
WORKING PAPER 68/2012

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Banks in India**

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Price : Rs. 35

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Abstract

Random effects panel data analysis is applied to identify financial parameters that influence banks in India in complying with Basel I. The private sector and foreign banks are affected by credit risk weighted assets; they are guided by the risk in their loan portfolio. The public sector banks are influenced by credit deposit ratio, capital and return on asset. Tobit censored regression model for Basel II shows that business per employee and profit per employee influence CRAR of banks belonging to different ownership in India. In Basel II phase, the net non-performing assets influences foreign banks operating in India.

Keywords: *Basel-I, Basel-II, Capital Risk Adjusted Ratio, Non-performing assets, Risk Weighted Assets.*

JEL Codes: *G21, F33.*

ACKNOWLEDGMENT

I thank S.Anita and S.Madhu for their research assistance, and like to acknowledge comments of participants at the First Seminar Series Madras School of Economics in Aug 2010. I specially wish to thank Dr. Malathi V Rao of Victoria University NZ.

INTRODUCTION

The deterioration of asset quality of banks has caused major turmoil across the world, renewing interest in bank regulation. Since 1980¹ over 130 countries, comprising almost three fourth of the International Monetary Fund's member countries, have experienced significant banking sector distress. This is particularly problematic as banks universally face the dilemma of balancing profitability and stability. The Basel Capital Accord in 1988 proposed by Basel Committee of Bank Supervision (BCBS) of the Bank for International Settlement (BIS) focused on reducing credit risk, prescribing a minimum capital risk adjusted ratio (CRAR) of 8 percent of the risk weighted assets. Although it was originally meant for banks in G10 countries, more than 100 countries claimed to adhere to it, and India began implementing the Basel I in April 1994.

Basel I is arguably the most successful of all recent financial 'standards' (Powell 2002). In the 1990s, the rapid transformation in risk management techniques, exponential growth in use of information technology in the banking sector far outpaced Basel-I's straightforward approach. So banks shifted their higher-risk loan portfolio to off-balance sheet accounts and yet remained compliant with the Accord. Eventually in 2004, the more sophisticated Basel II replaced the risk insensitive Basel I.

Substantial debate arose after the introduction of the Accord with two distinct opinions about this milestone in banking regulation. One strand of thought criticizes the capital adequacy ratio of Basel I for being too simple and risk insensitive. The other criticizes Basel II on the grounds of it being procyclical, and, therefore implying that Basel II is counter productive as a policy tool in the hands of central banks.

1 Nachane (2002) "Capital Adequacy Requirements and the Behaviour of Commercial banks in India" by Development Research Group.

However, those who are associated with the BCBS refute this criticism. They contend that the solutions are inbuilt into the regulation and hence it is not procyclical. These discussions centred on the macroeconomic perspective, and little attention has been given to the micro level issues, such as how banks adjust their operations in response to the regulatory capital mandate.

To understand how banks manage their counteracting function of profitability and stability within the country's central bank's supervisory control, we study the impact of various financial parameters which reflect the risk factors embedded in the Accord.– credit risk in Basel I, and also operational risk and market risk in Basel II – on banks' credit risk adjusted ratio (CRAR). The purpose of the analysis is to understand the extent to which these various factors constrain a bank's ability to comply with the Basel mandate. We use a sample of banks operating in India, covering the period 2002-2010. The period of study is divided into a Basel I regime, covering the years 2002 and 2006 and a Basel II regime covering the period 2006 to 2010 when banks transitioned to the Basel II.

The study segregates the banks across different ownerships. This is necessary because while the public sector banks having large government ownership have the reassurance of government support, private sector banks are more vulnerable to market forces, the foreign banks on the other hand have a different perspective as they have to maintain profitability in their Indian operations while being controlled by the parent bank. The Reserve Bank of India (RBI) announced guidelines that were graded according to the foreign exposure.

Panel data allows a rich and powerful analysis of a set of entities, when the researcher intends to consider both the space and time dimension of the data We estimate a random effects model with the CRAR as the dependent variable and various key risk indicators as the

independent variables. Since the CRAR has a lower bound of 8 following the Basel mandates, our dependent variable is essentially censored. As is well known, when the dependent variable is censored, variation in the observed dependent variable will understate the effect of the regressors on the “true” dependent variable². We therefore use a censored regression model with random effects to take account of the censoring.

The paper is organised as follows: the next section provides a concise literature review. In the following section an outline of the regulatory guidelines by the RBI of banks operating in India is presented. This is followed by two sections that provide an explanation of the Basel I computation of risk weighted assets, and a description of the data, and the empirical methodology. The results are reported in the final section along with the conclusion.

LITERATURE REVIEW

Most of the literature on the subject is focused on the pro-cyclic predilection of Basel II. Gordy (2003), Repullo and Suaerez (2008) and Powell (2002) among others focus on the weakness of the Pillar I of the Basel II on the embedded pro-cyclic nature. Banks accumulate provisions against loan default, which protect against expected losses that are likely to vary over time. Provisions are, therefore, different from capital, which would provide a buffer against unexpected losses. Decisions about provisions and capital are unlikely to be independent. For instance, Laeven and Majnoni (2004) explore the relationship between capital and provisions and find that banks tend to delay provisioning for bad loans, thereby possibly are impacted by the economic cycle.

