Impact of Basel Norms on Indian Banking System: An Empirical Analysis

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In this paper, empirical investigation is done to study the Impact of Basel accord on banking sector with the help of panel data regression analysis under a set of control variables, by taking capital adequacy ratio as independent variable and factors pertaining to returns such as return on assets, return on advances, return on investments, return on advances adjusted to cost of funds and return on investments adjusted to cost of funds as dependent variables. Although trend of capital adequacy ratio shows sound and stable position of banks, it is essential to identify what impact Basel accord have on the returns of banks. The results of panel data regression indicate that the capital adequacy ratio has a positive significant impact on the return on assets, return on advances and return on advances adjusted to cost of funds. Also, negative significant impact can be noticed on return on investments and return to investment adjusted to cost of funds. The positive impact of capital adequacy ratio on the profitability factors of banks suggest that banks with strong capital base take higher risk by granting more loans and they make less investment which in turn increase profitability, return on advances and decrease return on investments.

Key Word: *Basel Norm, Public Bank, capital adequacy ratio*

INTRODUCTION

Banking sector acts as a backbone for the Indian economy. It facilitates the efficient flow of money between lenders and borrowers. It has witnessed massive changes in all dimensions. With the concept of liberalization, banking sector changed drastically in terms of growth, activities, profits, technology, customers etc. While new vistas opened up for augmenting revenues of banks, increased competition in the wake of new products, new processes and technological progress has exposed banking to higher risks (Prakash, 2008). To deal with such risks and to handle them effectively, Reserve Bank of India (RBI) takes various measures time to time. With the recommendation of Narasimham committee, banking reforms were introduced in India. The main purpose for which was to enable smooth functioning of banks. Issue of capital regulation was on the prime agenda of this committee. As capital regulation was already present in one or other form, introduction of Basel guidelines was an indispensable step. Though its adoption was not mandatory but recommendatory, it was advised to implement them in order to be internationally acceptable. Since India has an international presence, RBI instructed banks to follow the guidelines of Basel regulations?

Not only in India, but the scenario of banking has changed on international grounds as well. With the wide area of operations and advancement of technology, risk of failure increased and so the need for proper regulations. This became the reason for the inception of Basel regulations. As the complexity increased, the Basel Committee of Banking Supervision (BCBS) modify the norms and make it efficient enough to well perform in present situations. Basel accord's implementation had great impact on banking industry in terms of capital, risk taking behavior,

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profitability, asset quality, cost of capital etc. BCBS has suggested the capital adequacy ratio (CAR) minimum requirement to be 8% but RBI has taken a conservative approach and decided to keep CAR at 9%. Although variations can be seen in trend but most of Indian banks fulfils the minimum requirement and have CAR well above the decided limit. CAR of Indian banks for the period 2003-2015 is shown as below:

It is evident from the above figures (Figure 1 & 2) that all banks have CAR well above the minimum requirement. However, significant variation among CAR (12.18 to 11.29) of public banks is noticed across 13 years. A rise after the implementation of Basel II and decline after

introduction of Basel III is observed. Reason for which may addressed to the introduction of new capital buffers and inclusion of certain components under Basel III. Whereas, overall stability in CAR of private banks (13.12 to 13.74) is marked. Also, the mean value of CAR of private banks is highest followed by public banks across 13 years.

