The Impact of Basel Norms on the Capital and Risk Behavior of Indian Banks

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The present study is an attempt to empirically examine the impact of Basel Accord regulatory guidelines on the capital and risk behavior of Indian banks. It aims to assess how Indian banks adjust capital and risk under capital regulation. The study uses simultaneous equation modeling with Three-Stage Least Square (3SLS) regression to study the endogenous relationship between risk and capital. A regulatory dummy variable has been included as a proxy for Basel norms regulation. The data of public and private sector banks operating in India over a period from 2006 to 2016 is used for the present study. The results evidently reveal significant impact of Basel norms on the capital and risk behavior of Indian banks. The study found a positive impact of Basel norms on the capital level of Indian banks. The results also highlight the negative relationship between capital and risk in the context of Indian banks.

Introduction

Banks are the main financial intermediaries of an economy and play a pivotal role in the economic growth and development of a nation. To cater to the changes ushered in by globalization and re-engineering, banks have widened the breadth of their activities, and they are offering myriad customized products and services to their customers. This increase in the array of activities has exposed the banking sector to various types of risks. Therefore, financial institutions around the world have started recognizing the importance of identifying, managing and monitoring risk considering its disastrous consequences. This has led to the development of capital regulations, which is supposed to prevent or at least decrease the frequency of the banking crisis by prohibiting banks from excessive risk-taking behavior (Behr *et al.*, 2009).

During the 1970s, the global economy witnessed a huge downfall in the capital ratios of banks worldwide. The regulators were alarmed about the bank capital decline during that time, but there were no regulations that specified minimum capital ratios (Nachane *et al.*, 2000). So, risk-based capital standards came into the scene at the end of the 1980s with a view to protecting the soundness of global financial and banking system. Basel Accord (Basel I) propagated by Basel Committee on Banking Supervision was the first international regulatory

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initiative adopted globally to achieve banking and financial stability and to combat the financial crisis. Its prime objective was to make bank capital requirements responsive to the risk in the asset portfolio of banks. Basel Committee on Banking Supervision came up with a series of capital regulations beginning from Basel I in 1988, then moving upon to three pillar approaches under Basel II in 2004, thereafter, furthering towards the most comprehensive regulatory norms, i.e., Basel III (2010) which has its focus on ultimate global resilience.

Capital adequacy has always been a prime area of concern for banking regulators worldwide. It has been considered as one of the major indicators of banking soundness and stability. So, banks have increased their focus on maintaining sound capital adequacy position with the mounting importance of risk-based capital standards. In India, capital adequacy has always assumed key importance for banking and financial system. In conformity with international risk-based capital standards, capital to risk-weighted asset ratio of 8% under Basel I was introduced in 1992 for Indian banks. Further, in consonance with international standards, RBI also endorsed Basel II in 2004 and Basel III in 2010. Moreover, Prompt Corrective Action (PCA) framework stipulated by RBI has three basic parameters for effective monitoring of banks, i.e., (1) Capital-to-Risk Asset Ratio (CRAR); (2) Non-Performing Assets (NPA); and (3) Return on Assets (ROA). Further, CRAR is also an important component of the CAMELS (capital adequacy, asset quality, management, equity, liquidity, and systems) rating system which bank managers and regulators should consider in order to maintain safe and sound banking (Lastra, 2004). Therefore, capital adequacy under Basel norms is an efficient indicator and one of the widely used parameters by Indian banks. Thus, assessing the impact of such risk-based capital standards, i.e., Basel norms, has become imperative in the Indian context.

The present paper aims to study the impact of Basel norms on the capital and risk behavior of Indian banks. The paper is organized as follows: it discusses the theoretical framework related to the impact of capital regulation and details regarding capital and risk relationship in a banking scenario, followed by the description of the objectives and data and methodology used in the study. Then, it discusses the results, and finally, offers the conclusion comprising the implications and recommendations of the study.

