

Implementation of BASEL Norms in Credit Risk

Renu Arora*

Archana Singh**

The purpose of this study is to evaluate the implementation of Basel-II advanced approaches in credit risk by the Indian public sector banks. The paper analyses the extent to which the internal credit rating models of the banks are aligned with Basel II Internal Rating Based (IRB) Approach for calculation of regulatory capital, through the perception of their credit managers. The paper studies the managerial perceptions for three groups, credit managers in large and small public sector banks, credit managers at three hierarchy levels, and credit managers in different experience groups. The size of the bank has been found to be a key discriminatory variable in Indian public sector banks in implementation of Basel norms in credit risk modelling as large banks have shown better results. The paper finds that many public sector banks are calculating risk adjusted return on capital (RAROC) on each loan transaction which can measure and compare loan performances across businesses, industries and sectors. Through ANOVA and post hoc tests, the study finds positive managerial perceptions about Basel II advanced approaches as a business enhancement skill in risk management. The study suggests that higher compliance with Basel norms aligns the regulatory capital with economic capital of banks, and improves the credit growth for business and industry. Further, larger convergence with international best practices in risk management would develop financial infrastructure and risk sensitivity in Indian public sector banks.

Key words: RAROC, Exposure at default, Loss given default, Risk mitigation, Loan pricing.

Introduction

All scheduled commercial banks in India have become Basel II compliant as per the Standardized Approach with effect from April 1, 2009 (RBI, 2012, Para 4.24). The Standardized Approach of Basel II measures regulatory capital for credit risk based on rating grades by external rating agencies (RBI, 2007). Presently the banks are migrating to advanced approaches of Basel II i.e., the Internal Rating Based (IRB) Approach and are at various stages of development of Basel II compliant Internal Credit Rating Models for calculation of minimum regulatory capital or Capital Adequacy Ratio.

The IRB approach is more risk sensitive but with high complexity in calculation of regulatory capital than the standardized approach. It requires banks to develop internal estimates of PD (Probability of Default) under Foundational IRB approach (F-IRB), and of PD, LGD (Loss Given Default) and EAD (Exposure at Default) for different asset classes under the Advanced IRB approach (A-IRB), for

arriving at risk weighted assets, and tracking rating transitions. These approaches are more complex but with incentives of lower regulatory capital requirement and more effective credit risk management systems for risk based supervision. Since public sector banks are under high pressure on account of non-performing assets, they need to develop efficient internal credit rating models and risk management systems in line with international best practices of Basel II. All institutions using the IRB approach will be allowed to determine the borrowers' probabilities of default while those using the advanced IRB approach will also be permitted to rely on own estimates of loss given default and exposure at default on an exposure-by-exposure basis (Basel, 2005). These risk measures are converted into risk weights and regulatory capital requirements by means of risk weight formulas specified by the Basel Committee (Basel, 2005).

The purpose of this study is to explore the extent to which the Indian public sector banks' internal credit rating models have been able to calculate risk parameters of Basel II IRB approach.

Literature Review

The Indian financial system is expected to further grow not only in size but also in complexity in the years to come (KPMG, 2012). Basel II has the potential to significantly improve credit risk

* Assistant Professor in Commerce Department, Mata Sundri College for Women, University of Delhi, New Delhi, India, 28.renuarora@gmail.com

** Assistant Professor in Delhi School of Management, Delhi Technological University, Delhi, India, sarchana03@yahoo.co.in

measurement and management practices in developing countries, and thereby contribute to the effectiveness and stability of their financial systems. (Stephanou & Mendoza, 2005). In line with the international best practices, India has also been strengthening capital adequacy framework and risk management practices of banks (RBI Report on Currency & Finance, 2008).

A significant aspect of the Basel II Accord is the greater use of the banks' internal systems as an input to the capital assessment and adequacy calculations (Greuning & Bratanovic, 2009). It provides incentives for banks to improve their risk management practices, with increasingly sensitive risk weights when banks adopt more sophisticated approaches to risk management (Greuning & Bratanovic, 2009). According to Basel (2005), Probability of Default (PD) is the probability that the borrower will default within one year horizon, Loss Given Default (LGD) is the bank's economic loss upon the default of a debtor/borrower, and Exposures at Default (EAD) is gross exposure/potential gross exposure under a facility (i.e. the amount that is legally owed to the bank) at the time of default by a borrower. Managing the credit risk means managing the amount of loss if a default should take place, known as the loss given default (LGD) (Brown & Moles, 2012).

The capital adequacy standard under the Basel Accords is based on the principle that the level of a bank's capital should be related to the bank's specific risk profile (Greuning & Bratanovic, 2009). The credit risk weights are related directly to the credit rating of each counterparty instead of the counterparty category (RBI Report on Currency & Finance, 2008). The overall objective of an internal-models regulatory capital charge would be to allow banks and supervisors to take advantage of the benefits of advanced risk-modelling techniques in setting capital standards for credit risk (Hirtle et al., 2009). Comprehensive credit risk models (would) account for variation due to three key modelling elements: transition probabilities, credit exposures, and asset revaluation (Hirtle et al., 2009, P-7). Capital requirements would have been very high for banks with poor-quality loan portfolios, reflecting the high default experience even for the highest-quality loans (Segoviano & Lowe, 2002). The IRB approach allows a more risk-sensitive calculation (based on the banks internal estimates) of the capital required

to cover the risks associated with claims than was or will be possible under Basel I and the newly modified standardized approach (Oesterreichische, 2004). The goal is to use the capital required from an economic point of view as the yardstick for the regulatory capital requirement. Basel II is specifically aimed at internationally active banks and seeks to strengthen the security and soundness of the international financial system by emphasising risk-based calculation of bank capital, the supervisory review process and market discipline (Basel, 2004). However, this will only happen if the banks measure the risks in accordance with the regulatory criteria (Oesterreichische, 2004 & RBI, 2011-IRB Approach). The structure of an internal rating system is influenced by a broad range of factors, including the uses to which the rating information is put, and the bank's policy towards the treatment of impaired assets (Basel, 2000).

The results verify that one of the main advantages of an internal credit risk model is to lead to a better allocation of capital and to better loan pricing (Dietsch & Petey, 2004). The introduction of Basel II should increase collateral-based lending, because the risk of lending must align with the amount of capital a bank is required to hold (Gama & Gerald, 2012). The advanced approaches to credit risk will require large banks to analyse their credit exposures in a formal and systematic way, assigning both default and loss probabilities to such exposures (Ferguson, 2003). Corporate credit lines are a key product for banks, and the management of their inherent credit risks requires calibration of their EAD parameters (Jiminej et al., 2009).