After liberalization, Indian banking sector has witnessed a gradual implementation of Basel accord. With its compliance, a significant change is noticed in the capital base and risk management techniques of banks. Adoption of Basel norms affected Indian banks in terms of profitability and stability. Compliance to these norms and
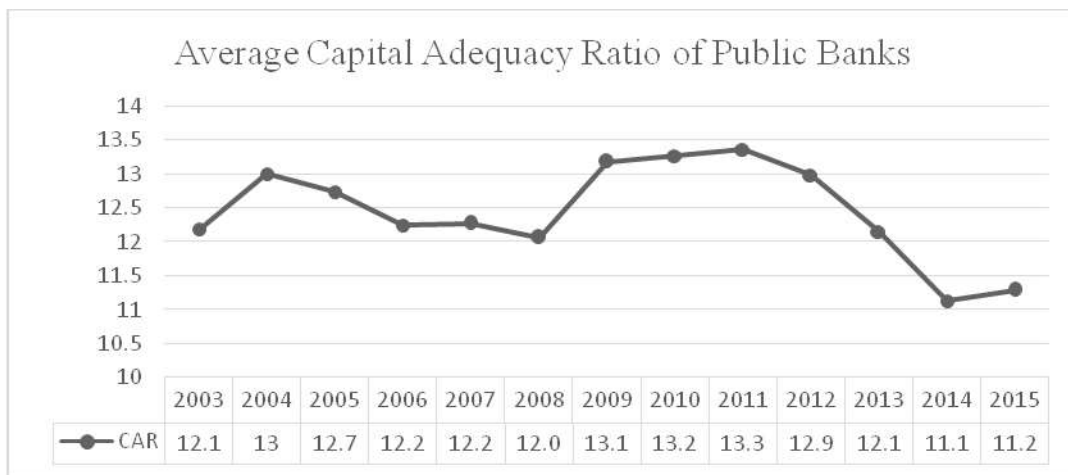

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CAR	12.1	13	12.7	12.2	12.2	12.0	13.1	13.2	13.3	12.9	12.1	11.1	11.2

Figure 1: Average Capital Adequacy Ratio of Public Banks (Note: Data retrieved from various statistical tables available at www.rbi.org)

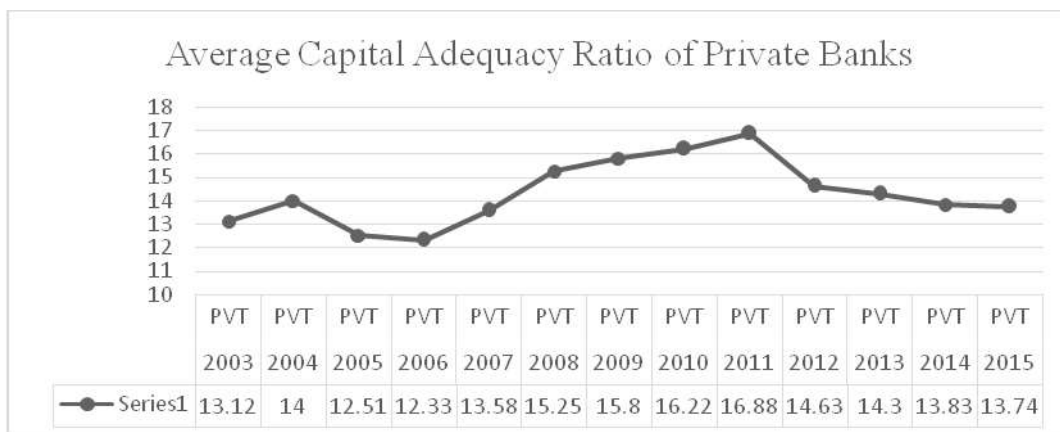|	PVT	PVT	PVT	PVT	PVT	PVT	PVT	PVT	PVT	PVT	PVT	PVT	PVT
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Series1	13.12	14	12.51	12.33	13.58	15.25	15.8	16.22	16.88	14.63	14.3	13.83	13.74

Figure 2: Average Capital Adequacy Ratio of Private Banks (Note: Data retrieved from various statistical tables available at www.rbi.org)

in the run for its existence in the competitive environment, the banks objectively incubated diverging portfolio of products and services leading to a change in the capital allocation and business operations of the banks (Roy, 2014). Basel III is still in its implementation phase and Indian banks are maintaining comfortable CAR and planning to raise capital.

EVIDENCES FROM LITERATURE

Decision of keeping high or low capital base is also a point of debate between regulators and bankers. On one hand, regulators want to keep high capital base to ensure depositors safety, low probability of failure and hence overall stability. On the other hand, bankers anticipate the negative effect of high capital base on profitability and earnings, hence emphasize on low capital base and on more liquidity. To gain more understanding on the researcher's point of view, a review is made on both theoretical and empirical researches.

