. Pearson correlation matrix was used to examine the multicollinearity problem between independent variables. As evident from the table 3, the highest correlation is -0.626 between the independent variables, LNA and LATA. The correlation value of more than 0.70 indicates the multicollinearity problem between the variables (Kennedy, 2003) and the correlation value of more than 0.80 indicates serious multicollinearity problem (Gujarati, 2009). Thus the correlation among the variables is not so strong, hence no multicollinearity exists between the independent variables.

Table 3: Correlation matrix of variables

	ROA	ROE	OPR	NIM	BPE	PPE	CAR	LATA	NNPA	PSATA	LNA	GSTI	GDP
ROA	1												
ROE	0.275	1											
OPR	0.807	0.023	1										
NIM	0.455	-0.037	0.570	1									
BPE	0.052	-0.209	0.030	-0.058	1								
PPE	0.511	-0.013	0.419	0.126	0.654	1							

CAR	0.309	-0.264	0.273	0.256	-0.002	0.189	1						
LATA	0.283	-0.182	0.332	0.213	0.060	0.077	0.446	1					
NNPANA	-0.127	-0.005	-0.166	-0.252	-0.072	-0.108	0.086	-0.055	1				
PSATA	0.218	0.021	0.221	0.104	-0.170	0.000	0.112	0.255	-0.007	1			
LNA	-0.380	0.323	-0.349	-0.243	-0.217	-0.257	-0.480	-0.626	0.005	-0.340	1		
GSTI	0.020	0.019	0.024	0.020	-0.147	-0.138	0.145	0.143	0.077	0.064	-0.070	1	
GDP	-0.102	-0.092	-0.102	-0.084	0.040	-0.030	-0.002	0.017	0.087	0.016	-0.029	0.055	1

Source: Authors Calculation

Table 4 shows the results of panel regression analysis. Both fixed effects and random effects models were computed for the dependent variables ROA, ROE, OPR, NIM, BPE & PPE, separately. In all models random effects model were found to be appropriate based on the results of the Hausman test. Therefore, the results of only random effects model have been reported. The summary of the results is shown in table 4.

In the case of ROA, the dummy variable for the ownership of foreign banks had a positive impact on ROA, Macroeconomic control GDP and a dummy variable for the Basel III era had a negative impact on ROA while dummy variable Basel III was found to have a positive and significant impact on ROA. In the model with ROE as the dependent variable, independent variable for bank capital (CAR), macroeconomic control (GDP), a dummy variable for Demonetization, Basel III era & foreign ownership of banks, were found to have a significant and negative impact. However, the variable for bank risk (NNPANA), priority sector advance (PSATA) and a dummy variable for financial crises period had positively & significantly impacted the ROE. In the case of OPR, Bank Risk, Economic growth and Basel III era were found to have a negative and significant impact.

Table 4: Results of Panel Data Regression

Independent variables	Dependent Variables					
	ROA	ROE	OPR	NIM	BPE	PPE
C	2.012106 (0.0037)***	9.602259 (0.0332)**	3.154139 (0.0023)***	2.529975 (0.0001)***	235.4164 (0.0021)***	7.914933 (0.0026)***
CAR	0.002812 (0.1108)	-0.052525 (0.0001)***	-0.002141 (0.3432)	0.002077 (0.1650)	-0.546108 (0.0021)***	0.030243 (0.0000)***
LATA	0.000841 (0.8299)	0.002364 (0.9304)	0.007815 (0.1394)	0.007586 (0.0292)**	0.620679 (0.1283)	-0.038880 (0.0030)***
NNPANA	-0.010077 (0.1696)	0.102817 (0.0676)*	-0.030435 (0.0011)***	-0.040666 (0.0000)***	-2.514231 (0.0006)***	-0.087114 (0.0001)***
PSATA	0.000969 (0.7779)	0.045253 (0.0554)*	-0.004983 (0.2860)	0.007104 (0.0206)**	-1.602622 (0.0000)***	-0.037831 (0.0011)***

