



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 12, December 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com



Impact of CRAR on Banks Profitability Factors to the Indian Public and Private Sector Banks

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ABSTRACT: The study mainly focused impact of Capital to Risk-weighted Assets Ratio (CRAR) in the dimension of profitability factor. The data used in the paper are balance sheet and off-balance sheet columns, ratios for the annual periods from 2005 to 2019 of Indian Public and Private Sector Banks by using Dummy Variable Regression Model with fixed and random effect methods. Align data a strongly balanced data set, calculate banks' ownership-wise descriptive statistics of all variables and components, compute statistical model parameters, and make significant inferences. There are two policy criteria: Basel-III and asset quality implementation in banks. We conclude that the dependent variables Operating Profit to Total Assets (OPTA), Return on Equity (ROE), Return on Asset (ROA), and Net Interest Margin (NIM) have a positive impact on CRAR and the size of Public Sector Banks (PSBs) and Private Sector Banks (PVTs), presenting the profitability factor linkages of Indian Banks with appropriate empirical results. Keywords: Capital to Risk-weighted Assets Ratio, Capital Adequacy Ratio, Return on Asset, Return on Equity, Size, Public Sector Banks (PSBs), Private Sector Banks (PVTs).

I. INTRODUCTION

Capital adequacy norms limit banks' capital structure flexibility. Rationally, a bank invests in opportunities which seem to be profitable. From portfolio theory, we know that risk is directly proportional to return. Thus, we can say that the enforcement of the capital adequacy ratio would have a negative impact on the profitability (OPTA, RE, A) of the banks. This is in agreement with Calomiris and Kahn (1991) In the study, agency costs between managers tend to be inflated owing to a higher capital ratio due to the imposing of debt repayment in order to satisfy the capital adequacy norms. However, Holmstrom and Tirole (1997), Allen et al. (2011) and Mehran and Thakor (2011) are of the opinion that increased surplus generated by better bank-borrower relationships and improved monitoring laid down by the capital adequacy norms would bring about a positive impact on the banks' profitability. Further, the capital adequacy norms aim at the stability of the banks and, as a result, they try to minimize the riskiness of the assets in the portfolios of the banks. From this point of view, it is very obvious that the enforcement of the capital adequacy norms would bring in an improvement in the asset quality of the banks. There is some evidence in the literature about the impact of Capital to Risk-weighted Assets Ratio (CRAR) on the efficiency and productivity of the banks. The authors Berger and Patti (2006), using a parametric distribution free approach, have shown that higher capital ratios have a negative impact on the efficiency of the banks in US. However, Fiordelisi et al. (2011) that less efficient banks tend to take on more risk and that better capitalized banks perform better in terms of efficiency. The paper is organised into five sections. Section II presents a literature review, Section III specification of Data Sources, Variables and Methodologies, Section VI review of statistical tables and results and Section 5 narrates the study's findings and conclusions.

II. LITERATURE REVIEW

Aside from the introduction studies, some of the relevant studies are explained with regard to the relationship between capital adequacy and bank profitability. Bourke (1989) verified a positive relationship, and his study explains the Bank solvency signals hypothesis with the capital at disposal, and the latter conveys banks' conservative approach by ignoring potential investment opportunities. Berger (1995) examined the capital and earning relationship of annual data 1983-1989 plus three years of lags on book values of U.S. commercial banks by using a regression with CAR, ROE, controlled and dummy variables. The author concluded the positive Granger-causality from earnings to capital is statistically consistent with the hypothesis that banks retain some of their marginal earnings in the form of equity increases and also that higher capital is followed by higher earnings. This evidence is also supported by Angbazo (1997), and Olalekan and Adeyinka (2013). Swamy (2001) studied the comparative performance of different bank groups from 1995-96 to 1999-2000 and concluded that the share of rural branches, average branch size, trends in the



bank's profitability, share of wages in expenditure, share of public sector assets, provisions and contingencies, net Non-Performance Assets in net advances and spread.

The study of Acharya et al. (2002) focused on effects of Diversification on Bank Risk and Return from Individual Bank Loan Portfolios of Italian banks from 1993-99, concluded that the industrial loan diversification reduces bank return while endogenously producing riskier loans for all banks and Sectoral loan diversification produces an inefficient risk-return trade-off only for high-risk banks. Finally, diversification of bank assets is not guaranteed to produce superior performance and/or greater safety for banks.

Ram Mohan (2004) discovered in his study that public sector banks have improved their profitability over private and foreign bank comparisons over the years. pointed to a convergence in performance between public and private sector banks in the post-reform era. Ashok Thampy (2004) employed a periodic model of capital allocation versus the supply of loans and capital adequacy ratios versus treasury investments. The results emphasized that when the bank is severely capital constrained, such as when the capital ratio is 6%, the capital adequacy ratio is 9%, then the banks reduce the supply of loans and conserve their capital by allocating fewer assets to loans. Regulators, while designing and implementing risk-based capital standards, need to balance concerns regarding bank safety with the availability of bank credit in the economy. The study did, however, mention that for banks with high capital adequacy ratios, there is little impact on loan growth.

SomanadeviThiagarajan and Ramachandran (2011) conducted a study to measure the credit risk component of the Indian Scheduled Commercial Banking sector over a ten-year period (2001-2010). study results indicate that there was a consistent increase in the total loans to total assets ratio and total loans to total deposits ratio for both the public and the private sector during the period of study. Monetary policy affects the profitability of banks indirectly through the revision of interest rates under different circumstances (Khan and Sattar 2014).

The study of Das (2013) examined the impact of the financial crisis on the Net Interest Margin (NIM) of Indian banks: bank specific, representing the banking industry, and macro-economic variables used panel data for the period 1992 through 2010. concluded that public sector banks were significantly impacted during the crisis, banks with low capital and poor liquidity were significantly harmed when compared to banks with adequate capital and liquidity support after the crisis passed.