The theoretical research indicates that Basel norms will reduce the earnings of banks and will negatively affect return on assets and return on equity. Jain (2013) states that Basel III will push up the capital needs of Indian banks and may decline return on assets and could drop return on equity by 1-4 %. Shah (2013) revealed that by implementing Basel III norms, the capital of any banks will reduce because of phased removal of certain components of capital from tier 1 and in addition, the risk weightings are expected to grow. The twin impact of these two stipulations will greatly reduce the return on assets and the profitability of banks. Went (2010) discusses the implications of Basel III on the future of banking, risk management and risk managers. The author states that Basel III will impact the availability, price and volume of credit. The author states that to meet the liquidity standards, banks will have to increase the amount of low-yielding liquid assets which in turn reduced the earnings and profitability of the banking sector. Mahapatra (2012) states that the new liquidity and leverage framework will not only enhance the risk absorbency of individual banks but also aid in

stabilizing financial system during period of extreme stress.

However, the results of empirical studies in this regard provide mixed results. Anderson and Nordenhager (2013) has analyzed the impact of Basel II regulations in the European banking market, by taking data from 24 European banks. Ordinary least square regression is applied by taking capital adequacy ratio as dependent variable and equity ratio, net loans or total assets, return on assets, liquid assets over total deposits and non-performing loan ratio as independent variable. They found a significant effect of all independent variables on capital adequacy ratio. They also reported that effect has changed since Basel II. Roy (2014) analyzed the impact of capital adequacy ratio on various parameters such as profitability, efficiency, productivity and asset quality by taking capital adequacy ratio as independent variable and other parameters as dependent variable. He analyzed a positive impact of capital adequacy ratio on profitability and efficiency of banks.

In same respect Okafor et al. (2010) studies the effect of capital adequacy on bank's performance. They have taken performance (earnings) as dependent variable and capital adequacy ratio, total assets and liquidity as independent variable. They found that strong banks have a positive correlation with capital adequacy ratio and have no impact on total assets and liquidity whereas in weak banks only liquidity has significant correlation. Noman et al. (2015) studied the effect of credit risk on profitability of the banking sector of Bangladesh. Result of panel data regression model reveals negative effect of non-performing loan to gross loan and capital adequacy ratio on return on equity and return on assets.

Dawood (2014) evaluates the profitability of the 23 commercial banks operating in Pakistan for the period of 2009 to 2012. Taking only internal factors into consideration, author reports that liquidity and return on assets develop the negative relationship whereas capital adequacy ratio and deposits both formulate the positive relationship with the return on assets of commercial banks.

Also, a study is being made by Ani et al. (2012) to investigate the determinants of the profitability of deposit money banks in Nigeria. Data set is made up of 147 bank level observations over a 10-year period from 2001 to 2010 in respect of 15 banks. Major outcomes of the analysis include that increase in size (higher total assets) may not necessarily lead to higher profits due to diseconomies of scale; higher capital-assets ratio and loans and advances contribute strongly to bank profitability.

Buyuksalvarci and Abdiuglu (2011) found negative effect of loans, return on equity and leverage on capital adequacy ratio whereas loan loss reserves, return on assets negatively influence capital adequacy ratio. They also reported that size, deposits, liquidity and net interest margin do not have any significant effect on capital adequacy ratio. Aspal and Nazneen (2014) examines the effect of bank performance factors on capital adequacy ratio. Bank performance was measured in terms of loan, asset quality, management efficiency, liquidity and sensitivity. They revealed that loans, management efficiency, liquidity and sensitivity have significant influence on capital adequacy ratio whereas asset quality has negligible influence on capital adequacy ratio of Indian private banks. Williams (2011) investigated the impact of bank's characteristics, financial structure and macro-economic indicators such as rate of inflation, real exchange rate, demand deposits, money supply, political instability, and return on investment are most robust predictors of the determinants of capital adequacy in Nigeria. Raharjo et al. (2014) studied the determinants of capital ratio of state owned banks in Indonesia. By applying panel data regression on dependent variable (capital adequacy ratio) and independent variables (size, non-performing loan, net interest margin, equity to total liabilities, interest rate risks) they found size, non-performing loan, equity to total liabilities, interest rate risks have significant effect on capital adequacy ratio whereas net interest margin did not significantly affect the capital adequacy ratio.