According to McDonough (2003) Basel II has sought to develop a more flexible and forward-looking capital adequacy framework - one that better reflects the risks facing banks and encourages them to make ongoing improvements in their risk assessment capabilities. Advanced approaches under Basel II are expected to help banks improve their risk management by building their own data models and assigning their own ratings to better assess risk while reducing capital requirements (KPMG, 2012).

However, its effective implementation in many developing countries is hindered by fundamental weaknesses in financial infrastructure that will need to be addressed as a priority such as unavailability of

required risk data in easily accessible or comprehensive format (Stephanou & Mendoza, 2005). The minimum requirements for the advanced approaches are technically more demanding and require extensive databases and more sophisticated risk management techniques (RBI, 2008). Basel II is quite complex as it offers choices, some of which involve application of quantitative techniques (RBI Report on Currency & Finance, 2008).

Research Methodology

The purpose of this paper is to study the extent to which the Indian public sector banks (PSBs) have implemented the Basel norms on credit risk through perception of their credit managers. The perception of bank managers has been analysed for three groups of managers, managers in large and small public sector banks, managers in junior, middle and senior levels, and managers in three experience groups- 'up to 7 years', '8 to 20 years' and 'above 20 years'.

Sampling and Data Collection

The study uses a sample of 12 PSBs (out of total 26) containing six large and six small PSBs. The banks in large and small categories have been divided on the basis of bank's total assets to total assets of all PSBs (cut off 2.5 per cent) in 2011-12. Six large banks in the sample (judgment sampling) are the SBI, PNB, BOB, OBC, IDBI Bank and the Syndicate Bank. Six small banks in the sample are (judgment sampling) Vijaya Bank, Dena Bank, United Bank of India, Punjab & Sind Bank, Andhra Bank and the State Bank of Bikaner & Jaipur.

Data has been collected through a structured questionnaire from 337 respondents working as credit managers in sample PSBs, in and around Delhi (172 from large PSBs, and 165 from small PSBs).

Respondents' Profile

Out of 337 respondents, 51 per cent belong to large PSBs, and 49 per cent to small PSBs. The 39 per cent respondents have up to 7 years of banking experience, 25 per cent from 8 to 20 years, whereas 36 per cent have more than 20 years' experience. The 14.8 per cent respondents are junior managers, 53.4 per cent middle level managers, and 31.8 per cent senior level managers. The respondents in all groups are fairly distributed across sample banks.

Research Instrument

The structured questionnaire has four questions (10 variables).

Question 1 examines the Indian public sector banks' preparedness to migrate to the Internal Rating Based (IRB) Approach by probing whether banks' credit risk assessment models are capable to calculate PD, LGD, EAD, capital adequacy requirements, portfolio credit risk, rating transition matrix and RAROC (Risk-adjusted Return on Capital).

Questions 2 to 4 probe the perception of credit managers of Indian public sector banks towards Basel II in effective credit risk management.

Qt.2: Basel II is a business enhancement skill in risk management and not merely a compliance issue.

Qt.3: The quantitative framework of Basel II guidelines is complex and difficult to train the staff.

Qt.4: Basel II has helped in credit risk mitigation in banks.

Basel norms are based on international best practices for integrated risk management in banks. However, Basel II IRB guidelines have complex quantitative requirements, and especially the emerging economies and developing nations find it difficult to implement them. By understanding the managerial perception, banks may find better ways to implement the Basel guidelines.

Data Analysis and Results

Data has been analysed by frequencies, mean, standard deviation values, one way analysis of variance (ANOVA), and Tukey's post hoc tests of multiple comparisons.

Basel II Compliance in Internal Credit Rating Models (Q.1)

a) Probability of Default (PD)

Probability of default is the possibility of default by the borrower in a loan transaction. In a rating model, lower is the credit score, higher is the probability of default. Higher is PD, higher will be risk weight of a loan transaction, and higher will be the capital adequacy ratio. PD estimation has to be based on quantitative and qualitative risk characteristics of counterparty and historical experience.

Qt.1a: Whether Bank's Model is Capable to Calculate PDs? (Yes-3, No-1, Not Sure-2)

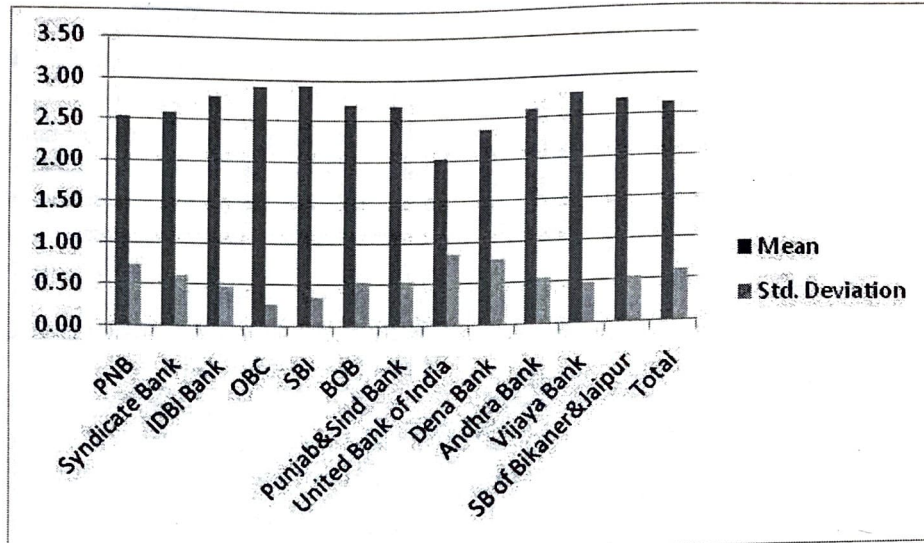


Figure 1 : Bank-wise Mean & Standard Deviation of PD.