² Tobin (1958) used this model to analyze consumer expenditures on automobiles; this is generally referred to regression models with non-negativity constraints as Tobit models.

Despite the minimum requirement of 8 percent , many banks actually retain a capital higher than that as a buffer. The need for this arises from the inability to anticipate unexpected losses from deterioration of asset quality. There is a growing body of empirical literature on the determinants of banks' capital buffers, for instance, Furfine (2000) for US banks, Rime (2003) for Swiss banks, Ayuso et al. (2004) for Spanish banks, and Lindquist (2004) for Norwegian banks. Jackson (1999) finds that following introduction of the Basel Accord there was an increase in major bank's risk-weighted capital ratio in the G-10 countries. The average CRAR of these banks rose from 9.3 percent in 1988 to 11.2 percent in 1996. Jackson (1999) also finds that undercapitalized banks raised new equity capital, whereas weakly capitalised banks reduced their high risk weighted assets and lending.

Danielsson J et al., (2001) find that credit rating agencies are unregulated and the qualities of their risk estimates are unobservable. Stijn Claessens et al. (2008) show that developing countries' assets are subject to more volatility and procyclicality than developed countries. They argue that if banks follow similar models, their reaction to market signal will be mirrored leading to systemic effects. However, Illing and Graydon (2005) argue that changes in minimum required capital and provisions would be countercyclical, so they would increase during recessions and fall during economic booms. Stijn Claessens et al., (2008) caution that adopting the Basel-II standards would reduce capital inflows and external financing to developing countries. Kleff and Weber(2003) analyze the determinants of bank capital ratios of German savings banks, and cooperative banks and find that banks with lower capitalization raise capital to maintain the CRAR. However, profitability is an important determinant of bank capital especially the larger savings banks that rely on retained earnings.

Nag and Das (2002) and Ghosh and Nachane. (2003) find that for India in the post reform period, public sector banks have shifted their

portfolio to reduce capital requirements. Also the adoption of stricter risk management practices and minimum capital requirements have had a dampening effect on overall credit supply. Their findings resonate with that of Laeven and Majnoni (2004). Sarma and Nikaldo (2007) find that Indian banking system performed reasonably well during the Basel I regime, maintaining an average CAR of about 12 per cent, which is higher than the internationally accepted level of 8 per cent and the RBI's minimum requirement of 9 per cent. Most of these discussions however, focus on the macro perspective. There is scanty attention paid to understand the strategy individual banks adopt to comply with the regulatory capital requirement prescribed by the BCBS.

The objectives of this paper are firstly to identify the financial factors that influence banks in their compliance with the regulatory capital requirement in two phases of Basel I and Basel II. To do so the behaviour of banks and the factors that influence their decision in implementing the CRAR with a view to understanding how different banks maintain the minimum capital requirement balancing their key functions of credit creation and profitability. A panel data analysis with random effects in both phases is used, as the Basel I regime has given way to the revised Basel II. The dependent variable CRAR is censored since it takes values of 9 and above. To account for this censoring, a semi-parametric Tobit censored regression model is used to capture the factors that may impact the banks' operational ratios while complying with the Basel capital regulation.

Moreover, the financial crisis that engulfed the world following the collapse of Lehman Brothers stimulated banks to become more cautious by maintaining buffer capital, over and above the minimum level required by the Basel II. Banks balanced their revenue as well as the risk associated with loans advanced while retaining the regulatory capital. The maintenance of buffer capital as added precaution is studied for Indian banks during the years 2009 and 2010. Thus, we also apply an

OLS regression model to examine what impact operational variables had on maintenance of the buffer capital. This analysis is carried out for the two years 2009 and 2010, for banks in the public and private sector only.

THE RESERVE BANK OF INDIA'S GUIDELINES FOR BASEL CAPITAL COMPLIANCE

According to Section 17 of the Banking Regulation Act (1949) every bank incorporated in India is required to create a reserve fund and transfer a sum equal to but not less than 20 per cent of its disclosed profits, to the reserve fund every year. The RBI has advised banks to transfer 25 per cent and if possible, 30 per cent to the reserve fund. The First Narasimham Committee Report recommended the introduction of a capital to risk-weighted assets system for banks in India since April 1992. This system largely conformed to international standards. It was stipulated that foreign banks operating in India should achieve a CRAR of 8 per cent by March 1993 while Indian banks with branches abroad should comply with the norm by March 1995. All other banks were to achieve a capital adequacy norm of 4 per cent by March 1993 and the 8 per cent norm by March 1996.

In its mid-term review of Monetary and Credit Policy in October 1998, the RBI raised the minimum regulatory CRAR requirement to 9 per cent, and banks were advised to attain this level by March 31, 2009. The RBI responded to the market risk amendment of Basel I in 1996 by initially prescribing various surrogate capital charges such as investment fluctuation reserve of 5 per cent of the bank's portfolio and a 2.5 per cent risk weight on the entire portfolio for these risks between 2000 and 2002. These were later replaced with VaR-based capital charges, as required by the market risk amendments, which became effective from March 2005. India went a step ahead of Basel I in that banks in India were required to maintain capital charges for market risk on their 'available for sale' portfolios as well as on their 'held for trading portfolios' from March 2006 while Basel I requires market risk charges for trading portfolios only.