Literature Review

Impact of Bank Capital Regulations: Theoretical Framework

Bank regulations serve as prudential measures that diminish the effects of economic crises on the stability of the banking system and subsequent accompanying macroeconomic consequences. The existing literature provides quite diverse inferences regarding the response of banks towards capital requirements.

The study by Koehn and Santomero (1980) examined the effect of flat capital regulation on banks. The results showed that increase in capital regulation would have the resultant impact of increase in risk-taking behavior of banks. In contrast to this, Keeley and Furlong (1990) model suggested that increase in bank capital standards leads to reduction in portfolio

risk. Similarly, Shrieves and Dhal (1992) concluded that regulatory pressure of risk-based capital standards had a positive impact on rate of adjustment of capital level of undercapitalized banks and negative impact on risk levels. The study by Haubrich and Wachtel (1993) also found evidence that Basel Accord regulations encouraged undercapitalized banks to shift their portfolio towards low-risk assets.

The study by Jacques and Nigro (1997) found that risk-based capital standards led to increase in capital ratios and decrease in portfolio risk. Similarly, a study by Aggarwal and Jacques (2001) found that undercapitalized and well-capitalized banks increased their capital ratios and reduced their risks in response to regulation. Further, the study by Nachane *et al.* (2000) also found evidence that regulatory standards led to significant reductions in portfolio risk and increase in capital ratios. Hussain and Hassan (2005) suggested that such regulations reduced the portfolio risks of banks. The study by Al-Zoubi and Atier (2010) indicated that regulatory pressure induced banks to increase their capital, but did not affect their level of risk. Hua (2011) found that regulatory pressure increased the risk-taking in banks with inadequate capital. Sharma (2011) studied the adjustment in capital ratios and risk levels of banks and found that banks reduced capital and increased risk in response to regulation. Rahman *et al.* (2015) found significant positive relationship between bank size and risk-taking behavior. So, the reviewed literature provided mixed results regarding the impact of regulatory requirements on capital and risk behavior of banks.

Bank Capital and Risk Relationship: Historical Perspective

Another important association which has significant influence on performance of capital regulation is the simultaneous relationship between capital and risk in a banking framework. This simultaneity or endogeneity can assume a positive direction or negative direction depending upon the banking structure or economic scenario. With regard to inter-linkages between capital and risk-taking behavior, there exist several theoretical models as propounded by different researchers (Stolz, 2002). Positive association between bank risk-taking behavior and bank capital has been defined by several theories like regulatory influence, bankruptcy cost avoidance, agency cost and managerial risk aversion. The negative relationship between risk and capital can be attributed to the existence of incentives for excessive risk-taking by bankers by increasing leverage, deposit insurance and asset risk for maximizing the value of stockholders' equity (Shrieves and Dhal, 1992). Seminal works like Shrieves and Dhal (1992), Bertrand (2000), Aggarwal and Jacques (2001), Matejašák and Teply (2007), and Al-Zoubi and Atier (2010) found a positive relationship between capital and risk-taking behavior of banks, while studies like Furlong and Keeley (1989) concluded that increase in bank capital is associated with reduction in the asset risk level. Furthermore, Jacques and Nigro (1997), Nachane *et al.* (2000), Das and Ghosh (2004), Murinde and Yaseen (2004), Al-Sabbagh (2004) and Zong-Yi *et al.* (2008) also showed a negative association between risk and capital.

Roy (2005), who studied the impact of 1988 Basel Accord on G-10 countries, found a positive relationship between capital and risk for Japanese banks, negative association in the

case of US banks, and no relationship in the case of France, Italy and the UK. Hua (2011) did not find any significant relationship between capital and risk. Maji and De (2015) found an inverse association between risk and capital of commercial banks. So, different studies showed different patterns of relationships between capital and risk-taking behavior of banks according to their respective economic circumstances. These studies provided a considerable outline while studying the impact of (risk-based capital regulation) Basel norms on the capital and risk behavior of Indian banks.

Objective

The present research work, particularly aims at studying the impact of Basel Accord regulations on bank capital and risk behavior of Indian banks.