Table 1 : Descriptive Statistics (Large vs. Small Banks)

Bank Category	Values	Q.1a *PD	Q.1b *LGD	Q.1c *EAD	Q1d Capital Adequacy	Q.1e *Portfolio Credit Risk	Q.1f *Rating Transition	Q.1g *RAROC	Q.2 Basel II as Business Skill	Q3 Basel II is Complex	Q.4 Basel II as Risk Mitigation
Large	Mean	2.74	2.67	2.69	2.80	2.76	2.78	2.53	3.97	3.28	3.90
	N	172	172	172	172	172	172	172	172	172	172
	S.D.	.545	.611	.605	.529	.539	.502	.737	.948	1.068	.807
Small	Mean	2.55	2.41	2.38	2.78	2.62	2.65	2.23	3.75	3.19	3.77
	N	165	165	165	165	165	165	165	165	165	165
	S.D.	.685	.724	.744	.498	.638	.570	.770	1.062	1.115	.992
Total	Mean	2.65	2.55	2.54	2.79	2.69	2.72	2.38	3.86	3.24	3.84
	N	337	337	337	337	337	337	337	337	337	337
	S.D.	.624	.680	.694	.514	.592	.539	.767	1.010	1.090	.903

Note: * F Statistic or mean difference (ANOVA) is significant at the 0.05 level.

PD estimation through credit rating models has highest response or mean score from credit managers of State Bank of India (SBI), Oriental Bank of Commerce (OBC), IDBI Bank and Vijaya Bank. Please see Figure 1. In all, 72.7 per cent agree that probability of default is calculated in the credit risk models of the bank.

One way analysis of variance (ANOVA) has been conducted for three independent variables i.e., groups of managers in large or small banks; managers at three levels of experience; and managers at three levels of management. The ANOVA results show significant mean differences in the opinion of large and small

banks managers only, with F statistic is 8.728 (df 1,335), at $p= 0.003$. Thus large public sector banks' credit rating models are able to capture PD for each borrower more specifically than of small PSBs. Refer to Table 1.

b) Loss Given Default (LGD)

Loss Given Default means expected loss to bank in case of default, and depends on facility ratings or security coverage ratio. Loss will depend on loan recoveries and value of collaterals.

Qt.1b: Whether Bank's Model is Capable to Calculate LGD? (Yes-3, No-1, NotSure-2)

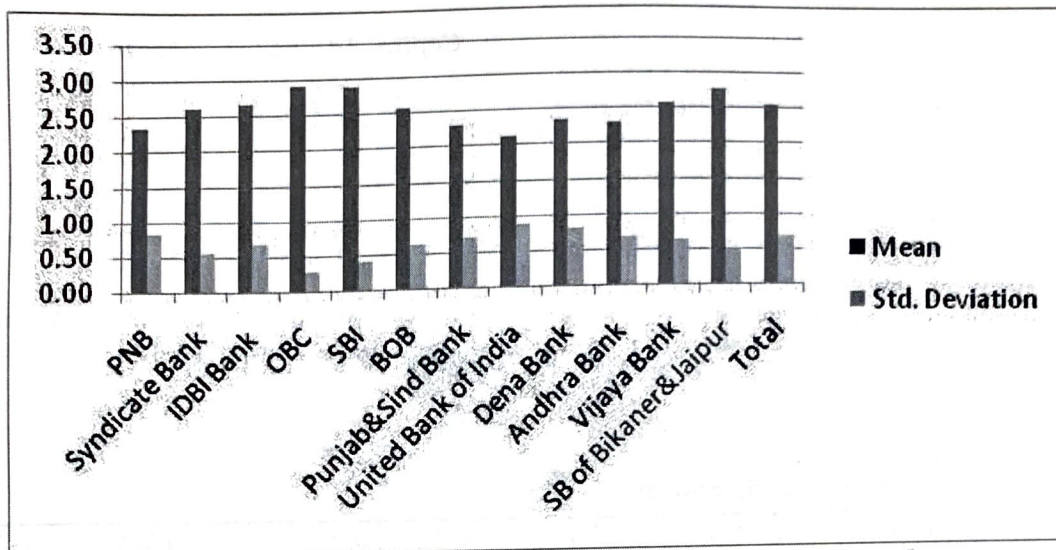


Figure 2 : Bank-wise Descriptive Statistics for LGD.

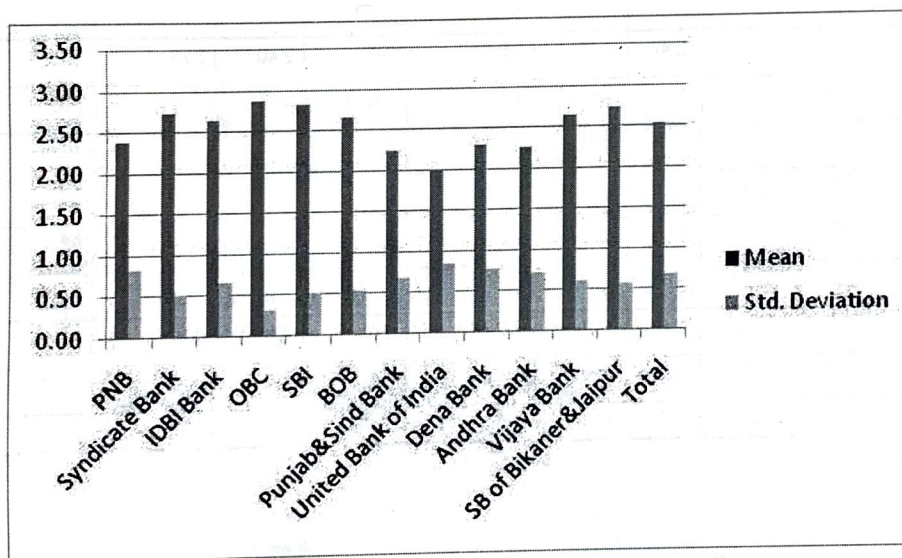


Figure 3 : Exposure at Default- Mean and Standard Deviation Values.

In all, 65.3 per cent of respondents agree about calculation of Loss Given Default(LGD) of loan counterparties through internal credit rating models of banks. Again the highest mean score is from large banks (2.69), against the mean score of small banks (2.41) (Table 1). Figure 2 displays bank-wise descriptive statistics.

ANOVA results have been found to be statistically significant for large and small banks managers (F statistic =12.962, df 1,335, at $p=0.000$) as well as for managers at three levels, junior, middle and senior levels (F statistic=3.044, df 2,334, at $p= 0.049$) (Tables 1 & 3). Post hoc tests on multiple comparisons,

however, do not find significant differences between junior, middle and senior level credit managers.

c) Exposure at Default (EAD)

Exposure at Default means amount of loan at risk of loss, in case of default. Estimation of EAD will require exposure analysis of defaulted credit.