The RBI announced the implementation of Basel II norms in India for internationally active banks from March 2008 and for the domestic commercial banks from March 2009. Before we go into details of several issues facing the banking industry in India in the wake of Basel II, a brief description of the current state of affairs with respect to capital adequacy of India's banking industry is given. In May 2004, RBI announced that banks in India should examine the options available under Basel II for revised capital adequacy framework. In February 2005, RBI issued the first draft guidelines on Basel II implementations in which an initial target date for Basel II compliance was set for March 2007 for all commercial banks, excluding Local Area Banks (LAB) and Regional Rural Banks (RRB). This deadline was, however, postponed to March 2008 for internationally active banks and March 2009 for domestic commercial banks in RBI's mid-year policy announcement of October 30, 2006.

Although RBI and the commercial banks have been preparing for the revised capital adequacy framework since RBI's first notification on Basel II compliance, the complexity and intense data processing requirement of Basel II have thrown up several challenges in its implementation. Given the limited preparation of the banking system for Basel II implementation, this postponement is not surprising. The final RBI guidelines on Basel II implementation were released on April 27, 2007. According to these guidelines, banks in India would initially adopt Standardized Approach for credit risk and Basic Indicator Approach for operational risk. RBI provided the specifics of these approaches in its guidelines. After adequate skills are developed, both by banks and the RBI, certain banks would be allowed to migrate towards the more sophisticated approach Internal Ratings Based Approach (IRBA). Under the revised regime of Basel II, Indian banks were required to maintain a minimum CRAR of 9 per cent on an ongoing basis. Further, banks were encouraged to achieve a tier I CRAR of at least 6 per cent by March 2010. In order to ensure a smooth transition to Basel II, RBI advised

banks to have a parallel run of adhering to the revised norms as well as compliance with the currently applicable norms.

For claims in Indian Rupees, the RBI's guidelines provide risk-weights for direct and guarantee exposures of the central and state governments, exposures to apex bodies such as the RBI, the Deposit Insurance and Credit Guarantee Corporation (DICGC), the Credit Guarantee Fund Trust for Small Industries (CGTSI) and the Export Credit Guarantee Corporation (ECGC), exposures to scheduled commercial banks and other banks, and exposures to corporate bodies with various credit ratings. RBI also set extensive guidelines on to how to deal with non-performing assets (NPA's) in calculating risk-weighted assets. As far as claims on foreign currency were concerned, the RBI retained the indicative guidelines of the Basel Committee, and provided risk weights in accordance with the credit ratings of external credit rating agencies. We now proceed to the computation of the Credit Risk Weighted Assets under the Capital accord in the next section.

Computation of Risk Weighted Assets in the Basel I framework

The strength of Basel I lay in inducing relatively weakly capitalized banks to maintain higher capital ratios. In this context, a common structure of formal regulatory capital requirements across countries may have enabled financial markets to exert greater market discipline on undercapitalized banks than would otherwise have been the case. However, over time the banks learnt how to exploit the broad brush nature of the requirements - in particular the limited relationship between the actual risk and the regulatory capital charge for that risk. In India on an average, banks maintain a higher CAR than 8 percent. It has been reported that the average ratio of capital to risk-weighted assets of major banks in the G-10 rose from 9.3 percent in 1988 to 11.2 percent in 1996 (Powell, 2002). The explanation below is drawn from BCBS An Explanatory Note on the Basel II Internal Rating Based Risk Weight Functions (2005).

The Basel agreement identifies three types of credit risks:

- The on-balance sheet risk.
- The trading off-balance sheet risk. These are derivatives, namely interest rates, foreign exchange, equity derivatives and commodities.
- The non-trading off-balance sheet risk. These include general guarantees, such as forward purchase of assets or transaction-related debt assets.

The Risk Weighted Assets (RWA) of a bank can be calculated both for the on balance sheet and off balance sheet assets as follows:

$$RWA=0*(bucket1)+0.2*(bucket2)+0.5*(bucket3)+1.0*(bucket4) \quad (1)$$

where bucket 1 consists of assets with zero default risk (e.g. cash, government bonds/securities), bucket 2 consists of assets with a low rate of default (e.g. loans to OECD banks), bucket 3 consists of medium-risk assets (essentially residential mortgage loans) and bucket 4 consists of the remaining assets (in particular loans to non-banks). Tier 1 capital, also called "core capital", consists primarily of stockholder equity capital and disclosed reserves whereas tier 2 capital or "supplementary capital", which includes elements like undisclosed reserves and subordinated term debt instruments provided that their original fixed time to maturity exceeds five years. The difference between tier 1 and tier 2 capital thus reflects the degree to which capital is explicit or permanent. Table 1 reports the asset class and their assigned weights.