According to Makri et al. (2014), highly capitalized banks are expected to have a higher proportion of bad loans. Fatima (2014), studied Capital Adequacy: A Financial Soundness Indicator for Banks for a period of 5 years from 2008-09 to 2012-13 using a panel regression of Profile "A" Banks. The result concluded that private sector banks are in a good position as compared to public banks by maintaining a higher capital adequacy ratio and also the impact of past financial crises was low due to the strong capital structure and regulatory environment for the banks of PSBs and PVTs in India.

The study conducted by Salgotra1 et al. (2015), mainly focused on CRAR values for selected Indian banks and results revealed that the PSBs have a better stake in the maintenance of CRAR rather than in PVTs.

ElBannan (2015) has provided contrary results regarding capital strength and problem loans and income diversification and size have shown a negative association with the GNPA ratio. With respect to income diversification and NPA, similar results have been propounded by Ozili (2018), Banks that generate revenue from non-interest-bearing assets and fee-based activities are more likely to have control over their GNPA ratio. In addition to a diversified revenue structure, banks can try to manage their problem loans by expanding their asset base. The role of market power for GNPA has been found to be significant. It has been discovered that industry competition has a negative impact on bad loans. In a highly competitive banking market, individual banks try to gain market share by extending more credit, which may sometimes lead to sub-prime lending.

RatnaBarua (2018) used regression analysis in a study on macroeconomic factors on the capital adequacy ratio of 101 commercial banks comprised of public sector banks, private banks, and foreign banks from 1999 to 2016 (18 years).The study examined bank-specific variables such as profitability, credit risk, capitalisation, leverage, and credit growth and concluded that declining profitability, a higher level of non-performing assets, sluggish economic growth, and lower credit offtake are currently the major impediments to Indian banks meeting the higher capital regulatory norms of Basel III. Private sector banks and foreign banks with a higher capital base have been able to meet the higher



capital requirements of Basel III. Since 2014, the majority of PSBs have suffered massive losses due to the evaporation of their equity capital.

Anita, Tanwar et.al (2019), the authors, analysed the CRAR of selected banks from 2008 to 2016. The results presented that ICICI bank is highly consistent in maintenance of CRAR.

Neeraj Gupta et.al (2020), The examination focuses on assessing the role of various bank-specific, industry-specific and macroeconomic determinants in Indian commercial banks' performance using a fixed effects estimation model and the Generalized Method of Moments (GMM), which has been used on a panel of data for 19 years for the 64 commercial banks of India. The findings show that private sector banks are more profitable than public sector banks.

The second criterion is related to research: it is commonly assumed that bank asset quality has an inverse relationship with profitability. The non-performing loan ratio (Non-performing loans/total loans) has been used as an indicator of asset quality in the majority of studies. The increase in Non-Performing Loans (NPL) implies the failure of credit policy and a decrease in the bank's earnings. Saba et al. (2012) concluded that banks should control and modify their credit advancement policy in order to have a lower non-performing loan ratio in the US Federal system from 1985 to 2010. Asha Singh (2013), the study explained the performance of non-performing assets (NPAs) in Indian commercial banks. NPAs are an inevitable burden on the banking industry. The success of a bank depends upon the methods of managing NPAs. According to the study, the NPAs of public sector banks are less improved than those of private sector banks.

Viswanathan (2015) addressed the conference of ASSOCHAM on Asset Quality in Indian Banks: the way forward. Public Sector Banks (PSBs) are grappling with the huge stock of stressed assets that has led to this phenomenal build-up of NPAs that has piled up in the system over the years. In fact, if a bank's risk management function is not commensurate with the complexity of its operations, it is prone to risks manifesting and turning beyond its risk appetite. In 2015, the RBI established a framework for risk management that was on the verge of becoming quality. Mundra (2016), addressed asset quality challenges in India – diagnosis and prognosis. Presented with the remedial measures post AQR, a vast majority of corporates are overleveraged with severely diminished debt servicing ability, projects which need fresh capital, new management and new promoters. Banks are wary of increasing their commitments to accounts which are under stress, for a variety of reasons. It may be extremely difficult to operate the enterprise profitably without paring down debt levels and the first step could possibly be to bring down the debt to a manageable level. This might involve writing down a part of the debt by the lenders and/or converting it into equity and bringing in a new promoter to run the enterprise. Bhaarathi (2018), The author presented whether asset quality affects bank profitability in India using panel regression for 2005-2016 and concluded that higher non-performing loans lead to lower return on equity and return on assets, and lower non-performing loans lead to higher return on equity and return on assets.

Richard Paul et.al (2019), the author, examined the quality of assets of banks has received added attention especially after the global financial crisis of 2007-08. The slowdown in industrial and commercial activities caused by the crisis has severely impacted the servicing of debts by borrowers. As a result, the quality of the banks' loan books has deteriorated. The results reveal that the public sector banks have performed better than the private sector banks under certain parameters, while the private sector banks have achieved a better performance than the public sector banks under certain parameters. Dolly Gaur et.al (2020), The study presented the proportion of priority sector lending (PSL) in total credit extended by banks as the major determiner of NPA, while controlling for certain other bank-specific and macroeconomic factors predicting NPA. The sample includes 46 commercial banking institutions operating in India, studied over a time span of 14 years (2005-2018). The findings show that, contrary to expectations, PSL had a minor but negative impact on the NPA.

Little literature is focused on determination of banks profitability in and across countries and studies identified factors such as the size of the bank, agility, efficiency, labour productivity, capital ratio, deposit growth, etc. which determine the bank performance and factors. Basel III compliance in banks and Asset Quality policy change have played a vital role in profitability. No such conditional approach has been followed in past studies. In this study, we wish to analyse the employment of four dependent variables, ROA, ROE, NIM and OPTA of private banks. The study considered annual data from 39 banks, 585 observations under two ownership structures, Public and Private Sector Banks, for a time period of 15 years from 2005 to 2019 and employed the Dummy variable regression with Fixed and Random effects models using the STATA package.