Qt.1c: Whether Bank's Model is Capable to Calculate EAD? (Yes-3, No-1, Not Sure-2)

Out of 337 respondents, 65.3 per cent agree that banks' credit rating models can calculate Exposure at Default. The trend in mean and

standard deviation scores is very similar with that for Loss Given Default (Figure 3). ANOVA results are also similarly significant for large and small banks managers (F statistic=18.380, df 1,335, at p=0.000); and for different levels of management (F statistic=4.946, df 2,334, at p=0.008) (Tables 1 & 3). Again, post hoc tests are not showing any significant differences between any of sub-management groups.

d) Capital Adequacy Requirement

Capital adequacy means estimation of minimum regulatory capital based on risk weighted assets of the bank. Risk weights of asset classes under Basel II advanced approaches are based on internal estimates of PD, LGD, EAD etc.

Qt.1d: Whether Bank's Model is Capable to Calculate Regulatory Capital? (Yes-3, No-1, Not Sure-2)

Table 2 : Descriptive Statistics (Experience-Wise)

Banking Experience (years)	Values	Q.1a PD	Q.1b LGD	Q.1c EAD	Q.1d *Capital Adequacy	Q.1e *Portfolio Credit Risk	Q.1f *Rating Transition	Q.1g RAROC	Q.2Basel II as Business Skill	Q3 *Basel II is Complex	Q.4 Basel II as Risk Mitigation
Up to 7 Years	Mean	2.56	2.51	2.47	2.70	2.60	2.67	2.40	3.74	3.02	3.85
	N	133	133	133	133	133	133	133	133	133	133
	S.D.	.667	.692	.724	.564	.627	.574	.738	.984	1.066	.793
8 to 20 Years	Mean	2.76	2.65	2.63	2.94	2.88	2.87	2.46	3.90	3.30	3.80
	N	82	82	82	82	82	82	82	82	82	82
	S.D.	.534	.636	.639	.287	.397	.377	.789	1.084	1.119	.999
20 Years & above	Mean	2.66	2.52	2.55	2.78	2.66	2.68	2.31	3.97	3.44	3.84
	N	122	122	122	122	122	122	122	122	122	122
	S.D.	.625	.695	.694	.553	.638	.579	.783	.979	1.061	.954

Note: * F Statistic or mean difference (ANOVA) is significant at the 0.05 level.

Table 3 : Descriptive Statistics (Management Level-Wise)

Management Level	Values	Q.1a PD	Q.1b *LGD	Q.1c *EAD	Q.1d Capital Adequacy	Q.1e Portfolio Credit Risk	Q.1f Rating Transition	Q.1g RAROC	Q.2Basel II as Business Skill	Q3 Basel II is Complex	Q.4 Basel II as Risk Mitigation
Junior Managers	Mean	2.68	2.64	2.64	2.78	2.64	2.76	2.52	3.74	3.08	3.66
	N	50	50	50	50	50	50	50	50	50	50
	S.D.	.513	.563	.598	.418	.563	.476	.677	.986	.986	.872
Middle Level Managers	Mean	2.58	2.46	2.43	2.78	2.67	2.71	2.33	3.90	3.21	3.91
	N	180	180	180	180	180	180	180	180	180	180
	S.D.	.668	.727	.748	.534	.606	.546	.784	.992	1.122	.861
Senior Level Managers	Mean	2.75	2.64	2.67	2.80	2.75	2.73	2.40	3.85	3.37	3.79
	N	107	107	107	107	107	107	107	107	107	107
	S.D.	.584	.633	.611	.522	.584	.559	.775	1.053	1.077	.978

Note: * F Statistic or mean difference (ANOVA) is significant at the 0.05 level.

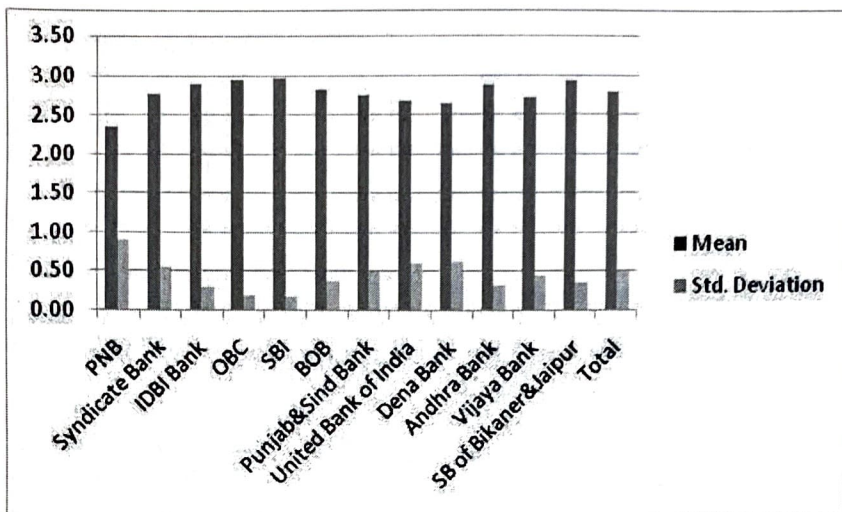


Figure 4 : Capital Adequacy Ratio-Descriptive Statistics.

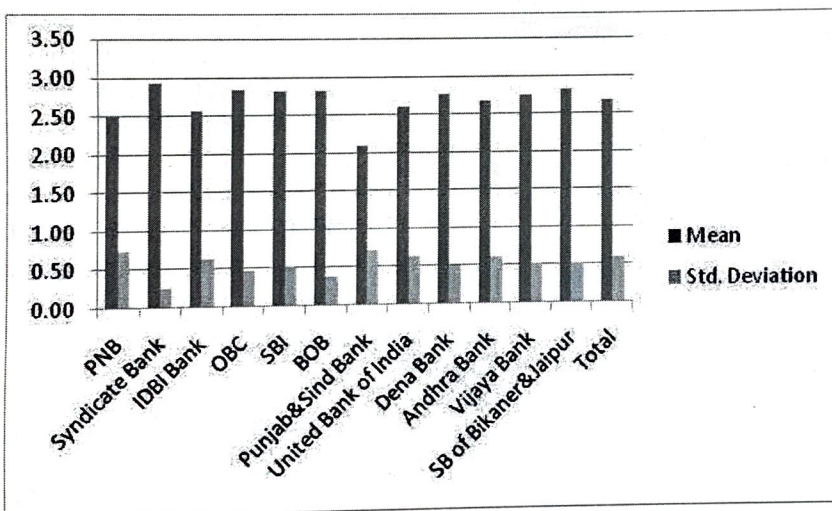


Figure 5 : Measurement of Portfolio Credit Risk.