Table 1: Asset Classes and Weights

Weight	Asset Type
0 percent	Cash held Claims on OECD central governments Claims on central governments in national currency
20 percent	Cash to be received Claims on OECD banks and regulated securities firms Claims on non-OECD banks below 1 year Claims on multilateral development banks Claims on foreign OECD public-sector entities
50 percent	Residential mortgage loans
100 percent	Claims on the private sector (corporate debt, equity, etc.) Claims on non-OECD banks above 1 year Real estate Plant and Equipment

Source: Basel Committee on Banking Supervision (2005), *An Explanatory Note on the Basel II Internal Rating Based Risk Weight Functions, BIS, Bank for International Settlements.*

General provision/loan loss reserves are held against future unidentified losses. On-balance sheet assets consist principally of loans for most credit institutions and, the capital charges should provide recognition of variation in asset quality.

$$\text{Credit Exposure}^3 = \text{NRV} + \text{Add-on}^4 \quad (2)$$

Banks which intend to raise their CAR can either i) increase capital level⁵; ii) decrease risk weighted assets as proportion of total assets; and/or iii) decrease total assets.

3 The Basel Accord computes the credit exposure for derivatives as the sum of the current net replacement value plus an add-on that is supposed to capture future or potential exposure.

4 Add-on factor depends on the (maturity) and type of contract. It roughly accounts for the maximum credit exposure which, depends on the volatility of the risk factor and the maturity. This explains why the add-on factor is greater for currency, equity, and commodity swaps than for interest rate instruments, and also increases with maturity.

5 Which depends on the regulatory ratio concerned.

The growth rate of capital adequacy can be decomposed into: the growth rate of capital, the growth of the credit risk, and the growth rate of assets.

$$\Delta CAR_{i,t}/CAR_{i,t} = \Delta K_{i,t}/K_{i,t} - \Delta Risk_{i,t}/Risk_{i,t} - \Delta A_{i,t}/A_{i,t} \quad (3)$$

where CAR = K/RWA is the capital adequacy ratio, K is the capital which is either tier 1 capital or total capital, Risk =RWA/A which is the credit risk ratio. A is the total assets and t denotes time. Hence an increase in Capital Adequacy Ratio does not prevent banks from simultaneously increasing their capital and their credit risk ratio provided the growth of credit risk is lower than the growth rate of capital.

The Basel I is criticized for an over-reliance on a simple formula for comparing levels of capital across varied complex banks as well as across different countries. Under Basel I all commercial lending was subject to the same 8 percent capital requirement regardless of the creditworthiness of the borrower and the strength of the collateral offered. There was therefore an incentive to retain low-risk instruments and move relatively high-risk instruments to off balance sheet. Paradoxically, however, the power of the Accord is simplicity. The financial innovations that arose in response to this incentive provided banks with opportunities for regulatory arbitrage (Jones 2000). Despite this weakness, it was the first international instrument to assess risk in relation to capital, and would remain a milestone in the history of banking regulation.

Basel II

In this section, the modalities of the capital regulation and the rationale from which it has evolved is discussed. This section is drawn from the documents of the BCBS, particularly "An Explanatory Note on the Basel II Internal Rating Based Risk Weight Functions" 2005. Basel II is a more comprehensive framework, including the CRAR computation, and

provisions for supervisory review and market discipline. Basel II stands on three pillars:

- (1) Minimum regulatory capital (Pillar 1): This is a revised and comprehensive framework for capital adequacy standards, where CRAR is calculated by incorporating credit, market and operational risks.
- (2) Supervisory review (Pillar 2): This lays down the key principles for supervisory review, risk management guidance and supervisory transparency and accountability.
- (3) Market discipline (Pillar 3): This pillar instils market discipline through disclosure requirements for market participants to assess key information on risk exposure, risk assessment process and bank's capital adequacy.

The Basel II makes significant improvement in linking risk and regulatory capital for internationally active banks especially for their corporate loan book. However, the corporate-calibrated Internal Rating Approach Banks (IRB) approach leads to significant changes to capital requirements and spreads for banks. Under the IRB approach banks may go by their own opinions regarding borrowers in setting capital requirements, based on a set of pre-determined parameters that banks may use to estimate the actual risk weights. The three crucial parameters required are : i) the Probability of Default (PD) or the average percentage of obligors that default at a particular rating grade in the course of one year and, ii) the Loss Given Default (LGD) or the percentage of the exposure that the bank might lose in case of default by the borrower and iii) Exposure at default (EAD), or an estimate of the amount outstanding (drawn amounts plus likely future draw downs of yet undrawn lines) in case the borrower defaults. Other important parameters include the calculation of the actual risk weight, including in some cases the Maturity of the Transaction (M)

and the Exposure At Default (EAD) are determined by supervisory rules under both alternatives.⁶

While it is not possible to anticipate losses, a bank can forecast the average level of credit loss, that are known as Expected Losses (EL) and are considered to be the cost component of doing business. Some banks retain a capital buffer to protect it against peak losses. Losses above expected levels are referred to as Unexpected Losses (UL). Institutions know that they will experience unexpected loss now and then, but they cannot anticipate their timing or severity. Interest rates, including risk premia, charged on credit exposures may absorb some components of unexpected losses, but the market does not support prices sufficiently to cover all the unexpected losses. Capital is needed to cover the risks of peak losses, which is its loss-absorbing function. The risk weight functions used for supervisory capital charges of Unexpected Losses (UL) are based on a model developed by (Gordy, 2003).⁷