Considering the present scenario of implementation of Basel norms in Indian banking sector, empirically the issue is whether Basel norms (as measured by regulatory pressure and a dummy variable) have an impact on the capital and risk behavior of Indian banks. So, the following null hypotheses have been developed for the present study.

H_{01}: *There is no significant impact of Basel norms as measured by regulatory pressure on changes in capital level of Indian banks.*

H_{02}: *There is no significant impact of Basel norms as measured by regulatory pressure on changes in risk level of Indian banks.*

H_{03}: *Changes in bank capital and asset risk are not significantly related to one another.*

Data and Methodology

The study employed data of 42 scheduled commercial banks operating in India comprising 25 public sector banks and 17 private sector banks. Furthermore, data was collected on a yearly basis, which represents the highest periodicity for which data is systematically available. The dataset for the present study spans from year 2006 to 2016. Year 2006 has been taken as the beginning period of sample data due to the fact that Basel II was introduced by the Basel committee in this very year. The data was collected from various sources, namely, annual reports of sampled banks, Basel Pillar 3 disclosures of sampled banks, various publications of Reserve Bank of India like, Statistical Tables Relating to Banks in India (various years), Report(s) on Trends and Progress of Banking, Database on Indian Economy and Basic Statistical Returns of Scheduled Commercial Banks in India. Furthermore, the Prowess database has also been used for the collection of relevant data.

In the present study, Three-Stage Least Square (3SLS) regression was used for estimation (after satisfying order condition for identification), because it is asymptotically more efficient than 2SLS regression. Moreover, it provides consistent estimates of the parameter than the 2SLS by using the information in the non-zero covariance between the error terms of the system of equations.

Model Specification

The foregoing discussion suggests that a simultaneous relationship exists between bank capital and risk, and that the risk-based capital standards, i.e., Basel norms may have an impact on the both capital and risk. To examine these issues, a modified version of simultaneous equation model with partial adjustment framework as developed by Shrieves and Dahl (1992) has been used. An important feature of this model is that it recognizes that changes in both capital and risk have an exogenous as well as an endogenous character. Therefore, capital and risk taking have been decomposed into two components, i.e., discretionary adjustments and changes caused by unanticipated exogenous 'random shocks'. Thus, to examine the impact of Basel norms on the capital and risk behavior of banks and to study the relationship between capital and risk of Indian banks, the model has been specified as follows:

$$\Delta CAP_{j,t} = \Delta^d CAP_{j,t} + \widetilde{E}_{j,t} \quad \ldots(1)$$

$$\Delta RISK_{j,t} = \Delta^d RISK_{j,t} + \widetilde{U}_{j,t} \quad \ldots(2)$$

where $\Delta CAP_{j,t}$ and $\Delta RISK_{j,t}$ represent total observed changes in capital and risk levels for bank j in period t. $\Delta^d CAP_{j,t,}$ and $\Delta^d RISK_{j,t}$ represent endogenously determined discretionary adjustments in capital ratios and risk levels. $\widetilde{E}$ and $\widetilde{U}$ are exogenously determined random shocks. Recognizing that banks may not be able to adjust their desired capital ratios and risk levels instantly, the discretionary changes in capital and risk are modeled using a partial adjustment framework. Hence,

$$\Delta^d CAP_{j,t} = \alpha\left(CAP^*_{j,t} - CAP_{j,t-1}\right) \quad \ldots(3)$$

$$\Delta^d RISK_{j,t} = \beta\left(RISK^*_{j,t} - RISK_{j,t-1}\right) \quad \ldots(4)$$

where $CAP^*_{j,t}$ and $RISK^*_{j,t}$ signify target level of capital and risk and $CAP_{j,t-1}$ and $RISK_{j,t-1}$ represent lagged capital and risk. So, under this framework, the endogenous components of the change in capital and risk are proportional to the difference between a bank's target capital ratio and risk level and the capital ratio and risk level at the beginning of the period. Upon substituting Equations (3) and (4) into Equations (1) and (2), it yields:

$$\Delta CAP_{j,t} = \alpha\left(CAP^*_{j,t} - CAP_{j,t-1}\right) + \widetilde{E}_{j,t} \quad \ldots(5)$$

$$\Delta RISK_{j,t} = \beta\left(RISK^*_{j,t} - RISK_{j,t-1}\right) + \widetilde{U}_{j,t} \quad \ldots(6)$$