Shingjergji and Hyseni (2015) analyze the main banking determinants of the capital adequacy ratio in the Albanian banking system after the global financial crises and reported that return on assets and return on equity do not have any influence on capital adequacy ratio while, Non-performing loan, loan to deposit ratio and equity multiplier have negative and significant impact on capital adequacy ratio in the Albanian banking system. Sood (2015) analyzed the impact of regressed variables on capital adequacy ratio. The study has found the capital adequacy ratio is negatively associated with advances, asset efficiency and operational efficiency but positively correlated with liquidity and net worth.

RESEARCH OBJECTIVE

Evidences from literature in this area show how Basel regulations impact banking industry in different ways specially on the profitability and earning of the banks. Since Basel III is introduced and implemented by Indian commercial banks from 2013, very few studies have been done to examine the Basel III impact. Thus, in this study an analysis is made to compare the positions of banks under Basel I, Basel II and Basel III regulations. Also, previous researches examined the impact of various determinants on capital adequacy ratio. This study is different in this context as well, as an analysis is done to examine the impact of capital adequacy ratio on different factors pertaining to returns. The impact of Basel accord on the banking industry is analyzed by taking capital adequacy ratio as the variable representing Basel norms. Thus, to fill the research gap, *the research objective of this chapter is to investigate the impact of Basel accord on the banking system.*

DATA

In this chapter, the impact of capital adequacy ratio on the banking industry is analyzed with reference to the factors pertaining to returns of banks, under a set of control variables using panel data analysis.

The purpose of this chapter is to examine if and how the implementation of Basel accords has had any significant impact on the returns of the

commercial banks in India. For this purpose, the time period of 2003-2015 is taken into account. This period is divided into three Basel eras such as Basel I era (2003-2008), Basel II era (2009-2013) and Basel III era (2014 & 2015). Although Basel I was not fully implemented in India and market risk amendment came in 2002. Thus, we consider 2003 as the beginning of Basel I era. Basel II was introduced in 2004 and was meant to be implemented by 2008 end. Thus, year 2009 is considered as the beginning of Basel II era. And capital adequacy ratio under Basel III is reflected in bank's balance sheet since September 2013, thus Basel III era comprise of years 2014 and 2015. Annual data is taken for the study as many financial decisions are made on annual basis and data for some variables are not reported by banks quarterly or half yearly.

The sample for the study consist of scheduled Indian commercial banks divided into three ownerships i.e. State Bank of India and its associates, Public banks and Private banks. Number of banks varies in different years due to closures and mergers but this does not affect the panel of the study as we are taking data of complete ownership but not of individual banks. Also, comparison is made across different eras.

To analyze the impact of Basel accord, an empirical study is conducted using panel data regression analysis. Selection of the variables is made on the basis of gaps in previous literature and on the basis of research objective. For this, capital adequacy ratio is taken as an independent variable. Impact is analyzed on factors pertaining to returns which are the dependent variables such as return on assets, return on advances, return on investment, return on advances adjusted to cost of funds and return on investment adjusted to cost of funds. Analysis is done under a set of control variables to account for cash deposit ratio, credit deposit ratio, ratio of net interest income to total assets (net interest margins) and ratio of secured advances and total advances. To make comparison between different Basel eras, dummy variable is assigned to each Basel era. The chosen variables are tabulated as below:

METHODOLOGY

To know the impact of one variable on other, regression analysis is used. Since data of the study is panel data thus, panel data regression analysis is applied to know the impact of CAR on factors pertaining to returns. Panel data covers dimensions of both time series data and cross-sectional data. It takes into account data for various entities at different point of time and gives a better understanding of the results. Panel data regression analysis is based on some