DATABASE AND METHODOLOGY

We explore the factors that determine the key capital ratio the CRAR - the ratio of qualifying capital to risk adjusted (or weighted) assets - in Indian banks across different ownerships in two phases. The RBI set the minimum capital adequacy ratio at 9 percent. The entire period of study is from 2002 to 2010: the first phase is from 2002 to 2006 and second from 2006 to 2010. The one year overlap is taken to accommodate for transition. The banks are classified as public sector, private sector and foreign. For Basel I the sample consists of 27 public sector banks, 25 private sector banks and 22 foreign banks, and the total size being 74. In the case of Basel II, the sample has 27 public sector 24 private and 22

6 Andrew Powell (2002), A Capital Accord for Emerging Economies? March Universidad Torcuato Di Tella and Visiting Research Fellow, World Bank (Financial Sector Strategy and Policy - FSP).

7 Basel Committee of Banking Supervision "An Explanatory Note on the Basel II IRB Risk Weight Functions", July 2005, Bank for International Settlements Press & Communications CH-4002 Basel, Switzerland.

foreign, and the total being 73. As Basel I concentrated on credit risk, we use Deposits (DEP), Return on Asset (ROA)⁸, Credit Risk Weighted Asset Ratio (CRWA), Capital (CAP), and Credit Deposit Ratio (CDR) as the independent variables. The dependent variable is Capital Risk Adjusted Ratio (CRAR) or Capital Adequacy Ratio (CAR). The ROA captures the profitability of banks, while the size of business activity is represented by DEP and CDR the CDR is also known as the Loan to Deposit Ratio, as it measures the spread between the outflow and inflow it indicates the efficiency of credit creation.

For the analysis in the Basel II phase, variables representing operational risk and market risk are incorporated along with the variables used for Basel I. These variables comprise the following: number of offices or bank branches, business per employee, profit per employee, for operational risk and log of advances are included for market risk. Details of trading desk portfolio are generally confidential. The net non-performing asset NNPA replaces CRWA in the Basel II analysis. Gross Non Performing assets is the total outstanding of all the borrowers classified as non-performing assets (viz, substandard, doubtful and loss asset). Banks recognize a loan as an NPA if either the principal or the interest is overdue for two quarters or 180 days. From March 2004 the banks adopted '90 days overdue' norm or the 90-day income recognition norm for calculating non-performing assets. NNPA is the Gross NPA minus gross provision made, it is computed taking the unrealized interest and unadjusted credit balances with regard to various NPA accounts.

The list of variables used in the analysis is reported in Table 2. The data have been sourced from the Reserve Bank of India Data Warehouse in the following sites:

- (1) Statistical Tables relating to Banks,
- (2) Bank -Wise Tables
- (3) Profile of Banks various years.

⁸ Return on Assets = Net Income/ Total Assets

The Summary Statistics for the variables for first and second phase are reported in Table 3 and Table 4 respectively.

Table 2: List of Variables

Acronym	Variable	Used in
CRAR	Capital Risk Adjusted Ratio	Basel I and Basel II
Deposits	Deposits in Rs. Crores	Basel I and Basel II
Office	Number of Branches	Basel II
Bus_emp	Business per employee in Rs. Lakhs	Basel II
Prof_emp	Profit per employee in Rs. Lakhs	Basel II
Adv	Advances in Rs. Crores	Basel II
ROA	Return on Assets	Basel I and Basel II
CRWA	Credit Risk Weighted Assets	Basel I
NNPA	Net non- performing Asset	Basel II
Cap	Capital in Rs. Crores	Basel I and Basel II
CDR	Credit Deposit Ratio	Basel I and Basel II

Table 3: Summary Statistics (Basel I)

Variables	Public Sector Banks				Private Sector Banks				Foreign Banks			
	Mean	StdDev.	Max.	Min.	Mean	StdDev.	Max.	Min.	Mean	StdDev.	Max.	Min.
CRAR	12.38	1.40	18.16	9.21	13.28	3.9946	34.34	9.09	29.05	21.37	97.06	9.41
Deposits	61864	7280.5	435521	16369	18666	36505.41	230510	331	4670	9608.9	37875	21
ROA	0.91	0.36	2.01	-0.45	0.70	0.96	2.13	-2.01	1.47	2.06	9.64	-3.52
NNPA	1.39	1.14	8.11	0.17	1.79	1.59	7.65	0.17	3.13	9.27	55.05	0
CAP	445	360	1810	17	157.62	249.72	1249.34	0.28	412.72	446.72	2271.55	0.2
CDR	67.60	46.04	412.73	33.04	64.42	13.93	114.77	33.18	111.87	161.55	114.77	1.55

Table 4: Summary Statistics (Basel II)