III. DATA SOURCE, VARIABLES AND METHODOLOGIES

Data Source:

The purpose of the study is to determine whether banks have specific factors influencing CRAR, performance, and efficiency of Indian Public and Private Sector Banks from 2005 to 2019, the most recent available annual data set extracted from the Reserve Bank of India's "Statistical Tables relating to Banks in India". This study mainly concentrates on Public and Private Sector Banks with the exclusion of Regional Rural Banks, Cooperative Banks and Foreign Banks.

Variables:

Variable type	Notation of variable	Definition	Expected sign in the models in relation to CRAR and Size
Dependent variable	Return on Asset (ROA)	It is a ratio of net income to total assets for the bank	+
	Return on Equity (ROE)	It is a ratio of net income to shareholder's equity of a bank.	+
	Net Interest Margin (NIM)	It is a ratio of net interest income to total assets.	+
	Operating Profit to Total Assets (OPTA)	This is the percentage ratio of operating profit to total assets.	+
Independent Variables	Capital to Risk-weighted Assets Ratio (CRAR)	It is a ratio of Capital Funds to Risk Weighted Assets.	Not applicable
	Size		Not applicable
Dummy Independent variables	dbasel2	Basel II norms	Not applicable
	dbasel3	Basel III norms	Not applicable
	daqr	The Asset Quality Ratio (AQR) is the primary criterion for evaluating quality and determining the components of non-performing assets in total assets.	Not applicable

Methodologies:

The study considered annual data from 39 banks, 585 observations under two ownership structures, Public and Private Sector Banks, for a time period of 15 years from 2005 to 2019 and employed the Dummy variable regression with Fixed and Random effects models using the STATA package. The specification of Dummy variables regression model for the study are:

$$OPTA_{it} = \alpha + \xi_1 CRAR_{it} + \xi_2 Size_{it} + \xi_3 dbasel2_{it} + \xi_4 dbasel3_{it} + \xi_5 daqr_{it} + v_{it}$$

$$ROA_{it} = \alpha + \xi_1 CRAR_{it} + \xi_2 Size_{it} + \xi_3 dbasel2_{it} + \xi_4 dbasel3_{it} + \xi_5 daqr_{it} + u_{it}$$

$$ROE_{it} = \alpha + \xi_1 CRAR_{it} + \xi_2 Size_{it} + \xi_3 dbasel2_{it} + \xi_4 dbasel3_{it} + \xi_5 daqr_{it} + w_{it}$$

$$NIM_{it} = \alpha + \xi_1 CRAR_{it} + \xi_2 Size_{it} + \xi_3 dbasel2_{it} + \xi_4 dbasel3_{it} + \xi_5 daqr_{it} + z_{it}$$

$i = 1, 2, \dots, 39$ banks and $t = 2005$ to 2019 (15 years data).

The models are individual operated the data set results in Public Sector Banks and Private Sector Banks.



$OPTA_{it}$ = Operating Profit to Total Assets (OPTA) of bank i for the year t .

ROA_{it} = ROA of the bank i for the year t .

ROE_{it} = ROE of the bank i for the year t .

NIM_{it} = NIM of the bank i for the year t .

α = Intercept

$\xi_1, \xi_2, \xi_3, \xi_4, \xi_5$ = regression coefficient's of the explanatory variables.

$CRAR_{it}$ = CRAR of the bank i for the year t .

$size_{it}$ = size of the bank i for the year t .

$dbasel2_{it}$ = Dummy variable of basel2 of the banks for the period from 2005 to 2008 = 1, otherwise = 0. $dbasel3_{it}$ = Dummy variable of basel3 of the banks for the period year 2019 = 1, otherwise = 0.

$daqr_{it}$ = Dummy variable of asset quality ratio(aqr) of the banks for the period from 2015 to 2019 = 1, otherwise = 0.

$v_{it} = u_{it} = w_{it} = z_{it}$ = Disturbance term of the bank i for the year t and assuming that the error terms satisfies the usual OLS assumptions. The regression coefficients are unknown under the fixed effect model and also coefficients are random under random effect model as per the usual econometric methods.

Hypothesis

All banks, PSBs and PVTs:

H_{01} : There is no significant relationship between OPTA on CRAR and Size

H_{02} : There is no significant relationship between ROA on CRAR and Size

H_{03} : There is no significant relationship between ROE on CRAR and Size

H_{04} : There is no significant relationship between NIM on CRAR and Size

Section IV Review of results

The descriptive statistics summary is depicted in three tables Viz. Table 1: Complete data set descriptive statistics summary for all banks, Table 2: Descriptive statistics summary of Public Sector Banks (PSBs) and Table 3: Descriptive statistics summary of Private Sector Banks (PVTs). The data set organised the total observations of 585 and 39 banks for the period from 2005 to 2019 of Indian PSBs and PVTs. We're hoping to learn something new through basic statistical measures. The mean value of variable CRAR over all and individual banks is maintained above 9% as prescribed under the guidelines of the RBI and there is a marginal mean CRAR difference among PSBs between PVTs, i.e., 2.5%, because the PVTs are given more advances employed as part of business. The mean value of OPTA higher in the PVTs as it indicates that efficiently utilised funds in the business. The mean value of the variable ROA is less than 1 among the descriptive results. It is indicative that the response has hugely affected the net income levels of bad assets for both the groups. The higher mean value of ROE for PVTs compared to the overall PSBs is due to the high net income of shareholders' equity. The mean value of the NIM and the size variable are roughly the same in both groups at the standstill state.

