Prompt Corrective Action, Bank Capital and Risk: An Empirical Analysis of Public Sector Banks

Chapter III

Introduction

Managing a banking crisis is one of the most difficult tasks confronting a policy maker. Often measures need to be decided on quickly, sometimes in the eye of a crisis. Almost inevitably, decisions have to be guided by imperfect information. This is an intrinsic problem because the very business of banking is built on the possession of information not available to others. Because banks lie at the hub of modern economies, targeted policies can have far-reaching implications. The global dimensions also assume importance currently, when so many emerging market economies are simultaneously grappling with banking crises.

III.1 Rules versus Discretion

Therefore, if banks are not to be allowed to fail, it is essential that corrective action be taken while the bank still has a manageable cushion of capital. This is particularly crucial since low or negative capital often tempt bank managers to try desperate remedies such as offering high rates of interest on deposits to fund credit to high-risk borrowers or "gambling for resurrection", to use a phrase coined by Dewartipont and Tirole (1994). Even the Basle Committee has strongly endorsed the need for supervisors to take timely corrective action when banks fail to meet capital adequacy ratios or other prudential requirements. Yet, one of the commonest complaints about bank supervisors is that they intervene too late in problem banks.[i] This has led many observers to suggest that interventions should be guided by rules rather than be left to the discretion of the supervisors. A recent study by Jones and King (1995) applies the definition of Basle Accord to a confidential data set of US banks in the 'eighties and finds that a number of institutions which would have exceeded the 8 per cent hurdle would, in fact, with a high probability, have been insolvent within two years.

The case for automatic rules rests on the premise that they lead to prompter action, which is important as the costs of restructuring a bank are likely to rise, the longer the action is delayed. Several arguments can be advanced to support this case. Forbearance, or expecting that the problem will solve itself, is always a tempting option, especially given the usual lack of precise information about the extent of a bank's problem. If a large number of banks are simultaneously in trouble, political economy considerations might prevent contemplating the short-run costs of radical action. Alternately, supervisors may fear that intervention in one bank could spark a run on others, as occurred in Indonesia in November 1997 (Sheng, 1996). As a consequence, rule-based methods of intervention, especially if enshrined in legislation, may be particularly helpful for supervisors to take decisions based on established procedures and principles.

The best-known examples of rules are the compulsory quantitative triggers (in relation to bank capital levels) for action by the supervisors set in the 1991 US Federal Deposit Insurance Corporation Improvement Act (FDICIA) (Table 3.1). Studies by Shrieves and Dahl (1992), and more recently, Peek and Rosengren (1997) find that excessive risk-taking among undercapitalised banks is, at least, partially constrained by regulation, while Gilbert (1992) finds that the length of time a bank is undercapitalised prior to its failure does not affect its ultimate resolution cost.

Table 3.1: United States FDICIA System

Capital Level Trigger (per cent)	Mandatory and Discretionary Actions
10>CAR>8	Cannot make any capital distribution or payments that would leave the institution undercapitalised.
5>CORE>4	
CAR<8 or	Must submit a restoration plan; asset growth restricted; approval required for new acquisitions, branching and new lines of business.
CORE<4	
CAR<6 or	Must increase capital; restrictions on deposits' interest rates and asset growth; may be required to elect new Board of Directors.
CORE<3	
CAR<4 or	Must be placed on conservatorship or receivership within 90 days; approval of the FDIC for: entering into material transactions other than usual core business, extending credit for any highly leveraged transaction; changes in accounting methods; paying excessive compensation or bonuses.
CORE<2	

CAR: Capital Adequacy Ratio
CORE: Core Capital

Similar rules have been adopted in some industrial economies and in a number of emerging economies (Table 3.2). Once capital falls below 8-9 per cent, such rules typically require banks to draw up plans for recapitalisation, limit or prohibit dividends and impose limits on risk-taking. Restrictions often involve limiting new acquisitions or restricting interest rates on deposits. When capital falls to very low levels, the authorities can force mergers or acquisitions, or proceed to closure. Such rules, however, would be rarely applied to a large bank-in such an eventuality, some observers believe that greater discretion would inevitably condition supervisors' responses (the "too-big-to-fail" argument).