Variables	Public Sector Banks				Private Sector Banks				Foreign Bank			
	Mean	Std Dev.	Min.	Max.	Mean	StdDev.	Min.	Max.	Mean	StdDev.	Min.	Max.
CRAR	12.59	1.06	9.39	15.37	14.92	6.02	7.52	49.15	33.43	26.93	9.58	36.92
Deposits	95031	113184	16369	804116	28647	49962.1	378	244431	6846.6	13731	21	55748
Office	2032.38	2029.77	173	13039	364.36	325.72	2	1729	10.22	20.04	1	95
Bus_em	647.35	326.95	240.5	2417.42	594.79	250.44	225	1526.7	1424.1	836.71	148.51	3891
Prof_em	4.0056	2.07	0.36	12.45	4.3755	3.65	-7	15.75	36.72	43.10	-42.26	271
Adv	68686.1	86035.16	9107	631914	21912	43324.3	205	225616	5198.3	10233	1	41552
ROA	0.95	0.30	0.16	1.67	0.99	0.67	-2.01	2.13	2.14	1.96	-3.12	10.23
NNPA	0.96	0.55	0.16	3.04	1.09	0.95	0	4.5	1.70	5.04	0	41.58
Cap	460.53	370.67	17.25	1810.87	176.23	272.01	0.28	1463.29	616.86	945.46	0.2	4709.6
CDR	68.24	36.60	31.11	412.73	66.04	12.78	33.18	114.77	108.41	151.33	0.87	867

EMPIRICAL RESULTS

Phase I : Panel data regression model with random effects was carried out to identify variables influencing CRAR for each of the three samples separated by ownership type: public, private and foreign.

Phase 1 Random Effects Model

$$\text{CRAR} = \alpha + \beta_1(\text{Deposits}) + \beta_2(\text{ROA}) + \beta_3(\text{CRWA}) + \beta_4(\text{CAP}) + \beta_5(\text{CDR}) + u_{it} \quad (4)$$

Table 5: Random-Effects Estimates of Bank Performance Ratios on CRAR in Basel I

Variables	Public Sector Banks	Private Sector Banks	Foreign Banks
Deposits	0.0000 (0.000)	0.0000 (0.000)	0.0003 (0.000)
Return on assets	0.5709*** (0.255)	0.0186 (0.127)	-0.3387 (0.200)
Credit Risk Weighted Assets	0.4029*** (0.041)	0.5615*** (0.049)	0.9565*** (0.053)
Capital	0.3162*** (0.048)	0.3663*** (0.047)	-0.0608 (0.024)
Credit Deposit Ratio	-0.0303** (0.011)	0.0039 (0.007)	-0.0008 (0.006)
No. of Observations	135	120	110
No of Groups	27	25	22
R-Square	0.7835	0.9242	0.9517

*** - significant at 1 percent level; ** - significant at 5 percent level; * significant at 10 percent level. Standard Error in brackets.

The results, reported in Table 5, show that for public sector banks, four variables are statistically significant out of the five independent variables identified for the study: ROA, CRWA and CAP are significant at the 1 percent level, and CDR at the 5 percent level. For private sector banks, CRWA and CAP are both statistically significant at the 1 percent level. Private sector banks are more vulnerable to market forces as they are not protected by the government like the public sector

banks. On the other hand for foreign sector banks only the capital risk weighted assets is statistically significant at 1 percent. Hence foreign banks are relatively more sensitive to borrowers' creditworthiness. It is not surprising that similar results are visible in Basel II phase as well Table 6. Foreign banks moreover are exposed to foreign exchange fluctuations since they have more international business in their portfolio. This aspect is outside the scope of our study and has not been investigated here.

Phase2: In the first phase the basic random effects panel data analysis was implemented. In the second phase the Tobit censored regression model is applied to analyze factors influencing the CRAR. We also present the uncensored random effects model estimates, for comparison purpose.

Phase 2 Random Effects Model and Random Effects Censored Tobit Regression Model

$$\begin{aligned} \text{CRAR} = & \alpha + \beta_1(\text{DEP}) + \beta_2(\text{Offices}) + \beta_3(\text{Bus_emp}) + \beta_4(\text{Prof_emp}) + \\ & \beta_5(\log \text{adv}) + \beta_6(\text{ROA}) + \beta_7(\text{NNPA}) + \beta_8(\text{CAP}) + \beta_9(\text{CDR}) \\ & + u_{it} \end{aligned} \quad (5)$$

Deposits are liabilities for banks; we find that in the Basel II phase for public sector banks, this variable is significant at the 10 percent and 5 percent levels for the uncensored regression and the censored random effect model respectively. Deposits are not significant in Basel I phase for banks in any of the sectors. The following operational factors which are: offices (the number of branches), business per employee and profit per employee are significant in both regression models. The negative sign for the first two variables clearly indicate how larger number of offices and more business per employee can also contribute to operational risk. In fact not surprisingly the results in the censored model are stronger. Public sector banks having a long history in India and have large outreach in terms of bank branches. This is true even after the

rationalization recommended by the First Narasimhan Committee for closing or merging unviable branches to reduce operating costs.