A classic symptom of multicollinearity verification using thumb rule pair-wise or zero order correlation coefficient between two regressors is high, i.e., 0.8 then multicollinearity is a serious problem. The four dependent variables, OPTA, ROE, ROA, and NIM, were calculated and examined. The pair-wise correlation matrix shows that the variables included in the models do not have any multicollinearity issues, yielding the values shown in Tables 4-7.

The Dynamic regression results presented of all aggregate banks in table no 7 and table no 8. The set of explanatory variables are same for the both models of methods FE and RE, Hausman test statistic is used to choose the best model. The Hausman statistic in the case of OPTA, ROA, ROE and NIM are obtained 31.08, 327.71, 38.25 and 327.71 respectively, which are statistically significant and indicates the appropriateness of the FE model. Thus, among the four models, the FE model is more appropriate and hence we confine to the results of FE model for both OPTA, ROA, ROE and NIM.

Tables 7 and 8 show the results of the dynamic regression for all aggregate banks. The set of explanatory variables is the same for both models of methods FE and RE. The Hausman test statistic is used to choose the best model. The Hausman statistics in the case of OPTA, ROA, ROE and NIM are obtained at 31.08, 327.71, 38.25 and 327.71



respectively, which is statistically significant and indicates the appropriateness of the FE model. Thus, among the four models, the FE model is more appropriate and hence we are confined to the results of the FE model for both OPTA, ROA, ROE and NIM.

From Table 7, the CRAR and Size independent variable coefficients in the two models have positive signs, it is found that these variables are statistically significant at the 5 percent level. Although the coefficients of the remaining interceptors, *basel2*, *basel3* and *daqr* are have native signs, it is found that these variables and interceptor are statistically significant at 1 percent level. According to the findings, a 1% increase in OPTA and ROA resulted in a 0.039 and 0.072 average increase in the banks' CRAR, respectively, and a 1% increase in OPTA and ROA resulted in a 0.737 and 1.293 increase in the banks' Size. The results show that the profitability of Indian banks, measured by OPTA ROA, shows the ability of the management to acquire deposits at a reasonable cost and invest them in profitable investments. Higher retained profit helps the bank to improve the CRAR.

From Table 8, the CRAR and Size independent variable coefficients in the two models have positive signs, it is found that these variables are statistically significant at the 5 percent level. Although the coefficients of the remaining interceptors, *basel2*, *basel3* and *daqr* are have native signs, it is found that these variables and interceptor are statistically significant at 1 percent level. Findings show that a 1 % average increase in ROE, NIM found a 0.853 and 0.072 average increase in CRAR of the banks and also a 1 % increase in ROE, NIM led to a 17.935 and 1.293 increase in the size of the banks. This implies that during the study period, NPAs had a significant impact on bank profitability. This may be due to the fact that the NPAs have not remained at a lower level for most parts of the study period. NIM has been observed to have a relatively smaller impact on reducing profitability in the case of ROE and ROA.

Tables 9 and 10 show the calculated results of the public sector banks. The set of explanatory variables is the same for both models of methods FE and RE. The Hausman test statistic is used to choose the best model. The Hausman statistics for OPTA, ROA, ROE, and NIM are 7.91, 4.98, 1.84, and 2.92, respectively, which is statistically significant and indicates that the FE model is appropriate. From Table 9, the CRAR and Size independent variable coefficients in the two models have positive signs, it is found that these variables are statistically significant at the 5 percent level. Although the coefficients of the remaining interceptors, *basel2*, *basel3* and *daqr* are have native signs, it is found that these variables and interceptor are statistically significant at 1 percent level. According to the findings, a 1% increase in OPTA, ROA leads to a 0.0814 and 0.229 average increase in bank size, and a 1% increase in OPTA, ROA leads to a 0.131 and 0.542 increase in bank size. The result shows that the profitability of public sector banks, measured by OPTA ROA, shows the ability of the management to acquire deposits at a reasonable cost and invest them in profitable investments. Table 10 the CRAR and Size independent variable coefficients in the two models have positive signs, it is found that these variables are statistically significant at the 5 percent level. Although the coefficients of the remaining interceptors, *basel2*, *basel3* and *daqr* are have native signs, it is found that these variables and interceptor are statistically significant at 1 percent level. According to the findings, a 1% increase in ROE and NIM resulted in a 4.094 and 0.045 average increase in the banks' CRAR, as well as a 1% increase in ROE, resulting in an 8.749 and 0.271 increase in the banks' profitability. This implies that during the study period, NPAs had a significant impact on bank profitability. This may be due to the fact that the NPAs have not remained at a lower level for most parts of the study period. NIM has been observed to have a relatively smaller impact on reducing profitability in the case of ROE and ROA.