TABLE 1
Selected Variables for the Study

Dependent Variables	Independent Variables	Control Variables
• Return on assets (ROA) = *[Net profit/ Total assets] *100* • Return on advances (ROADV) = *[Interest earned on advances/ Advances] *100* • Return on investment (ROI) = *[Interest earned on investments/ investments] *100* • Return on advances adjusted to cost of funds (ROAdvCOF)= *[Return on advances − Cost of funds]* • Return on investment adjusted to cost of funds (ROICOF) = *[Return on investment − Cost of funds]*	• Capital adequacy ratio (CAR) = *Total capital/ Total risk weighted assets* • B2 Basel II dummy • B3 Basel III dummy	• Cash deposit ratio (CDR) = *[(Cash in hand + Balances with RBI)/ Total deposits] *100* • Credit deposit ratio (CRDR) = *(Total Advances/Total Deposits) *100* • Ratio of net interest income to total assets (net interest margin) (NIM)= *(Net Interest Income/Average Assets) *100* • Ratio of secured advances to total advances (SATA) = *[(Advances secured by tangible assets + Advances covered by bank or Govt. guarantees) / Advances]*

underlying assumptions. Before proceeding with analysis, data was tested for some assumptions.

First of all, multicollinearity was checked. Collinearity means perfect linear relation between two variables and when more than two variables are involved term is called as multicollinearity. Regression analysis requires no multicollinearity between variables. The independent variables are tested for multicollinearity using variance inflation factor (VIF). As a thumb rule, variables having VIF value greater than 10 needs further investigation. VIF for all variables of in this study is under 10 *(Appendix 1 a)*. Hence, no multicollinearity exists among variables.

Secondly, data was checked for homoscedasticity which is another important assumption. For panel regression analysis, there should be homoscedasticity which means error term is same across all the independent variables. In other words, variance of the error term of the explanatory variables must be constant. Breusch-Pagan/Cook Weisberg test for homoscedasticity is conducted. Results show that p value is greater than 0.05 hence no heteroscedasticity *(Appendix 1 b)*. Normality of residuals was also checked using Shapiro-Wilk test. As per rule, residuals or error term should be identical and independently distributed. Significant p value (p > 0.05) implies that residuals for all regressions are normally distributed *(Appendix 1 c)*.Lastly, auto-correlation was checked. Auto correlation is present when the error terms are correlated to each other. It is checked with the help of Wooldridge test *(Appendix 1 d)*. Since data violates the assumption of no auto correlation (p value < 0.05), issue is resolved by using cluster robust standard errors. Results of panel regression are stated accordingly.

For regression analysis, various methods are used. Among them ordinary least square (OLS), fixed effect (FE) and random effect (RE) are quite common. FE explores the relationship between predictor and outcome variables within an entity (Greene, 2012). In RE the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model (Greene, 2012). RE is used in cases where the differences across entities is assumed to have some influence on the dependent variable. Thus, an advantage of RE is that the time variant variables can be included which are otherwise absorbed by the intercept in case of FE (Roy, 2014). To determine the appropriate method, statistical test needs to be applied. Hausman test is used to compare FE and RE. From the results of Hausman test, random-effect model is selected as the appropriate method to carry the regression analysis. Mathematically, a panel data regression model can be expressed as:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \ldots\ldots + \beta_k X_{kit} + \varepsilon_{it}$$

where i= 1, 2....n and t= 1, 2......T

RESULTS AND ANALYSIS

Table 2 shows descriptive statistics with number of observations, minimum, maximum, mean value and standard deviation for the total period of data. The independent variable (CAR) has a mean of 13.18% during the period of study which is much higher than the minimum requirement of 9% imposed by RBI. It shows that Indian banks are well capitalized. Also, standard deviation of CAR is 1.53% demonstrating low disparity among banks. Low standard deviation among all factors pertaining to returns explain low variation among the banks.