Mean number of bank branches for public banks are more than six times that of private sector banks and 20 times that of foreign banks (Table 4). Offices are not significant determinants of CRAR for private or foreign banks. Business per employee is significant at 1 percent for public and private banks, in both the random effects as well as in the censored model. A plausible explanation lies in the nature of the banking business. The financial sector is a labour intensive industry, and highly skill oriented, it is therefore not unexpected that contribution by the managers and staff at different level of the operation contribute to the CRAR. In the Basel II phase the IRB approach involves increased training for the bank staff to become Basel II compliant. So we note that the coefficient for offices and business per employees are negative indicating the risk of cost associated with operations and maintaining regulatory capital.

From the profitability point of view, return on assets (ROA) is significant for private sector banks but not for foreign banks and public banks (Table 6) perhaps because public sector banks are less aggressive in their profit orientation having a social objective embedded in their business model. Profit per employee is significant for public and private banks though more so in case of the former. Capital is not significant for any sector so it can be ignored as an influencing factor. Yet it is found to be significant during the Basel I regime. It must be noted that NNPA is significant for foreign bank only in this phase. It can be argued that business per employee is the factor to be considered here, the KYC norms that are now more rigorously imposed by banks for different ownerships could be the cause for NNPA not influencing CRAR. There is scope for further investigation of this aspect in future.

Table 6: Random-Effects Estimates of Bank Performance Ratios on CRAR in Basel II

<i>Variables</i>	<i>Public-Sector Banks</i>		<i>Private-Sector Banks</i>		<i>Foreign Banks</i>	
	<i>Uncensored</i>	<i>Censored</i>	<i>Uncensored</i>	<i>Censored</i>	<i>Uncensored</i>	<i>Censored</i>
Deposits	0.0001*	0.0001**	-0.0000	-0.0000	0.0002	0.0003
	(-0.000)	(-0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Offices	-0.0005***	-0.0005***	0.0061**	0.0067**	-0.1975	-0.2340
	(-0.000)	(0.000)	(0.003)	(0.003)	(0.312)	(0.339)
Business per Emp	-0.0022**	-0.0022***	0.0107***	0.0099***	-0.0016	-0.0008
	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.003)
Profit per Emp	0.3669*	0.3667**	-0.7037*	-0.6659*	-0.0567	-0.0067
	(0.155)	(0.149)	(0.391)	(0.387)	(0.060)	(0.046)
Log advances	0.3772	0.3621	-1.8610**	-1.5354*	-5.4132***	-3.7927***
	(0.303)	(0.299)	(0.946)	(0.948)	(1.689)	(1.041)
ROA	-0.4323	-0.4101	6.1376***	5.9428***	-0.4615	-1.4788
	(0.697)	(0.680)	(1.787)	(1.728)	(1.257)	(1.028)
NNPA	-0.0374	-0.0433	0.2150	0.2438	-0.5221*	-0.4912**
	(0.233)	(0.226)	(0.593)	(0.567)	(0.325)	(0.269)
Capital	0.0000	0.0001	0.0085	0.0061	0.0007	-0.0000
	(0.000)	(0.000)	(0.006)	(0.004)	(0.003)	(0.002)
Credit Deposit Ratio	0.0030	0.0029	0.0051	0.0191	0.0093	0.0067
	(0.004)	(0.004)	(0.052)	(0.047)	(0.019)	(0.022)
No of Observations	135		110		120	
No of banks	27		22		24	
Sigma_u	0.2937	0.2753	4.9649	4.8301	11.3227	21.7209
Sigma_e	0.8140	0.8349	3.2200	3.1984	13.6007	12.6507
Within=	0.2692		0.2600		0.0315	
Between =	0.3914		0.1359		0.5068	
Overall =	0.3075		0.1673		0.3938	

*** - significant at 1 percent level; ** - significant at 5 percent level; * - significant at 10 percent level

Standard Error in brackets

Buffer Capital

Following the collapse of the Lehman Brothers and the subsequent upheaval across the financial world central banks became more alert in their supervisory roles, Indian commercial banks on the other hand also adopted greater caution in their business. Fortunately, for most Indian banks exposures to toxic debts were limited (as per reports in media). Public sector and private sector banks in India approached this event with increased buffer capital. This part of the study is limited to the public and private sector banks only.

Three key variables return on assets, credit deposit ratio and net nonperforming assets were regressed with OLS model on the buffer capital for the two years 2009-2010. ROA reflects profitability, and CDR indicates credit creation or the proportion of loan-assets created by banks from the deposits received. The net non-performing assets are the non income yielding assets in the banks' asset portfolio exhibiting the potential loss that could be incurred by the bank. The data is taken separately year wise and ownership wise and then pooled with a dummy variable for each type of ownership. Not surprisingly, the ROA is positively related to buffer capital for all the models (Table 7) while the CDR is negatively related to buffer capital, higher earnings enables the banks to make additional provision , but larger CDR raises loan risk and is therefore inversely influencing the buffer capital.

By May 2009 the outstanding CDR of scheduled commercial banks had dropped below 70 per cent – the first time in almost three years.⁹ The NNPA reflects the banks' weakness and hence the need for higher capital is positively related to buffer capital, indicating greater cautiousness. The ROA is consistently positive in both periods. We observe that banks adjust their capital and NNPA to comply with regulatory capital. Not surprisingly these variables are not significant for public sector banks as they have been traditionally prudent and supported by the government.