This indicates that observed changes in bank capital ratios and portfolio risk in period t are functions of the target capital ratio $CAP^*_{j,t}$ and target risk level $RISK^*_{j,t}$, the lagged capital ratio CAP_{t-1} and risk levels $RISK_{t-1}$ and any random shocks, i.e., $\widetilde{E}_{j,t}$ and $\widetilde{U}_{j,t}$. The target capital ratio and risk levels are not directly observable, but are assumed to depend upon some

set of observable factors. Consistent with the existing literature, i.e., Shrieves and Dhal (1992), Bertrand (2000), and Nachane *et al.* (2000), in the present study, changes in the bank's capital ratio and risk decision are assumed to be influenced by a number of explanatory variables, i.e., size of the bank $(SIZE_{j,t})$, return on assets $(ROA_{j,t})$, loan loss provisions $(LLOSS_{j,t})$, changes in risk $(\Delta RISK_{j,t})$ and capital ratios $(\Delta CAP_{j,t})$, and regulatory pressure variable $(REG_{j,t})$ that could affect bank capital ratios or risk levels. In addition, as considered in the partial adjustment framework, lagged capital ratios and risk levels have been incorporated to measure the contention that banks adjust their capital and risk levels to their target levels over time. Table 1 describes the possible important variables that have been taken into consideration according to the Indian context. So, incorporating the role of these variables in explaining changes in bank's target capital ratios and risk ratios, Equations (5) and (6) are rewritten as follows:

$$\Delta CAP_{j,t} = \alpha_0 + \alpha_1 SIZE_{j,t} + \alpha_2 ROA_{j,t} + \alpha_3 \Delta RISK_{j,t} + \alpha_4 CAP_{j,t-1} + \alpha_5 REG_{j,t} + \widetilde{E}_{j,t} \quad \ldots(7)$$

$$\Delta RISK_{j,t} = \beta_0 + \beta_1 SIZE_{j,t} + \beta_2 LLOSS_{j,t} + \beta_3 \Delta CAP_{j,t} + \beta_4 RISK_{j,t-1} + \beta_5 REG_{j,t} + \widetilde{U}_{j,t} \quad \ldots(8)$$

Table 1: List of Variables Used in the Study

Variable	Acronym	Definition
Bank Size	*Size*	Natural log of total assets
Bank Capital	*Cap*	Annual changes in the ratio of capital to risk-weighted assets
Bank Risk	*Risk*	Annual changes in the ratio of gross non-performing loans to total assets
Regulatory Pressure	*Reg*	Dummy variable to capture the impact of Basel norms
Profitability	*ROA*	Return on Assets
Loan Loss Provisions	*LLOSS*	Ratio of loan loss provisions to total assets
Lagged Capital	Cap_{t-1}	Lagged capital ratio
Lagged Risk	$Risk_{t-1}$	Lagged risk ratio

Defining the Variables and Their Theoretical Relationship

In the above simultaneous equations, $\widetilde{E}_{j,t}$ and $\widetilde{U}_{j,t}$ represent error or disturbance terms. Parallel to Shrieves and Dhal (1992), endogenous variables $\Delta CAP_{j,t}$ and $\Delta RISK_{j,t}$ have been included in the equations to identify the probable simultaneous relationship between changes

in capital and changes in risk. The variables and their expected relationship pattern have been discussed as follows:

Bank Size: The explanatory variable bank size '$SIZE_{j,t}$' is measured by the natural log of total assets of bank *j* for the period *t*. Large banks can operate with less capital than smaller banks due to a myriad of big size benefits like internal diversification and lesser reliance on interest income (Aggarwal and Jacques, 2001). Thus, bank size is expected to have an inverse relationship with the changes in capital and risk behavior of banks. So, this variable has been included in the capital and risk equations to capture the size effects.