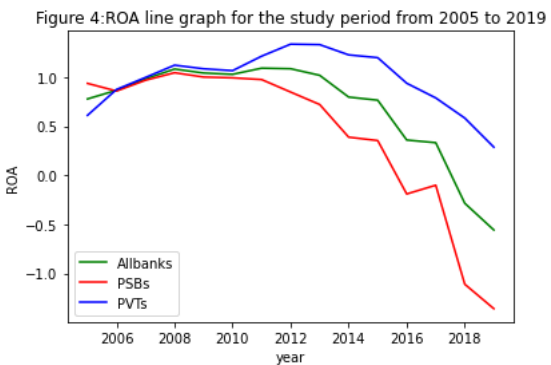
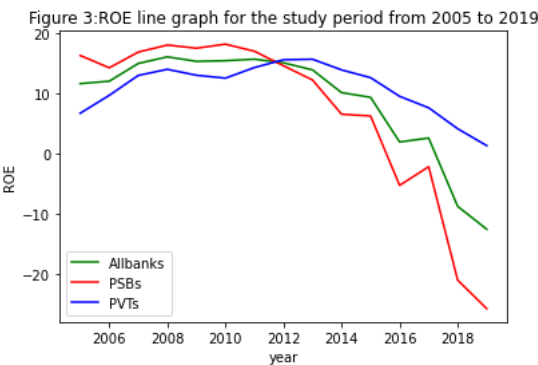
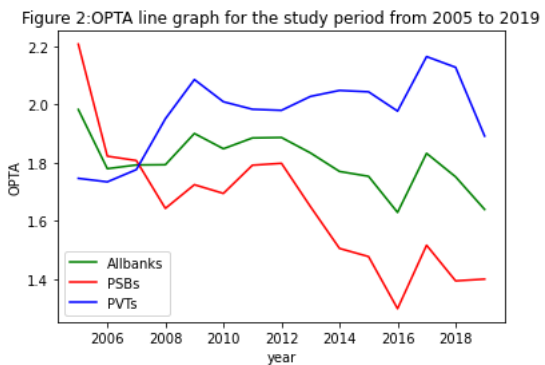
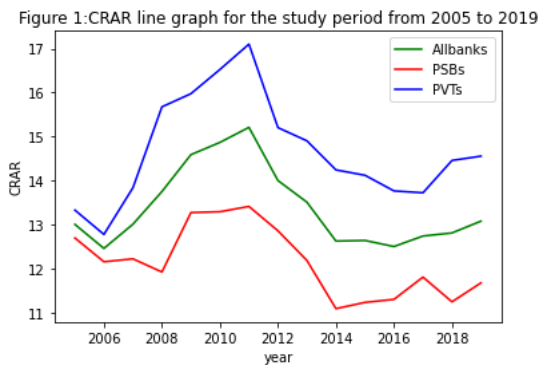
The private sector bank computational results are presented in Tables 11 and 12. The set of explanatory variables is the same for both models of methods FE and RE. The Hausman test statistic is used to choose the best model. The Hausman statistics for OPTA, ROA, ROE, and NIM are 3.5, 27.47, 16.21, and 1.62, respectively, which is statistically significant and indicates that the FE model is appropriate. From Table 11, the CRAR and Size independent variable coefficients in the two models have positive signs, it is found that these variables are statistically significant at the 5 percent level. Although the coefficients of the remaining interceptors, *basel2*, *basel3* and *daqr* are have native signs, it is found that these variables and interceptor are statistically significant at 1 percent level. The result shows that the 1 % average increase in OPTA, ROA was found to be a 0.031 and 0.047 average increase in CRAR of the banks and also a 1 % increase in OPTA, ROA, leading to a 0.836 and 1.279 increase in the size of the banks. The findings indicate that the profitability of PVTs, as measured by OPTA ROA, demonstrates the management's ability to acquire deposits at a reasonable cost and invest them in profitable investments. From Table 12, the CRAR and Size independent variable coefficients in the two models have positive signs, it is found that these variables are statistically significant at the 5 percent level. Although the coefficients of the remaining interceptors, *basel2*, *basel3* and *daqr* are have native signs, it is found that these variables and interceptor are statistically significant at 1 percent level. The findings show that a 1% increase in ROE and NIM resulted in a 0.358 and 0.035 average increase in the CRAR of the banks, as well as a 1%



increase in ROE, resulting in a 15.540 and 0.162 increase in the size of the banks. This implies that during the study period, NPAs had a significant impact on bank profitability. This may be due to the fact that the NPAs have not remained at a lower level for most parts of the study period.

Over all banks, PSBs and PVTs, empirical results reveal that the bank specific variables OPTA, ROA, ROE and NIM are statistically significantly established with CRAR and Size in the models' inclusion of dummy variables base12, base13 and daqr. Thus, in the comparison of ROE established with the CRAR of PSBs, it is found higher than PVTs and ROE established with the size of PVTs is found higher than the PSBs. PSBs continue to play a vital role in the Indian economy and financial system. They have been lagging behind their private sector counterparts in performance and efficiency indicators. The PSBs with a predominantly high share in infrastructure financing are observed to be facing the highest amount of stress in their asset quality and profitability (Financial Stability Report released by the Reserve Bank of India). The Indian banking sector's growth slowed further in 2019 as a result of the COVID-19 in both the first and second ways. Profitability declined on account of higher provisioning on bank loans and credit growth. The study mainly found that Indian commercial banks should be encouraged to diversify their income portfolios apart from the conventional sources of interest income. Regulators and policymakers should consider the extent of the non-government stake in such a way that it may improve the profitability of the Indian public sector banks. Further, bankers should be more attentive to the bank-specific determinants for efficient utilization of bank funds in order to improve the Indian commercial banks' financial performance. The empirical findings have a substantial influence on the prevailing body of literature by broadly describing and critically examining the present situation of Indian commercial banks' profitability.

Figures 1–5 in the graphic presentation are plotted using Python software; CRAR, OPTA, ROE, ROA, and NIM of all banks, PSBs and PVTs respectively, and reveal the higher performance of the private sector banks than the public sector banks. Private sector banks have managed to record better growth than their public sector counterparts.



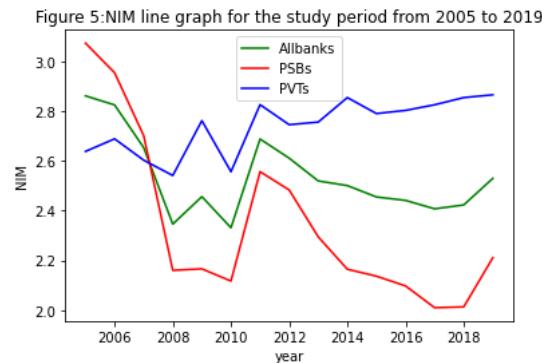


Table 1: Complete data set descriptive statistics summary.