⁹ Hindu Business Line May 8 2009 reports that the outstanding credit-deposit ratio (CDR) of scheduled commercial banks has dropped below 70 per cent – the first time in almost three years. As on May 8, 2009, the CDR amounted to 69.63 per cent. This is the lowest since the 69.89 per cent level that was recorded on May 26, 2006. A clearer view of banks' averseness to lend, however, is obtained when one looks at incremental magnitudes since October 10 – when the outstanding CDR touched an all-time-high of 75.16 per cent and also around the time when the effects of the global credit crunch became pronounced.

Table 7: Factors Influencing Buffer Capital in OLS

Variables	Public	Private	Public	Private	Public & Private with Dummy		Public & Private without Dummy	
	2009		2010		2009	2010	2009	2010
	ROA	0.0157 (0.009)	0.2324*** (0.044)	0.0024 (0.009)	0.1740*** (0.043)	0.1223*** (0.035)	0.1076*** (0.032)	0.1411*** (0.032)
NNPA	0.0034 (0.007)	0.1340*** (0.039)	-0.0035 (0.007)	0.0740 (0.027)	0.0384 (0.023)	0.014 (0.201)	0.0461* (0.023)	0.0166 (0.020)
CDR	0.0000 (0.0000)	-0.0050** (0.002)	0.0006 (0.000)	-0.0032* (0.001)	-0.0007 (0.001)	-0.0021 (0.001)	-0.0006 (0.001)	-0.0023** (0.001)
Dummy					0.0301 (0.024)	0.0148 (0.022)		
R-square	0.3332	0.8267	0.1504	0.7627	0.5557	0.6346	0.5128	0.6249

*** - significant at 1 percent level; ** - significant at 5 percent level; * significant at 10 percent level Standard Error in brackets

CONCLUSION

The Basel Accord or the mandatory maintenance of a minimum capital against deterioration of asset quality is a watershed in the history of central banking. It has special significance because of its validity across borders for all banks from countries who are signatories. The Accord's significance can hardly be overstated, yet the banks in the western hemisphere managed to cause such upheavals from which the world is yet to recover. The regulatory arbitrage that was spawned post Basel Accord is beyond the scope of this paper, but the banks in India who complied have fared well. Yet the literature on Basel I and Basel II has focused on the macroeconomic implications of this vital agreement among central bankers, and has largely ignored the microeconomic perspective. This paper examines how commercial banks operating in India within different ownership have complied with the capital risk adjusted ratio. To examine the strategy banks have adopted to comply with the regulatory capital while balancing their profitability and prudential restrictions, this paper implements a random effects panel data model with balanced panel data. As Basel I focused on credit risk, the econometric analysis for the commercial banks of the three different types is undertaken for credit deposit ratio, return on assets, credit risk

weighted assets and capital with CRAR as the dependent variable. It is interesting to observe in the case of public sector banks compliance was influenced by the profitability criteria ROA, business expansion criteria CDR and the risk elements credit risk weighted assets and capital. The private sector and foreign banks on the other hand appear to be guided more by the risk in their loan portfolio which appears intuitive.

The CRAR is a censored variable, since no bank is permitted to have a CRAR below 8 percent (9 percent in India), in the Basel II regime. A semi-parametric censored regression for panel data is applied. In this phase operational factors are incorporated because Basel II includes operational risk, the results change quite dramatically. The business per employee stands out as the factor influencing all the three types of banks in both models; that is uncensored random effect and Tobit regression. Public sector banks' capital regulatory compliance is influenced by the number of branches as they have wide outreach. An implication from this exercise is that business per employee is negatively related to CRAR, and banks across different spectrum may need to focus on their human resource policy. The profit per employee is significant for public and foreign banks. This reaffirms the point further. A key factor in Basel II is operational risk; training and skill development a factor that may work towards mitigating risk and enhance regulatory compliance considerably. Banks need to focus more on elevating their human resource management policies and at the same time upgrade the information technology. These steps will enable the banks to comply with the global standards of capital regulation more effectively.

The policy of holding buffer capital as an extra precautionary measure indicates a counter cyclical focus by banks. However, that is at the cost of the size of business. Banks need to grow sufficiently to balance the pressure of additional buffer capital. Retaining higher capital is costly, but for some countries like India and Indonesia where bank lending is growing at 20-25 percent per annum banks can fund additional

capital without raising equity. The ongoing global financial crisis has ushered in the new Basel III, for which the preliminary guidelines were announced by the BCBS in September 2011. Whereas the Basel I and II had focused on the asset side of the balance sheet, the Basel III focuses on liability, and prescribes higher minimum capital ratio. Tier 1 capital is raised to 7 percent from existing 2 percent. The changes envisaged centre on higher buffer capital and countercyclical capital this aims to address the criticism of the Basel II being procyclic. Yet there are myriad sources of risk that are waiting to be identified. At the same time financial innovation and new technology provide innumerable challenges to financial sector regulators in the new millennium.

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