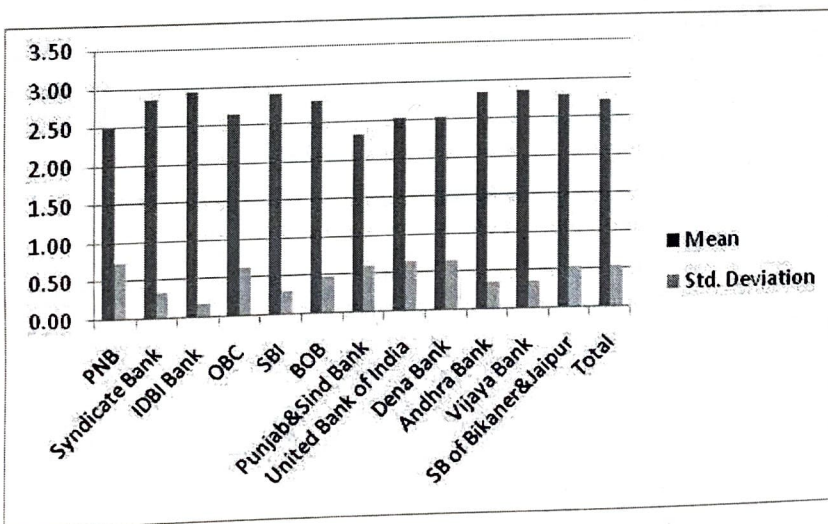


Figure 6 : Mapping Rating Transitions.

83.4 per cent of respondents agree that calculation of capital adequacy ratios of banks can be based on credit risk models. The mean score of all responses is 2.79 (S.D. 0.514). The mean score for large PSBs is 2.80, and for small banks 2.78 (Table 1). The highest mean score is for State Bank of Bikaner & Jaipur (2.93), and lowest for PNB (2.36) (Table 1 and Figure 4).

ANOVA results indicate statistically significant mean differences only between and within managers of different experience groups ($F=5.706$, df 2,334, at $p=0.004$) (Table 2). Tukey's post hoc tests on multiple comparisons show statistical significance in opinions between 'up to 7 years' and '8 to 20 years'; and between '8 to 20 years' and 'above 20 years' groups, but not between 'up to 7 years' and 'above 20 years' groups.

e) *Portfolio Credit Risk*

Portfolio credit risk is measured in terms of assets correlation and concentration risk.

Q1.1e: Whether Bank's Model is Capable to Calculate Portfolio Credit Risk? (Yes-3, No-1, NotSure-2)

Banks credit rating models can measure borrower's credit risk, and through computer networking can measure group-wise, sector-wise, industry-wise, and thereby portfolio credit risk. 76 per cent respondents agree. Bank-wise, Syndicate Bank has the highest mean score (2.93) with S.D. 0.254. Punjab & Sind Bank has the lowest mean score (2.10) with S.D. of 0.724, against all banks mean score response of 2.69 (S.D. 0.592) (Figure 5).

Large banks have higher mean score (2.76) than the small banks (2.62). Managers in '8 to 20 years' experience group have higher score (2.88) than the other groups. Senior managerial levels have higher score (2.75) than the other hierarchy levels (Tables 1 to 3).

ANOVA results show significant results for bank size category, large and small (F statistic =4.194, df 1,335, $p=0.041$), and for managers of different experience groups (F statistic=5.900, df 2, 334, at $p=0.003$) only (Tables 1 & 2).

f) *Rating Transition Matrix*

Rating Transition matrix maps rating, migration or change from one risk category to another. It can track the upward or downward movements in credit risk in loan transactions, and in asset classes, and in case of downward swing, give early warning signals of default.

Q1.1f: Whether Bank's Model is Capable to Create Rating Transition Matrix? (Yes-3, No-1, NotSure-2)

IDBI Bank has the highest mean score (2.96), followed by SBI (2.90) in mapping of rating transitions of borrowers during the tenure of the loan to measure distance to default or credit health of the loan (Figure 6). Punjab & Sind Bank has the least mean score (2.34). Large banks mean score (2.78) is higher than for small banks (2.65) (Table 1). Managers in the '8 to 20 years' experience group have the highest mean score (2.87)(Table 2). Managers at junior levels are giving the highest scores, with mean score of 2.76, for mapping rating migration (Table 3). In all 76.6 per cent respondents agree that they are measuring rating migrations in credit risk assessments.

ANOVA results are significant for managers in large and small banks, and for managers in three experience groups, but not for managers in three hierarchical levels (Tables 1 & 2). For three managerial levels, the mean differences are only chance differences.

g) *Risk-adjusted Return on Capital (RAROC)*

It is a risk based performance measurement. Measuring RAROC on each loan transaction and asset class helps banks in risk-based pricing of loans, measuring loan performance, and comparing loan performances across businesses, industries and sectors, in better risk management. RAROC is calculated based on risk adjusted net income, cost of funds and economic capital.

Q1.1g: Whether Bank's Model is Capable to Calculate RAROC? (Yes-3, No-1, NotSure-2)

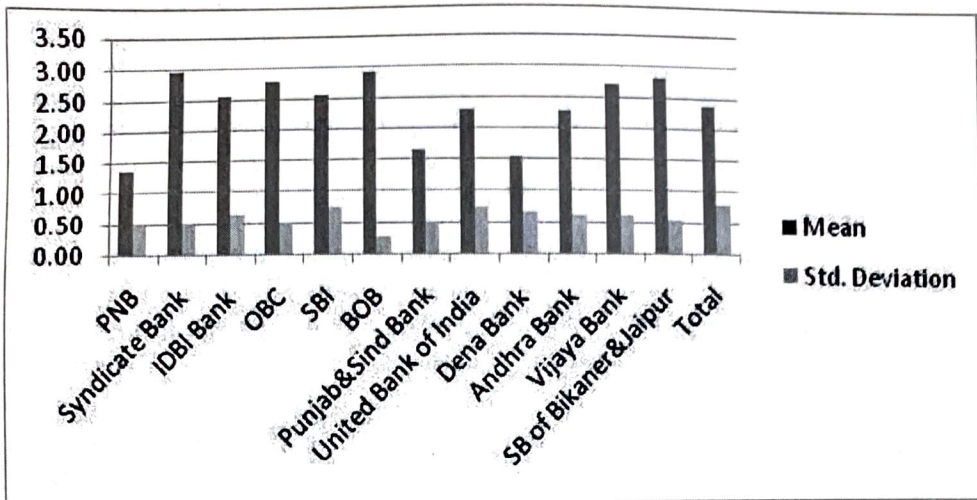


Figure 7 : Measuring RAROC- Descriptive Statistics.