Table 3.2: Structured and Discretionary Intervention Frameworks

Country	Capital Level Trigger (per cent)	Mandatory & Discretionary Actions
Structured Intervention		
Argentina	CAR<11.5	Bank is fined, must submit a recapitalisation plan, limit deposit raising, pay no dividends or bonuses and is restricted in branch opening.
Chile	CAR<8 or CORE<3	Bank has to raise new capital; if unable, supervisors prohibit extension of new credit and restrict the acquisition of securities (those issued by Central Bank).
	CAR<5 or CORE<2	Bank has to prepare credit restructuring agreement (expanding debt maturity, capitalisation of credits and sub-ordinated bonds, forgiveness of debt). If the agreement is not approved by the supervisors (first) and bank creditors (second), the bank is declared under liquidation.
Colombia	CAR<9	Recapitalisation plan agreement with supervisors to be carried out in one year. Discretionary application of sanctions.
	CAR<50% of tier-I	Supervisors take immediate possession after approval of Finance Ministry.
Czech Republic	CAR<5.3[1]	Plan to increase capital; restrictions on acquisition of new assets, interest rate on deposits, credit to related parties.
	CAR<2.6[1]	Revoke banking license.
Korea	8>CAR>6	Issue management improvement recommendations, including rationalisation of branch management and restrictions on investments, new business areas and dividends.
	CAR<6	Issue management improvement measures, including freezing new capital participation,

		disposal of subsidiaries, change management, draw up plan for merger, take-over by a third party.
	Distressed Institution	Issue management improvement order, including cancellation of stocks, suspension of Board of Directors; merger, take-over or request the Finance Ministry to revoke the banking license.
Discretionary Intervention		
Brazil	Illiquidity, insolvency, large losses due to bad management, serious violation of laws and regulations	Intervention: suspension of normal activities, removal of Directors. After 6 months, either return to normal activities or extra-judicial liquidation or bankruptcy; Temporary special management regime. The authority can authorise the merger, take-over of transfer of stock-holding control or decree extra-judicial liquidation. Extra-judicial liquidation: cancellation of office of the managers and Audit Committee members.
Hong Kong	CAR falls below the minimum (in practice, HKMA sets an informal 'trigger' ratio above the minimum capital ratio).	HKMA may take control of the bank. It will first discuss remedial action or give directions (e.g., to stop taking deposits). It can appoint an Adviser or Manager.
Hungary	Minor infringement	Higher reporting obligations; negotiate plan of action
	More serious infringement	On-site examination; revise internal regulation; may prohibit payment of dividend or earnings to managers supervisory commissioners on site.
	CAR<4 (for 90 days)	Prescribe sale of certain assets. Proscribe attainment of certain CAR.
Indonesia	Earlier, bank Indonesia would put pressure on banks whose CAR fell below 8 per cent. Presently, banks with CAR below 4 per cent may participate in re-capitalisation programme.	Banks required to implement plan to raise capital; may replace management.
Mexico	Irregular operations affecting the stability or solvency of the institution or the public interest.	Can declare receivership-intervention.
Peru	Non-compliance with a set of restrictions (liquidity, forex exposure, etc.) Suspension of payments or non-compliance with recovery plan; or loss of half risk-based capital.	Regular inspection of the bank and recovery plan, possibly through a Board of Creditors. Intervention by authorities for one day, then bankruptcy procedure.
Poland	Imminent loss (or danger of insolvency)	Bank has one month to draft acceptable programme of action, implemented under Curator's supervision; extraordinary meeting of shareholders, possible replacement of management, take-over or liquidation, if situation does not improve in 6 months.
Singapore	Banks unable to meet obligations, doing business detrimental to depositors or creditors, affecting the public interest or not complying with (minimum) 12 per cent CAR.	Monetary Authority of Singapore (MAS) could restrict or suspend operations, after ring-fencing banks and instructing them to take necessary action.
Venezuela	CAR<8	If recapitalisation plan fails, new lending and dividends can be prohibited, directors removed and supervisors appointed.