Return on Assets: The profitability of banks has been measured through ROA. The current profitability may influence the banks' capital level either in a positive or negative way. If the bank prefers to increase capital through retained earnings, rather than the new equity issue, the profitability may have a positive effect on bank capital. So, ROA is included in the change of capital equation and a positive coefficient is expected.

Regulatory Pressure: Since the main emphasis of the current study is to observe the effect of capital regulation on capital and risk behavior of banks, a dummy variable ($REG_{j,t}$) reflecting the degree of regulatory pressure is included as a determinant of banks' target capital and risk levels. The probabilistic approach propounded by Shrieves and Dhal (1992) and modified by Heid *et al.* (2003) has been followed in the present study. The absolute percentage difference (of capital adequacy ratio as per Basel norms) was divided by the bank-specific standard deviation of this percentage difference in order to obtain the banks' standardized capital buffers. Regulatory dummy (*REG*) variable was included in the regression equations, which is unity if a bank has a standardized capital buffer equal or less than the median standardized capital buffer over all observations, and zero otherwise. This variable describes the behavior of banks that fell short of the minimum capital requirements. For these banks, not meeting the Basel standards was potentially life-threatening as it meant exclusion from international business.

Capital: Two alternative measures of the bank's capital are used in the existing literature, i.e., actual capital and regulatory capital. Actual capital is usually measured by the ratio of equity capital to total assets and was primarily used by Shrieves and Dhal (1992), Jacques and Nigro (1997), and Bertrand (2000) in their studies. Regulatory capital is measured by a ratio of total capital to risk-weighted assets and was used by Nachane *et al.* (2000), Roy (2005), Sharma (2011), Hua (2011), and Maji and De (2015). In the current study, second definition of capital ratio $CAP_{j,t}$ has been used. Here capital is denoted as the Capital Adequacy Ratio (CAR) as per Basel norms, i.e., the ratio of total capital (Tier 1 + Tier 2) to total risk-weighted assets. Moreover, the difference of the CAR is calculated ($\Delta CAP_{j,t}$) to account for changes in capital.

Risk: The measurement of bank risk is complicated as existing literature suggests several alternatives for measuring and defining the risk level of the bank. As the main focus of the study is to examine the impact of Basel norms capital regulations on bank's risk behavior, choosing the right risk proxy is a crucial task. One of the relevant risk proxy is the ratio of risk-weighted assets to total assets as used by Shrieves and Dhal (1992), Jacques and Nigro

(1997), Bertrand (2000), Nachane *et al.* (2000), and Jokipii and Milne (2011). It is an *ex ante* measure of risk and represents the banks' investment in risky assets. Shrieves and Dhal (1992) pointed out that bank portfolio risk can also be determined by the quality of loans. It was argued that the quality of loans is best measured by ratio of non-performing loans to total assets. The support for this measure can be found in Meeker and Gray (1987) and Beaver *et al.* (1989). So, this *ex post* measure of portfolio risk and credit quality has been used as a risk measure by Nachane *et al.* (2000), Aggarwal and Jacques (2001), Godlewski (2004) and Maji and De (2015). In the case of India, banks were required to disclose the data about risk-weighted assets only after the implementation of Basel II disclosure requirements. So, data about this risk proxy is not consistently available for all banks throughout the study period. Therefore, in the present study, the ratio of gross non-performing loans to total assets has been used as a risk measure.

Loan Loss Provisions: Loan loss provision (*LLOSS*), as a percentage of gross advances, has been included in the risk equation as a proxy for asset quality of the bank. A positive association between *LLOSS* and *RISK* may imply evidence of market discipline.