Table 4 : Bank-wise Responses: RAROC

Bank Name	No	Not Sure	Yes	Total
PNB	18	10	0	28
Syndicate Bank	0	3	27	30
IDBI Bank	2	8	18	28
OBC	1	3	22	26
SBI	4	5	21	30
BOB	0	2	28	30
Punjab & Sind Bank	10	19	0	29
United Bank of India	4	10	12	26
Dena Bank	14	10	2	26
Andhra Bank	2	15	9	26
Vijaya Bank	2	4	22	28
State Bank of Bikaner & Jaipur	2	1	27	30
Total	59	90	188	337

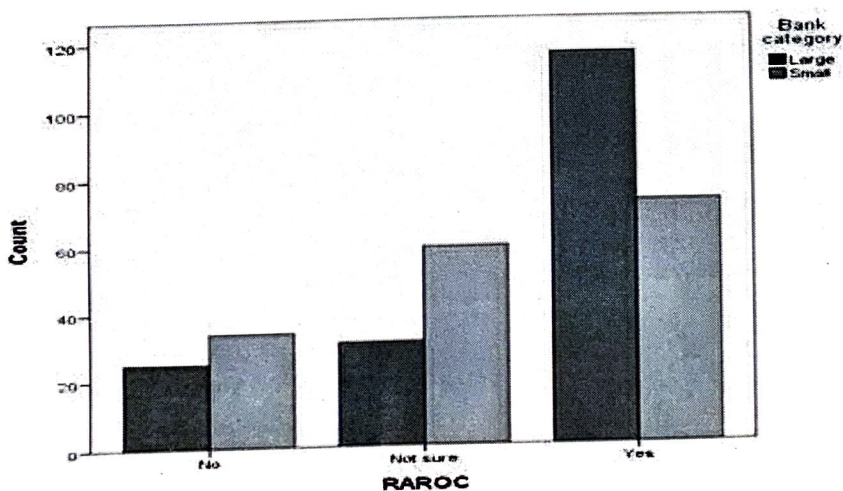


Figure 8 : Responses - Large vs.Small Banks.

Only 55.8 per cent respondent credit managers agree that their banks are measuring loan performance through RAROC. Responses for not measurement of RAROC are from PNB, Punjab & Sind Bank. Very less response is from Dena Bank, United Bank of India, and Andhra Bank (Figure 7). Thus out of five such banks, four are small banks (Table 4). Mean score for large banks is 2.53 (S.D. 0.737), and for small banks is 2.23 (S.D. 0.770) (Table 1 and Figure 8).

ANOVA results also show statistically significant mean differences between and within large and small group credit managers, with F statistics = 13.870 (df 1,335) at p=0.000

(Table 1). Other manager groups have only chance differences.

Managerial Perception towards Basel II (Q.2 to 4)

Question 2: Against the question that the Basel II is a business enhancement skill in risk management, and not merely a compliance issue, 76.5 per cent agreed/ strongly agreed. Mean score of responses is 3.86 (S.D. 1.010). Highest mean score is by SBI (4.10) with S.D. 0.995, followed by the Syndicate Bank (4.07) with S.D. 0.980 (Figure 9). Large banks mean score is 3.97 and small banks 3.75 (Table 1). ANOVA results are not significant for any three groups of managers, the independent variables (Tables 1 to 3).

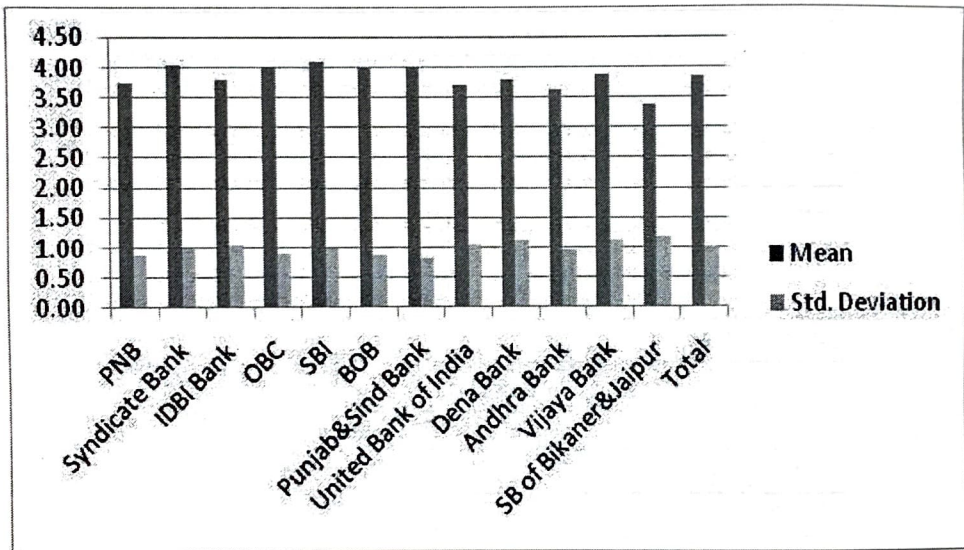


Figure 9 : Basel II as a Risk Management Tool.