Variables	CRAR	OPTA	ROA	ROE	NIM	Size
Mean	13.3852	1.8052	0.6916	8.9040	2.5363	4.9121
Median	12.7800	1.7600	0.8400	12.4600	2.4600	4.9800
Smallest	2.0000	-0.5300	-5.4900	-103.2700	0.2300	2.9400
Largest	56.4100	3.4600	2.1300	31.6200	5.2900	6.5700
Standard Deviation	3.6456	0.6244	0.9453	14.8104	0.6471	0.6422
Variance	13.2904	0.3898	0.8937	219.3484	0.4188	0.4124
Skewness	6.0188	-0.1081	-2.0254	-2.7515	0.3027	-0.4860
Kurtosis	60.3025	3.3355	9.7174	14.4066	3.9138	3.1044
Percentiles 25%	11.6400	1.4100	0.3800	6.2100	2.1100	4.5200
Percentiles 50%	12.7800	1.7600	0.8400	12.4600	2.4600	4.9800
Percentiles 75%	14.2300	2.2500	1.3000	17.5600	2.9600	5.3700
Percentiles 95%	17.5200	2.9000	1.7700	22.4800	3.7200	5.8400
Total Banks	39	39	39	39	39	39
Total observations	585	585	585	585	585	585

Table 2: Descriptive statistics summary of Public Sector Banks (PSBs)

Variables	CRAR	OPTA	ROA	ROE	NIM	Size
Mean	12.1563	1.6487	0.4211	6.9514	2.3425	5.2248
Median	12.1900	1.6500	0.6600	11.6400	2.2850	5.2100
Smallest	2.0000	0.1800	-5.4900	-103.2700	1.0300	4.2000
Largest	18.1600	3.0300	2.0100	31.6200	3.6500	6.5700
Standard Deviation	1.4655	0.4384	0.9344	17.1981	0.4686	0.4092
Variance	2.1476	0.1922	0.8731	295.7744	0.2195	0.1675
Skewness	-0.8599	0.1149	-2.0840	-2.3663	0.3899	0.3555
Kurtosis	10.5100	3.4627	9.7993	11.6422	2.8568	3.4256
Percentiles 25%	11.2050	1.3600	0.2250	3.6500	2.0050	4.9600
Percentiles 50%	12.1900	1.6500	0.6600	11.6400	2.2850	5.2100
Percentiles 75%	13.0550	1.9200	1.0150	17.4000	2.6600	5.4400
Percentiles 95%	14.2300	2.3700	1.3900	23.3550	3.1800	5.8700
Number of Banks	20	20	20	20	20	20
Number of observations	300	300	300	300	300	300



Table 3: Descriptive Statistics summary of Private Sector Banks (PVTs)

Variables	CRAR	OPTA	ROA	ROE	NIM	Size
Mean	14.6787	1.9699	0.9763	10.9593	2.7404	4.5831
Median	13.9100	2.0600	1.1500	13.1300	2.7200	4.5700
Smallest	7.7200	-0.5300	-4.6800	-63.7900	0.2300	2.9400
Largest	56.4100	3.4600	2.1300	25.7900	5.2900	6.1000
Standard Deviation	4.6684	0.7390	0.9763	11.4626	0.7406	0.6781
Variance	21.7941	0.5461	0.7598	131.3919	0.5485	0.4599
Skewness	5.1745	-0.5947	-2.4715	-3.1266	-0.1870	0.0064
Kurtosis	39.7977	3.1979	12.5767	16.4838	3.8917	2.5139
Percentiles 25%	12.4300	1.5000	0.6400	8.0700	2.2900	4.1300
Percentiles 50%	13.9100	2.0600	1.1500	13.1300	2.7200	4.5700
Percentiles 75%	15.8000	2.5200	1.5600	17.5600	3.2100	5.0100
Percentiles 95%	18.8300	2.9800	1.8600	22.0300	3.8800	5.7300
Number of Banks	19	19	19	19	19	19
Number of observations	285	285	285	285	285	285

Table 4: Pairwise correlation matrix of dependent variable “OPTA”.

	OPTA	CRAR	Size	daqr	dbasel2	dbasel3
OPTA	1					
CRAR	0.3051	1				
Size	0.0869	-0.231	1			
daqr	-0.095	-0.123	0.3477	1		
dbasel2	-0.031	0.0548	0.3921	0.4264	1	
dbasel3	-0.071	-0.023	0.1597	0.378	0.1612	1

Table 5: Pairwise correlation matrix of dependent variable “ROA”.

	ROA	CRAR	Size	daqr	dbasel2	dbasel3
ROA	1					
CRAR	0.3626	1				
Size	-0.1602	-0.2305	1			
daqr	-0.4263	-0.1228	0.3477	1		
dbasel2	-0.1499	0.0548	0.3921	0.4264	1	
dbasel3	-0.3535	-0.0226	0.1597	0.378	0.1612	1

Table 6: Pairwise correlation matrix of dependent variable “ROE”.

	ROE	CRAR	Size	daqr	dbasel2	dbasel3
ROE	1					
CRAR	0.2251	1				
Size	-0.1294	-0.2305	1			
daqr	-0.4951	-0.1228	0.3477	1		
dbasel2	-0.1968	0.0548	0.3921	0.4264	1	
dbasel3	-0.3874	-0.0226	0.1597	0.378	0.1612	1



Table 7: Pairwise correlation matrix of dependent variable “NIM”.