Results and Discussion

The study uses 3SLS regression using simultaneous equation modeling with partial adjustment framework.

Descriptive Statistics

Table 2 presents descriptive statistics for the major variables included in the study. The average size of all commercial banks included in the study is 20.4% with a standard deviation

Table 2: Descriptive Statistics

Variable	Mean	Minimum	Maximum	SD
$SIZE_{j,t}$	20.4605	16.09628	23.74275	1.257858
$ROA_{j,t}$	0.9440952	–2.01	2.13	0.5086999
$REG_{j,t}$	0.4428571	0.000	1.000	0.4973164
$CAP_{j,t-1}$	13.68929	9.39	56.41	4.114283
$\Delta CAP_{j,t}$	0.0512963	–33.21	23.57	2.924959
$\Delta RISK_{j,t}$	0.0022245	–9.869447	7.245332	1.298761
$RISK_{j,t-1}$	2.666054	0.017433	15.00848	1.671553
$LLOSS_{j,t}$	0.7918597	–0.438595	30.60602	1.643592

Source: Calculated using raw data from RBI

of 1.2%, where the maximum size of any particular bank is 23.7% and minimum size is 16%. As observed from Table 2, average *ROA* for banks included in the study is 0.94% and standard deviation is 0.50%, which does not indicate much variability in *ROA* of all banks. Further, average level capital ratio $\Delta CAP_{j,t}$ is 0.051% with a standard deviation of 2.9%, which signifies greater volatility in the level of capital ratio. One plausible reason for this could be greater pressure from government to maintain higher capital ratios which serve as a cushion to the banking sector to combat the impact of the US crisis. Moreover, risk level $\Delta RISK_{j,t}$ has a mean value of 0.0022% and a standard deviation of 1.29% which also shows much variability in the risk ratio. This may be because of the various priority sector projects and social developmental schemes implemented by government through banks. Many times such compulsory government-run projects are implemented without considering the potential risk involved and their failure at times enhances the risk of default.

Further, simple correlation analysis among all non-categorical variables and their relevant first differences and lags was conducted, where the correlation between levels of *CAP* and *RISK* was found to be negative. Furthermore, changes in capital level were positively related *ROA*, and *SIZE* was found to be inversely correlated to capital levels. The strength of these relationships has been further clarified by 3SLS regression.

Three-Stage Least Square Regression

The simultaneous Equations (7) and (8) are estimated using 3SLS regression on the dataset of banks. The banks' capital and risk levels were taken as endogenous variables, while the remaining variables, i.e., size, return on assets, regulatory pressure variable, loan loss provision ratio, lagged capital and risk variables, acted as exogenous instruments in the regression analysis. The results of 3SLS estimates for both the equations have been presented in Table 3. The results indicate that both the regression equations, i.e., capital ($\Delta CAP_{j,t}$) and risk ($\Delta RISK_{j,t}$) have a R^2 of 0.58 and 0.56 respectively. This showed that independent variables explained about 58% variation in changes in the capital equation, while 56% variation in the changes in the risk equation was explained by exogenous regressors and endogenous capital ratio. Table 4 presents the detailed 3SLS estimates for the impact of Basel norms on bank capital ($\Delta CAP_{j,t}$) and Table 5 shows 3SLS estimates for the impact of Basel norms on bank risk ($\Delta RISK_{j,t}$).

Table 3: Three-Stage Least Square Estimates

Equation	Obs.	R^2	*F*-Statistic	*p*-Value
$\Delta CAP_{j,t}$	378	0.5810	59.75	0.0000
$\Delta RISK_{j,t}$	378	0.5694	47.19	0.0000

Source: Calculated Through Stata

Variables Affecting Target Capital and Risk Levels

Bank size ($SIZE_{j,t}$) has a negative and significant impact on capital ratio levels (Table 4). One possible interpretation for this finding is that larger banks because of their easier access to capital and bond market, do not hold large capital levels with them. Hence, optimum capital buffer of large and well-diversified banks is smaller than other banks.