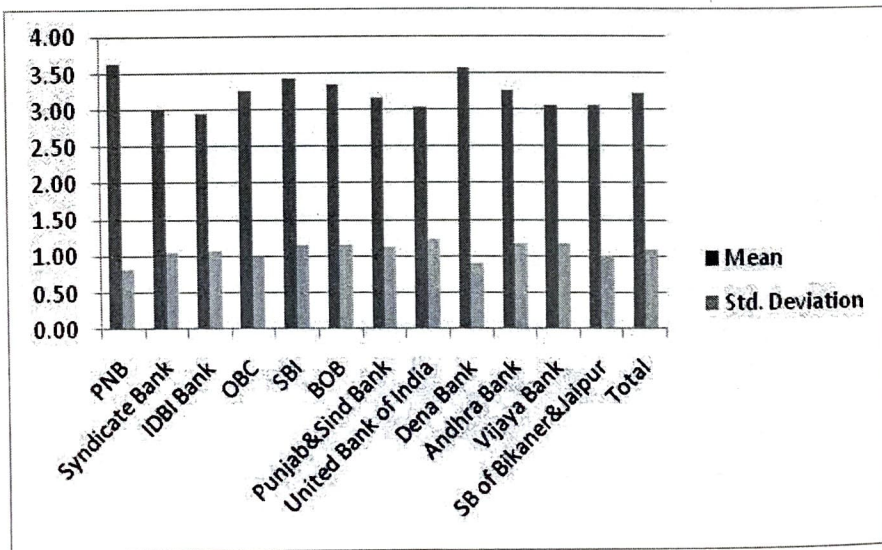


Figure 10 : Basel II is a Complex Framework.

Question 3: Against the question that the quantitative framework of Basel II regulatory guidelines is complex and difficult to train the staff, only 51 per cent agree/ strongly agree, 32 per cent disagree/ strongly disagree, and 17 per cent are indecisive (response-cannot say). Highest

agreement is from PNB, Dena Bank and SBI where respondent credit managers agree with the complexity of Basel guidelines (Figure 10). In total, largest agreement is coming from large PSBs, middle level managers, and managers with more than 20 years' experience (Tables 1 to 3) (Figures 11 to 13).

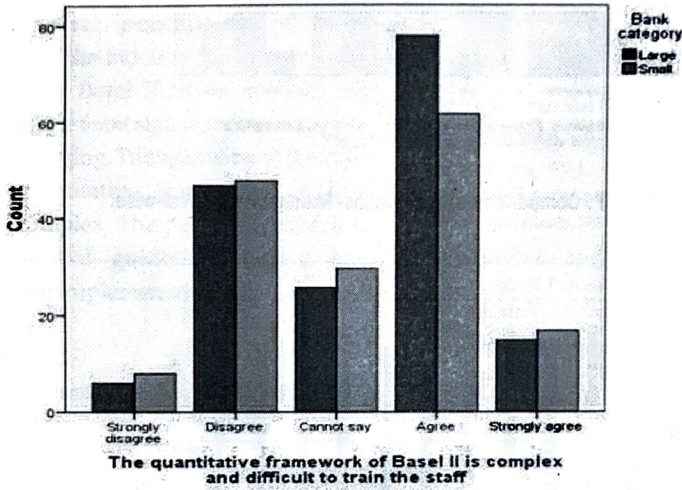


Figure 11 : Comparison of Responses (Large vs. Small).

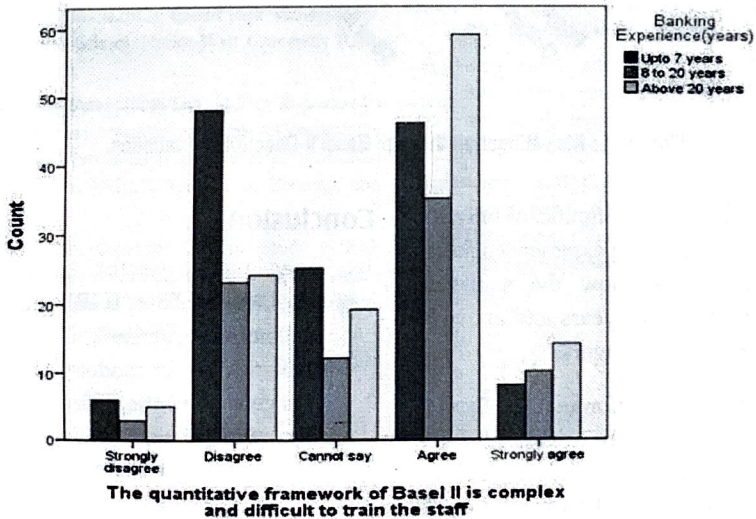


Figure 12 : Comparison of Responses- Experience-wise.

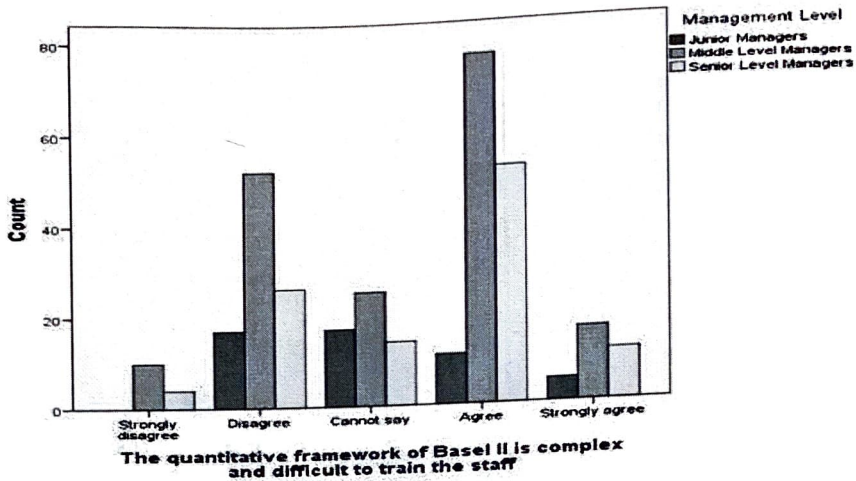


Figure 13 : Comparison of Responses- Management Level-wise.

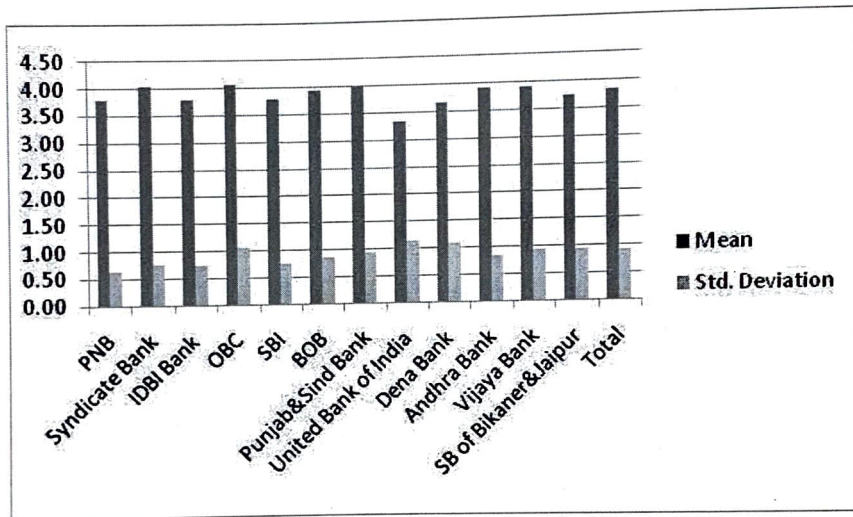


Figure 14 : Risk Mitigation through Basel II-Descriptive statistics.