The effect of independent variables on dependent variables is examined by using random effect model for panel data estimation as selected by Hausman test. The results of regression analysis are summarized in Table 3 below. As Table 3 depicts, capital adequacy ratio has a significant effect on all the five dependent variables. However, a positive effect can be noticed on return on assets, return on advances and return on advances adjusted to cost of funds whereas capital adequacy ratio has a negative significant effect on return on investments and return on investments adjusted to cost of funds.

In case of return on assets regression, net interest margin and capital adequacy ratio has positive significant effect whereas no significant effect is noticed by other independent variables. Both net interest margin and capital adequacy ratio have positive effect on return on assets.

TABLE 2
Descriptive statistics of the variables

	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
Cash - Deposit Ratio (CDR)	39	4.604861	10.559711	6.90662095	1.472506321
Credit - Deposit Ratio	39	48.390000	86.363619	72.53992246	9.890582558
(CRDR) Ratio of secured advances to total advances	39	76.742373	91.890000	83.08366485	3.587346192
(SATA) Ratio of net interest income to total assets (Net Interest Margin)	39	2.050000	3.370514	2.77495746	0.368559185
(NIM) Return on assets	39	0.372847	1.675728	1.02305797	0.285709570
(ROA) Return on advances	39	7.488892	11.524231	9.55457605	1.029480931
(ROAdv) Return on investments	39	6.161051	10.180000	7.53259892	0.936830529
(ROI) Return on advances adjusted to cost of funds	39	2.160000	5.480000	4.05694367	0.840298256
(ROAdvCOF) Return on investments adjusted to cost of funds (ROICOF)	39	0.750993	4.080000	2.03522290	0.986765962
Capital Adequacy Ratio (CAR)	39	11.06	17.43	13.1828	1.53114
Valid N (listwise)	39				

Dummy variables B2 and B3 have significant effect on return on advances adjusted to cost of funds which means that there is no significant difference in Basel II and Basel III era as compared to Basel I era.

In case of return on advances regression, control variables cash deposit ratio and net interest margin does not have any significant effect whereas credit deposit ratio and secured advances to total advances have significant positive effect on return on advances. Similar effects are noticed in case of return on advances adjusted to cost of funds.

In case of return on investments regression and return on investments adjusted to cost of funds regression, all the control variables have significant effect only exception is the effect of cash deposit ratio on return on investments. Also, credit deposit ratio has negative effect on both dependent variables whereas other control variables have positive effect on both dependent variables.

Coefficient of Determination, R^2 value measures the proportion or percentage of the total variation in dependent variable explained by the regression model. R^2 within explain the variation within one individual over a period of time whereas R^2 between explain the variation between the individuals. In return on assets regression R^2 overall is 0.6964 which means variations of independent variables can explain 69.64% variation in return on assets, rest is explained by other factors not considered under the study. In all the five regressions value of overall R^2 is good. The highest is in the regression

TABLE 3
Results from Panel Data Regression

Independent Variables	Dependent Variable				
	ROA	*ROAdv*	*ROAdvCOF*	*ROICOF*	*ROI*
Intercept	- 3.16276 (0.005) ***	- 8.919624 (0.051) *	- 16.6013 (0.000) ***	- 5.567974 (0.051) **	2.119276 (0.557)
B2	- 0.203321 (0.029)	0.0755088 (0.843)	- 0.421589 (0.086) **	- 0.1850909 (0.434)	0.3111784 (0.299)
B3	- 0. 1461245 (0.221)	0.3040347 (0.532)	- 0.9328755 (0.003) ***	- 0.7861589 (0.009) *	0.4503107 (0.241)
Cash Deposit Ratio	0.014894 (0.555)	0.0738493 (0.472)	0.1639347 (0.014)	0.1556292 (0.015) ***	0.0652857 (0.420)
Credit Deposit Ratio	0.0057712 (0.193)	0.0486425 (0.007) ***	0.0682941 (0.000) ***	- 0.0350413 (0.002) ***	- 0.054632 (0.000) ***
SATA	0.0155422 (0.126)	0.1304852 (0.002) ***	0.1350954 (0.000) ***	0.0995681 (0.000) ***	0.0948701 (0.004) ***
Net Interest Margin	0.1876088 (0.054) **	- 0.4520494 (0.254)	0.0017686 (0.994)	1.660495 (0.000) ***	1.205231 (0.000) ***
CAR	0.148513 (0.000) ***	0.3620655 (0.001) ***	0.2767615 (0.000) ***	- 0.274443 (0.000) **	- 0.1888944 (0.030) ***
R^2 Within	0.5101	0.4704	0.5943	0.8295	0.6941
R^2 Between	0.9590	0.9634	0.9212	0.9907	0.8658
R^2 Overall	0.6964	0.6125	0.7567	0.8365	0.7088