LNA	-0.077670 (0.0439)	0.405311 0.0833	-0.068731 0.2583	0.013764 0.7225	-3.850565 0.3829	-0.299620 0.0541
GSTI	0.003099 (0.2524)	0.003022 (0.8791)	0.005006 (0.1545)	-0.002312 (0.3198)	-0.791875 (0.0040)***	-0.016510 (0.0561)*
GDP	-0.046462 (0.0401)**	-0.187671 (0.2837)	-0.073352 (0.0104)**	-0.030813 (0.1043)	-2.534376 (0.2603)	-0.156631 (0.0253)**
D1_FC	0.138711 (0.1558)	1.428592 (0.0569)*	0.183149 (0.1421)	-0.025931 (0.7535)	-42.79223 (0.0000)***	-0.347975 (0.2556)
D2_DEM	-0.160871 (0.1735)	-2.159203 (0.0182)**	0.076295 (0.6103)	-0.073330 (0.4601)	25.20782 (0.0326)**	0.146079 (0.6903)
D3_B2	3.44E-05 (0.9997)	-0.827503 (0.2079)	0.022002 (0.8426)	0.032613 (0.6561)	62.44776 (0.0000)***	0.600769 (0.0276)**
D4_B3	-0.218471 (0.0222)**	-2.457298 (0.0004)***	-0.394369 (0.0026)***	-0.207730 (0.0149)**	148.0152 (0.0000)***	1.809518 (0.0000)***
D5_PVT	0.196492 (0.2712)	0.481593 (0.6151)	0.222161 (0.5103)	0.530824 (0.0104)**	-41.63534 (0.0663)*	-0.569493 (0.5300)
D6_FGN	0.892444 (0.0000)***	-2.000235 (0.0709)*	1.614251 (0.0000)***	0.868625 (0.0001)***	110.5475 (0.0000)***	3.182542 (0.0010)***
R²	0.116969	0.120530	0.124420	0.140571	0.419068	0.174784
Adjusted R²	0.104143	0.107756	0.111702	0.128087	0.410630	0.162797
F-stat	9.119602	9.435264	9.783056	11.26066	49.66376	14.58187
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Durbin Watson Stat	1.38	1.49	1.53	1.8	1.33	1.95

Source: Authors Calculation

Note: Numbers outside parenthesis are coefficients, Parenthesis shows probability values

***1% significance level **5% significance level *10% significance level

Table 5: Summary of hypotheses testing

Hypotheses Tested	Results
H ₀₁ : There is no significant relationship of CAR with ROA	Accepted
H ₀₂ : There is no significant relationship of CAR) with ROE	Rejected
H ₀₃ : There is no significant relationship of CAR) with OPR	Accepted
H ₀₄ : There is no significant relationship of CAR) with NIM	Accepted
H ₀₅ : There is no significant relationship of CAR with BPE	Rejected
H ₀₆ : There is no significant relationship of CAR with PPE	Rejected
H ₀₇ : There is no significant relationship of NNPANA with ROA	Accepted
H ₀₈ : There is no significant relationship of NNPANA with ROE	Rejected
H ₀₉ : There is no significant relationship of NNPANA with OPR	Rejected
H ₀₁₀ : There is no significant relationship of NNPANA with NIM	Rejected
H ₀₁₁ : There is no significant relationship of NNPANA with BPE	Rejected
H ₀₁₂ : There is no significant relationship of NNPANA with PPE	Rejected

Conclusion

Capital adequacy ratio has shown a negative relationship with return on equity and Business per employee indicating a negative impact of bank capital with bank performance. Net Non-

performing assets have negatively impacted banks profitability and productivity. Rapid increase in the NPAs of Indian banks has impacted lending capacity as well as profitability of banks. Government is taking steps to mitigate the problems of increasing NPAs but there is a need of more effective methods to recover the NPAs of banks specially in case of the public sector banks. Economic financial crises of 2008 impacted US economy and economy of many other countries in the world including India because of the spill over effects, but Indian banking sector showed a resilience towards the crises and was not much impacted by the crises. Profitability of banks were positively impacted by Basel II era but Basel III era had negatively impacted performance of banks indicating stricter requirement of Basel III norms. Profitability of Private and foreign banks was better than that of public sector banks.

Research Limitations

Some Limitations may affect the results of the study. Firstly, this study is based on data from secondary sources, collected from RBI database, so any discrepancy in data or incorrect data may influence outcome of the analyses. Secondly, the variables used in this study is limited, many other variables were not being address which may have their impact on banks' performance. Thirdly, the statistical tools have their own limitations.

Direction for Future Research

- Further studies may be conducted taking into consideration other bank specific variables
- Studies can be conducted for analysing impact of capital adequacy and credit risk controlling for other financial events like mergers of banks.
- Other macroeconomic variables can be used for controlling the impact of macroeconomics factors
- Studies can be conducted for analysing financial performance of other financial institutions like NBFCs, Small finance banks etc.

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