ANOVA results are, however, significant only for groups of managers in different experience groups (Table 2). Post hoc tests show the statistical difference only between 'up to 7 years' and 'above 20 years' experience groups of managers.

Question 19: Against the question that the Basel II has helped in credit risk mitigation in banks, 78.8 per cent agreed/ strongly agreed. Though large banks mean score (3.90) was higher than that of small banks (3.77), and mean scores were higher for managers in 'up to 7 years' experience group (3.85), and for middle level managers (3.91) (Tables 1 to 3) (Figure 14), ANOVA results are not showing significant differences in any of the groups.

Conclusions

1. Large public sector banks have better compliance of Basel II IRB guidelines than the small public sector banks in developing internal credit risk rating models. Thus, as per credit managers' perception, size of the bank is a key discriminatory variable in implementation of Basel norms in credit risk modelling.
2. Among small banks, Punjab & Sind Bank and the United Bank of India have been found to be the under performers on many Basel II variables.
3. Among seven variables tested, RAROC has

been found to be the most differentiating factor among sample public sector banks. Punjab National Bank and Punjab & Sind Bank have yet to develop this framework. Mean score for Dena Bank, United Bank of India, and the Andhra Bank is very less. Whereas Syndicate Bank, Bank of Baroda, Oriental Bank of Commerce, Vijaya Bank, IDBI Bank, SBI, and State Bank of Bikaner & Jaipur are measuring credit risk on each loan transaction through risk-adjusted return on capital (RAROC).

4. The managerial perception in credit departments of the Indian public sector banks, about utility of Basel II IRB guidelines as a business enhancement skill in risk management is quite encouraging. Though many of them also find the quantitative framework of these guidelines complex. The positive feedback for these prudential guidelines would have facilitated their implementation.

References

- Basel Committee on Banking Supervision (2000): 'Range of Practices in Banks' Internal Rating Systems', Discussion Paper No. 66, BIS, Basel, <http://www.bis.org>.
- Basel Committee on Banking Supervision (2004): 'International Convergence of Capital Measurement and Capital Standards- A Revised Framework', Bank for International Settlements, Basel, <http://www.bis.org>.
- Basel Committee on Banking Supervision (2005): 'An Explanatory Note on the Basel II IRB Risk Weight Functions', Bank for International Settlements, Basel, <http://www.bis.org>.
- Brown, Ken, and Peter Moles (2012): 'Credit Risk Management', Edinburgh Business School, Heriot-Watt University (UK), <http://ebsglobal.net>.
- Dietsch, Michel and Joel Petey (2004): 'Should SME Exposure be Treated as Retail or as Corporate Exposure- A Comparative Analysis of Default Probabilities and Asset Correlation in French and German SMEs?', Journal of Banking and Finance, Vol. 28.
- Ferguson, Roger W. (2003): 'Basel II: A Case Study in Risk Management', paper presented at Risk Management Workshop for Regulators, The World Bank, Washington, D.C., 28 April, <http://www.bis.org>.
- Gama, Ana, and H. Gerald (2012): 'Credit Risk Assessment and the Impact of the New Basel Capital Accord on Small and Medium-sized Enterprises- An Empirical Analysis', Management Research Review, Vol. 35, Issue 8.
- Greuning, Hennie Van, and Sonia B. Bratanovic (2009): 'Analysing Banking Risk: A Framework for Assessing Corporate Governance and Financial Risk', 3rd Ed., World Bank, Washington D.C.
- Hirtle Beverly, J., Levonian, S., Saidenberg, Water, and Wright (2009): 'Using Credit Risk Models for Regulatory Capital: Issues and Options', FRBNY Economic Policy Review, Federal Reserve Bank of New York, March, pp. 19-36.
- Jimenez, G., B. Espana, J. Saurina, and Lopez. (2009): 'EAD Calibration of Corporate Credit Lines' Working Paper Series 2009-02, Federal Reserve Bank of San Francisco, <http://www.frbsf.org>.
- KPMG (2012): 'Indian Banks-Performance Benchmarking Report -FY12 Results', KPMG.com/in.
- McDonough, W.J. (2003): 'Implementing the New Basel Accord', paper presented at the Global Association of Risk Professionals, New York, 11 February, BIS Review.
- Oesterreichische National Bank (2004): 'Guidelines on Credit Approval Process and Credit Risk Management', Vienna, Austria, December, <http://www.oenb.at>, pp. 1-103.
- RBI (2007): 'Implementation of New Capital Adequacy Framework - Standardised Approach', pp. 1-130, <http://www.rbidocs.rbi.org.in>.
- RBI (2008): 'Report on Currency and Finance 2006-08: The Banking Sector in India: Emerging Issues and Challenges', <http://www.rbidocs.rbi.org.in>.
- RBI (2010-2013): 'Financial Stability Reports' June, December, <http://www.rbidocs.rbi.org.in>.
- RBI (2011): 'Implementation of the Internal Rating Based (IRB) Approaches for Calculation of Capital Charge for Credit Risk' December, pp. 1-192, <http://www.rbidocs.rbi.org.in>.
- RBI (2012): 'Report on Trends and Progress of Banking in India: 2011-12', <http://www.rbidocs.rbi.org.in>.
- Segoviano, A.M. and P. Lowe (2002): 'Internal Ratings, the Business Cycle and Capital Requirements: Some Evidence from an Emerging Market Economy' Working Paper No. 117, BIS, September, <http://www.bis.org>.
- Stephanou, C. and J.C. Mendoza (2005): 'Credit Risk Management under Basel II: An Overview of Implementation Issues for Developing Countries', World Bank Policy Research, Working Paper Series 3556, World Bank, Washington, D.C., April.