1. Based on current minimum CAR of 8 per cent.
2. CAR: Capital Adequacy Ratio.

Source: Hawkins and Turner (1999)

After examining country experiences, one can surmise that supervisory authorities in different countries incorporate a blend of discretion and rules. For example, the less rigid criteria under some discretionary regimes are accompanied by some quantitative 'triggers', with the actions taken often similar to those in a rule-based system. Also, some of the rule-based systems are yet to be tested in a banking crisis: some more discretion may have to be used in practice. Finally, there is also the broader issue of what can be done to strengthen the political incentives to implement banking reforms. A banking crisis itself should lead to the adoption of an improved incentive or supervisory framework. Caprio and Klingebiel (1996) while detailing a number of success cases (Chile, Argentina and Hong Kong), observe that out of the 64 cases of bank restructuring, such success stories were few and far between.[ii]

In view of the above considerations, various actions are being contemplated by the regulators to detect early warning signals of crisis. One such measure which has been widely discussed in the literature has been Prompt Corrective Action (PCA). The major focus of PCA is to detect incipient signals of distress and promptly undertake remedial measures. In developed countries, the major focus of PCA is on capital ratios and this is not without justification. As Dahl and Spivey (1995) have observed, PCA (a) enables to reduce the losses for deposit insurers by discouraging healthy banks from becoming undercapitalised, and, (b) enables to reduce the number of failures among undercapitalised banks.

While the adoption and implementation of PCA focused attention on bank capital ratios, two issues merit further attention. First, did PCA cause banks to increase their capital ratios, or is the increase attributable to some other factors such as bank income levels in the early 1990s? Second, a number of theoretical and empirical studies suggest that increasingly stringent capital standards in general, and PCA in particular, may have the unintended effect of causing banks to increasing their level of portfolio risk.

III.2 Prompt Corrective Action: The Indian Experience

The world-wide phenomenon of building a safe and sound banking system, backed by a stronger supervisory regime, in accordance with one of the *Core Principles of Banking Supervision*[iii], which mandates that banking supervisors must have at their disposal adequate supervisory measures, backed by legal sanctions to bring about timely corrective action, has prompted the supervisory authorities in India to consider the possibility of introducing a system of Prompt Corrective Action (PCA) in India. Such a response has been dictated by two major considerations. The first is the responsibility of bank supervisors to identify problem banks. The other is to monitor the behaviour of troubled banks in an attempt to prevent failure or to limit losses. More so, if a bank is not allowed to fail, it is essential that corrective action be taken well in time.

In view of the above considerations, a system of PCA with various trigger points and mandatory and discretionary responses by the supervisors, is envisaged for the banking system in India. In contrast to the framework prevalent in other countries (Table 3.2 above), which focuses on a single trigger point (i.e., CRAR), a broader PCA regime is envisaged for India so as to delineate rule-based actions not only for shortfall in capital, but also for other indicators of deficiency "so that a seamless paradigm for corrective actions can be put in place for major deficiencies in bank functioning". Accordingly, in addition to capital adequacy (CRAR), two additional indicators, *viz*., Net NPA and Return on Assets, as proxies for asset quality and profitability, respectively, have been included under the broader PCA regime. Trigger points have been set under each of the three parameters, taking into the practicality of implementation of certain measures in the Indian context[iv].

Once a bank's performance falls below certain thresholds which activates the trigger point, a certain set of mandatory actions addressing critical areas of the bank's weakness will follow. In addition to the above, supervisors can initiate certain discretionary actions, if need be, to pre-empt any deterioration in the soundness of banks.