Table 4: 3SLS Estimates for Impact of Basel Norms on Bank Capital ($\Delta CAP_{j,t}$)

Variables	Parameter Estimates	*p*-Value
$SIZE_{j,t}$	–7.8940** (–11.91)	0.003
$ROA_{j,t}$	0.25695 ** (3.04)	0.012
$REG_{j,t}$	2.0421** (7.40)	0.000
$\Delta RISK_{j,t}$	–0.42124** (–4.23)	0.006
$CAP_{j,t-1}$	–0.79454** (–5.06)	0.000
Constant	11.02538** (12.66)	0.005

Note: ** indicates significance at 5% level; and figures in brackets indicate *t*-ratios.

Further, coefficient of bank size was found to have a negative and statistically significant impact (at 5% level) on risk level (Table 5). This may be due to the reason that large banks

Table 5: 3SLS Estimates for Impact of Basel Norms on Bank Risk ($\Delta RISK_{j,t}$)

Variables	Parameter Estimates	*p*-Value
$SIZE_{j,t}$	–1.93784** (–6.02)	0.0000
$REG_{j,t}$	–0.3744532** (–4.56)	0.015
$\Delta CAP_{j,t}$	–0.1648744** (–3.56)	0.006
$LLOSS_{j,t}$	0.24337 (0.52)	0.231
$RISK_{j,t-1}$	–0.674964** (–5.32)	0.000
Constant	8.26701** (9.71)	0.000

Note: ** indicates significance at 5% level; and figures in brackets indicate *t*-ratios.

have more diversification opportunities and they invest less in risky assets. Moreover, Das and Ghosh (2004) also highlighted in the context of the Indian market that such inverse relationship between size and risk level reflects differences in the markets served by larger banks vis-à-vis smaller banks.

Return on Assets ($ROA_{j,t}$), which implies profitability, was found to have a positive and significant impact on the capital level at 5% level of significance (Table 4). This indicates that profitable banks can more easily improve their capital ratios through retained earnings.

Lagged capital ratio $CAP_{j,t-1}$ was found to have a negative and significant impact on the target capital level (Table 4). The negative impact of the lagged capital ratio on the changes in capital level signifies that banks with lower capital ratios in the preceding period will increase their capital ratios in the current period.

Further, the negative coefficient of $RISK_{j,t-1}$ in Table 5 indicates that banks with higher risks may be inclined to reduce their asset risks, i.e., past accumulation of credit risk in portfolio prevents further progression of risk. Thus, the risk-taking behavior of Indian banks also significantly depends on their past experience.

Impact of Basel Norms on Bank Capital

The coefficient of the impact of Basel regulatory pressure on capital is positive and statistically significant at 5% level (Table 4). This implies that 1% increase in Basel norms capital regulation brings about 2.04% increase in the capital level of Indian banks. This result highlights that all banks with capital ratios, whether above or below the minimum requirement, significantly increase their capital levels in response to regulation. Banks with higher capital ratios their capital cushion for defensive purposes, thereby indicating their superior performance to regulatory authorities and investors. Whereas, banks below the minimum requirement increased their capital in order to avoid the penalties implied by a breach of the Basel norms regulations. The null hypothesis is rejected as parameters estimates are significant at 5% level, thus indicating a positive impact of Basel norms on capital ratio levels of banks.

Impact of Basel Norms on Bank Risk

With respect to portfolio risk, the results shown in Table 5 indicate negative and significant impact of Basel norms on risk level, signifying that regulatory pressure brought about by Basel norms led commercial banks in India to decrease their risk levels. This signifies that risk-based capital regulations are effective in reducing non-performing loan ratio of banks. Specifically, negative and significant coefficient of regulatory pressure variable indicates that all banks having actual capital adequacy ratios either below or above the required minimum limits have decreased risk in response to risk-based capital requirements, i.e., Basel norms. One possible explanation for this negative impact of Basel norms on asset risk is that in order to avoid regulatory constraint, banks endeavor to decrease their portfolio risk. Another plausible

reason to lower risk is to signal a better position of the bank to the market or to build strong capital buffers as being a step ahead with implementation of stringent Basel III norms.