	NIM	CRAR	Size	daqr	dbasel2	dbasel3
NIM	1					
CRAR	0.3415	1				
Size	-0.2522	-0.2305	1			
daqr	-0.0932	-0.1228	0.3477	1		
dbasel2	-0.1257	0.0548	0.3921	0.4264	1	
dbasel3	-0.0028	-0.0226	0.1597	0.378	0.1612	1

Table 8: Model estimation for the dependent variables OPTA and ROA

Variables	OPTA		ROA	
	Fixed Effects Model	Random Effects Model	Fixed Effects Model	Random Effects Model
α	-1.989*** (-4.46)	-0.966 (-2.63)	-5.822*** (-8.62)	-2.232 (-4.67)
CRAR	0.039* (5.95)	0.041 (6.26)	0.072* (7.19)	0.072 (7.36)
Size	0.737* (7.88)	0.505 (6.80)	1.293* (9.13)	0.492 (5.17)
dbasel2	-0.346*** (-5.64)	-0.247 (-4.37)	-0.553*** (-5.96)	-0.206 (-2.48)
dbasel3	-0.184*** (-2.40)	-0.167 (-2.14)	-0.984*** (-8.45)	-0.921 (-7.56)
daqr	-0.261*** (-5.07)	-0.192 (-3.88)	-0.984*** (-12.63)	-0.756 (-10.01)
Adjusted R^2	0.15	0.14	0.42	0.38
Number of Observations	585	585	585	585
Number of banks	39	39	39	39
Test for overall significance of the model	$F(5,541) = 19.22$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 84.69$ $Prob > \chi^2_5 = 0.0000$	$F(5,541) = 79.90$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 84.69$ $Prob > \chi^2_5 = 0.0000$
Hausman test	$Wald \chi^2_5 = 31.08$ $Prob > \chi^2_5 = 0.0000$		$Wald \chi^2_5 = 327.71$ $Prob > \chi^2_5 = 0.0000$	

Notes: T-ratios are presented in parenthesis.

*, **, and *** significant at 10 per cent, 5 per cent and 1 per cent level respectively

Table 9: Model estimation for the dependent variables ROE and NIM

Variable	ROE		NIM	
	Fixed Effects Model	Random Effects Model	Fixed Effects Model	Random Effects Model
α	-78.034*** (-6.79)	-21.926 (-3.18)	-5.822*** (-8.62)	-2.232 (-4.67)
CRAR	0.853* (5.04)	0.793 (4.18)	0.072* (7.19)	0.072 (7.36)
Size	17.935* (7.44)	5.628 (4.18)	1.293* (9.13)	0.492 (5.17)
dbasel2	-8.129***	-2.718	-0.553***	-0.206



	(-5.14)	(-2.03)	(-5.96)	(-2.48)
<i>dbasel3</i>	-15.609*** (-7.87)	-14.614 (-7.18)	-0.984*** (-8.45)	-0.921 (-7.56)
<i>daqr</i>	-16.838*** (-12.69)	-0.192 (-3.88)	-0.984*** (-12.63)	-0.756 (-10.01)
Adjusted R^2	0.41	0.38	0.42	0.38
Number of Observations	585	585	585	585
Number of Banks	39	39	39	39
Test for overall significance of the model	$F(5,541) = 75.48$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 325.89$ $Prob > \chi^2_5 = 0.0000$	$F(5,541) = 79.90$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 84.69$ $Prob > \chi^2_5 = 0.0000$
Hausman test	$Wald \chi^2_5 = 38.25$ $Prob > \chi^2_5 = 0.0000$		$Wald \chi^2_5 = 327.71$ $Prob > \chi^2_5 = 0.0000$	
Notes: T-ratios are presented in parenthesis. *, **, and *** significant at 10 per cent, 5 per cent and 1 per cent level respectively				

Table 10: Model estimation of PSBs for the dependent variables OPTA and ROA

Variable	OPTA		ROA	
	Fixed Effects Model	Random Effects Model	Fixed Effects Model	Random Effects Model
α	0.242* (0.34)	-0.064 (-0.12)	-4.496*** (-3.80)	-3.060*** (-5.25)
<i>CRAR</i>	0.0814*** (5.40)	0.887*** (6.06)	0.229*** (9.07)	0.233*** (10.06)
<i>Size</i>	0.131 (0.98)	0.175* (1.79)	0.542** (2.43)	0.238** (2.23)
<i>dbasel2</i>	-0.273*** (-3.81)	-0.294*** (-4.81)	-0.449*** (-3.73)	-0.328*** (-3.71)
<i>dbasel3</i>	-0.057 (-0.73)	-0.061 (-0.78)	-1.190*** (-8.94)	-1.175*** (-8.83)
<i>daqr</i>	-0.189*** (-3.42)	-0.189*** (-3.56)	-0.912*** (-9.79)	-0.841*** (-9.77)
Adjusted R^2	0.31	0.31	0.68	0.68
Number of Observations	300	300	300	300
Number of Banks	20	20	20	20
Test for overall significance of the model	$F(5,275) = 25.18$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 134.06$ $Prob > \chi^2_5 = 0.0000$	$F(5,275) = 119.29$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 617.54$ $Prob > \chi^2_5 = 0.0000$
Hausman test	$Wald \chi^2_5 = 7.91$ $Prob > \chi^2_5 = 0.1611$		$Wald \chi^2_5 = 4.98$ $Prob > \chi^2_5 = 0.4183$	
Notes: T-ratios are presented in parenthesis. *, **, and *** significant at 10 per cent, 5 per cent and 1 per cent level respectively				