Source: Primary Probe

p-value in parenthesis

*** denotes significance at 1% level of significance

** denotes significance at 5% level of significance

* denotes significance at 10% level of significance

of return on investments adjusted to cost of funds (0.8365) and lowest in case of return on advances (0.6125).

CONCLUSION

One of the important functions of banks is to create credit in the market. Banks do so by advancing loans. Granting loans not only benefit the borrowers but also return on loan is primary source of income for banks. Whatever amount of money is left with bank after all statutory requirements, a part of that money is granted as loan. And un loaned amount is invested in stocks and securities for longer period. Higher the capital requirement, lower amount of money is left for advances and investments. Hence returns will be affected.

A study by Calem and Rob (1996) support that strong banks take higher risk because they have strong capital base thus it will increase advances and decrease investment in risk free instruments. This study also depicts the same in case of Indian banks. Since Indian banks have higher capital adequacy ratio and strongly capitalized they indulge more in taking higher risk by more advancing and less investment. Also the enforcement of capital regulations brought reduction in bad debt and here by increasing profits. This is the reason capital adequacy ratio has positive impact on profitability and relative return on advances and has negative impact of relative return on investments. Similar study was conducted by Carlson, Shah and Warusawitharana (2013) which reveals that banks with higher capital base have relatively

higher loan growth, higher return on advances and better profitability.

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APPENDIX

Appendix 1 A: Variance Inflation Factor for Testing Multicollinearity Among Variables

Variance Inflation Factor (VIF)

Independent Variable	VIF
Credit deposit ratio	2.41
Cash deposit ratio	2.22
Net interest margin	1.46
Secured advances to total advances ratio	1.69
Capital adequacy ratio	2.15

Note: Multicollinearity is checked among independent variables to ensure that no independent variables are strongly correlated t other. VIF value less than 10 shows that no multicollinearity exists among independent variables.

Appendix 1 B: Breusch-Pagan/ Cook Weisberg Test for Homoscedasticity

Results of Breusch-Pagan/Cook Weisberg Test

Dependent Variables	Chi Square	p value
Return on assets	1.77	0.1834
Return on advances	0.38	0.5361
Return on investments	0.46	0.4969
Return on advances adjusted to cost of funds	0.82	0.3665
Return on investments adjusted to cost of funds	0.03	0.8600

Note: Results show that p value is greater than 0.05 hence accept the null hypothesis that states homoscedasticity is present which means variances across the regression line is same across the different X values.

Appendix 1 C: Shapiro Wilk Test for Normality of Residuals

Results of Shapiro-Wilk Test

Dependent Variables	z value	p value
Return on assets	0.766	0.22181
Return on advances	-1.459	0.92771
Return on investments	0.353	0.36215
Return on advances adjusted to cost of funds	-0.133	0.55281
Return on investments adjusted to cost of funds	0.701	0.24167

Appendix 1 D: Wooldridge Test for Auto-Correlation

Results of Wooldridge Test

Dependent Variables	F value	p value
Return on assets	8.846	0.0969
Return on advances	29.537	0.0322
Return on investments	53.767	0.0181
Return on advances adjusted to cost of funds	4.507	0.1677
Return on investments adjusted to cost of funds	90.491	0.0109

Note: Auto correlation is present when the error terms are correlated to each other. Data violates the assumption of no auto correlation (p value < 0.05), issue is resolved by using cluster robust standard errors.