Relationship Between Changes in Capital and Changes in Risk

Tables 4 and 5 indicate the overall relationship between changes in capital $\Delta CAP_{j,t}$ and changes in risk $\Delta RISK_{j,t.}$ The results reveal that changes in capital and risk level are inversely related to each other which are also statistically significant at 5% level. One plausible reason for this could be that undercapitalized banks might increase their capital and take measures to reduce asset risks under the compulsory constraint of the capital regulation. So, in order to meet minimum capital standard, banks might act reluctantly in investing more on high-risk assets. This negative relationship is consistent with the findings of Furlong and Keeley (1989), Jacques and Nigro (1997), Ediz *et al.* (1998), Nachane *et al.* (2000), Roy (2005), Floquet and Biekpe (2008), and Maji and De (2015).

So, overall the study evidently reveals that all the null hypotheses are rejected and there is significant impact of Basel norms on the capital and risk behavior of Indian banks. Table 6 presents the summary of empirical results.

Table 6: Summary of Impact of Basel Norms on Capital and Risk Behavior of Indian Banks

Variable	Sign of Relationship	
	Capital	Risk
Bank Size	Negative and Significant	Negative and Significant
Bank Capital	–	Negative and Significant
Bank Risk	Negative and Significant	–
Regulatory Pressure	Positive and Significant	Negative and Significant
Profitability	Positive and Significant	–
Loan Loss Provisions	–	Positive but insignificant
Lagged Capital	Negative and Significant	–
Lagged Risk	–	Negative and Significant

Recommendations

- As the results indicate a negative association between capital and risk of banks, it is suggested that banks should focus on managing credit activities and reducing NPAs which would ultimately reduce risk in a bank and enhance its capital base.
- The negative relationship between size and capital implies that larger banks hold lower amount of capital as compared to smaller banks. This finding suggests that large banks are required to hold a capital buffer in addition to the minimum requirements.

- Further, analysis showed that regulatory pressure in the form of Basel norms can have considerable effect on lowering the risk behavior of banks, which might prove effective for regulators in reducing bank deterioration and systematic bank failure.

Conclusion

Implementation of Basel norms provides an opportunity to make the global financial system more secure and stable. The RBI has made concerted efforts on its part to stimulate and instigate banks to better align with international best practices and standards, i.e., Basel norms in banking regulation and supervision. The present paper attempted to empirically investigate the impact of Basel norms on capital and risk behavior of banks in India. The study utilized the data of 42 commercial banks in India to examine the impact of Basel norms using 3SLS regression with simultaneous equation model as developed by Shrieves and Dhal (1992). The results indicated a positive impact of Basel norms on the capital level of Indian banks. Further, regulatory pressure induced by Basel norms stimulated banks to reduce their risk levels in order to avoid any penalty for breach of regulation. Furthermore, bank size was found to have a negative and significant impact on capital as well as risk. The results also highlighted the negative relationship between capital and risk in the context of Indian banks.

The results provide an understanding of bank's response to capital regulation in India and will be of great help to policy makers and bank regulators in formulating regulations that better satisfy the regulators' objectives. The managerial implications can be manifold as follows:

- The analysis of the impact of Basel norms regulations in terms of capital and risk behavior along with other performance parameters shows effectiveness of regulation in increasing capital and reducing risk-taking behavior of banks. This would help regulators to specify and understand the conditions for supervisory intervention in troubled banks.
- The findings of this study also provide thought to the regulators about capital and risk relationship of the banking industry in the Indian context, which might be helpful to frame policy guidelines with regard to prudential regulations in order to enhance the soundness of the banking industry as a whole.
- The study would help bank executives in assessing the relationship of various parameters with the capital and risk behavior of banks. This would further enable the Indian banks to take strategic steps to manage risk and capital in a prudent manner. ❖

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