Table 11: Model estimation of PSBs for the dependent variables ROE and NIM

Variable	ROE		NIM	
	Fixed Effects Model	Random Effects Model	Fixed Effects Model	Random Effects Model
α	-76.184*** (-3.29)	-49.665*** (-5.00)	3.488*** (4.52)	2.658*** (4.59)
CRAR	4.094*** (8.27)	3.996*** (9.14)	0.045*** (2.75)	0.052*** (3.26)
Size	8.749** (2.01)	3.531* (1.95)	-0.271* (-1.86)	-0.117 (-1.09)
dbasel2	-7.382*** (-3.14)	-5.226*** (-3.15)	-0.344*** (-4.37)	-0.409*** (-6.09)
dbasel3	-21.772*** (-8.37)	-21.478*** (-8.34)	0.150* (1.73)	0.141 (1.62)
daqr	-16.536*** (-9.09)	-15.521*** (-9.41)	-0.109* (-1.81)	-0.134*** (-2.31)
Adjusted R^2	0.65	0.64	0.38	0.37
Number of Observations	300	300	300	300
Number of Banks	20	20	20	20
Test for overall significance of the model	$F(5,275) = 102.91$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 542.30$ $Prob > \chi^2_5 = 0.0000$	$F(5,275) = 33.87$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 167.95$ $Prob > \chi^2_5 = 0.0000$
Hausman test	$Wald \chi^2_5 = 1.84$ $Prob > \chi^2_5 = 0.8712$		$Wald \chi^2_5 = 2.92$ $Prob > \chi^2_5 = 0.7127$	

Notes: T-ratios are presented in parenthesis.
*, **, and *** significant at 10 per cent, 5 per cent and 1 per cent level respectively

Table 12: Model estimation of PVTs for the dependent variables OPTA and ROA

Variable	OPTA		ROA	
	Fixed Effects Model	Random Effects Model	Fixed Effects Model	Random Effects Model
α	-2.075*** (-3.64)	-1.594*** (-3.21)	-5.021*** (-6.69)	-3.071*** (-5.08)
CRAR	0.031*** (3.88)	0.031*** (3.93)	0.047*** (4.49)	0.043*** (4.20)
Size	0.836*** (6.45)	0.721*** (6.59)	1.279*** (7.51)	0.818*** (6.14)
dbasel2	-0.216** (-2.24)	-0.162* (-1.79)	-0.367*** (-2.89)	-0.146 (-1.23)
dbasel3	-0.304** (-2.43)	-0.292** (-2.32)	-0.757*** (-4.58)	-0.705*** (-4.16)
daqr	-0.187** (-2.21)	-0.147* (-1.80)	-0.708*** (-6.36)	-0.552*** (-5.10)
Adjusted R^2	0.19	0.19	0.28	0.27
Number of Observations	285	285	285	285
Number of Banks	19	19	19	19
Test for overall significance of the model	$F(5,261) = 12.75$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 66.54$ $Prob > \chi^2_5 = 0.0000$	$F(5,261) = 21.17$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 86.55$ $Prob > \chi^2_5 = 0.0000$
Hausman test	$Wald \chi^2_5 = 3.55$ $Prob > \chi^2_5 = 0.6159$		$Wald \chi^2_5 = 27.47$ $Prob > \chi^2_5 = 0.0000$	

Notes: T-ratios are presented in parenthesis.
*, **, and *** significant at 10 per cent, 5 per cent and 1 per cent level respectively

Table 13: Model estimation of PVTs for the dependent variables ROE and NIM

Variable	ROE		NIM	
	Fixed Effects Model	Random Effects Model	Fixed Effects Model	Random Effects Model
α	-58.072*** (-5.64)	-32.508*** (-3.98)	1.459*** (2.82)	1.693*** (3.45)
CRAR	0.358** (2.49)	0.289** (2.05)	0.035*** (4.85)	0.035*** (4.90)
Size	15.540*** (6.64)	9.566*** (5.31)	0.162 (1.38)	0.106 (0.99)
dbasel2	-4.534*** (-2.59)	-1.633 (-1.01)	-0.007 (-0.09)	0.019 (0.22)
dbasel3	-9.021*** (-3.98)	-8.337*** (-3.60)	0.001 (0.01)	0.007 (0.07)
daqr	-10.589*** (-6.92)	-8.602*** (-5.83)	0.079 (1.03)	0.098 (1.31)
Adjusted R^2	0.19	0.24	0.11	0.11
Number of Observations	285	285	285	285
Number of Banks	19	19	19	19
Test for overall significance of the model	$F(5,261) = 17.94$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 71.96$ $Prob > \chi^2_5 = 0.0000$	$F(5,261) = 6.78$ $Prob > F = 0.0000$	$Wald \chi^2_5 = 34.22$ $Prob > \chi^2_5 = 0.0000$
Hausman test	$Wald \chi^2_5 = 16.21$ $Prob > \chi^2_5 = 0.0063$		$Wald \chi^2_5 = 1.62$ $Prob > \chi^2_5 = 0.8994$	
Notes: T-ratios are presented in parenthesis. *, **, and *** significant at 10 per cent, 5 per cent and 1 per cent level respectively				

V. FINDINGS AND CONCLUSION

The CRAR was discovered to have a positive impact on the profitability and efficiency of Indian banks. The positive impact on profitability can be discussed on the basis of the fact that improved monitoring standards have reduced bad debts in the banks' portfolios by maintaining quality capital on the balance sheet and restricting the flow of loans to highly risky ventures. When banks' lending was not enforced by a risk based on the probability of a defaulting borrower, the amount of funds generated from these restrictions and safe investments turned out to be greater. Although the CRAR has no significant impact on OPTA, ROE, ROA and NIM regression, we can assert this view on the basis of the reduction in the ratio of NPAs after the adoption of Basel III norms. In the case of efficiency, we measured it in monetized terms and also used only the different sources of income of the banks as our output vectors. Hence, with the reduction in bad debts, we found a positive impact of CRAR on the efficiency of the banks as well.

ACKNOWLEDGEMENTS AND CONFLICT OF INTEREST

The authors are thankful to reviewer and also the views expressed in this study are of the authors and need not necessarily belong to the organization to which they belongs. The authors declared no conflicts of interest with respect to the research, authorship, publication etc. No funding support received for this research.

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