In the light of the aforesaid discussion and keeping in view the broad PCA regime envisaged by the Reserve Bank, the present exercise examines the feasibility of a PCA for the Indian public sector banks using capital as the trigger. To recapitulate a bit, a capital to risk-weighted assets system was introduced for banks in India since April 1992, largely in conformity with international standards, under which banks were required to achieve a 8 per cent capital to risk-assets ratio.

III.3 The Methodology

In order to achieve our objective, we use a simultaneous equation model along the lines developed by Shrieves and Dahl (1992), and later modified by Jacques and Nigro (1997) to examine the possible consequences of PCA on bank capital and portfolio risk levels. However, unlike prior studies on this topic, by using a simultaneous equation model, the endogeneity of both bank capital and risk is explicitly recognised in our approach, and as such, the impact of possible changes in bank capital ratios on risk in a bank's portfolio can be examined. Table 3.3 summarises the major papers that examine this issue.

III.4 The Prompt Corrective Action Standards

For purposes of tractability, we classify banks into two zones, zone 1 and zone 2, depending on how well they meet the capital requirements, as detailed below. Banks falling in Zone 1 are classified into two capital categories: adequately capitalised and well capitalised. Zone 2 is that of undercapitalised banks. If a bank falls into one of the undercapitalised categories, mandatory restrictions are placed on its activities that become increasingly severe as the bank's capital ratios deteriorate. For example, undercapitalised banks are subject to restrictions that include the need to submit and implement a capital restoration plan, limits on asset growth and restrictions on new lines of business, while significantly undercapitalised banks face further restrictions on interest rates paid on deposits, limits on transactions with

Table 3.3: Prompt Corrective Action and Capital Ratios

Author/Year	Country/ Period	Issue
Gilbert, R.A. (1991)	US banks 1985-89	Constraints on Asset Growth and dividend payment of undercapitalised banks
Gilbert, R.A. (1992)	US banks 1985-90	Effect of PCA legislation on Bank Insurance Fund losses resulting from commercial bank failure
Dahl and Spivey (1995)	US banks 1980-88	Likelihood and timing of bank recovery from undercapitalisation
Jones and King (1995)	US banks 1984-89	Efficacy of PCA
Wall and Peterson (1995)	US banks 1989-92	Basle Accord
Jacques and Nigro (1997)	US banks 1990-91	Impact of risk-based standards on capital and risk
Peek and Rosengren (1997)	New England banks 1989-92	Supervisory Intervention under PCA
Aggarwal and Jacques (1998)	US banks 1991-93	PCA and bank capital
Jordan (1998)	New England banks 1987-96	Crisis resolution policies

affiliates and affiliated banks and others. Finally, once a bank is critically undercapitalised, it faces not only more stringent restrictions on activities, but also the appointment of a conserver (receiver) within ninety days of becoming critically undercapitalised[v].

It needs to be recognised that the ratio of 8.0 percent for the Capital to Risk Asset Ratio (CRAR) is recommended as a minimum ratio and there is a view that higher capital adequacy ratio may be necessary in select cases and in select markets. Therefore, in our judgement, while banks with CRAR of 8.0 percent may be considered as sufficiently capitalised, banks with a CRAR of 10.0 percent or above and tier–I capital not below 6 per cent may be considered as adequately capitalised. The FDIC Improvement Act of 1991 in the US considered banks with risk-weighted capital of 10.0 percent and a tier-I capital of 6.0 percent and above as well capitalised, while adequately capitalised

institutions have minimum thresholds of 8 per cent and 4 per cent, respectively. Banks that do not meet the BIS capital adequacy criteria and have risk weighted capital less than 8 per cent and tier-I capital below 4 per cent can be considered as undercapitalised. Banks with even lower CRAR may be classified as "significantly undercapitalised". Although there is not much to distinguish between significantly undercapitalised and critically undercapitalised banks, we prefer to make a distinction between the two.[vi] Table 3.4 summarizes the information.

Table 3.4: Categorisation of Banks According to Capital Status

Capital Status	Risk weighted capital (per cent)	Tier-I capital (per cent)	Leverage ratio (per cent)
ZONE 1			
Absolutely Capitalised	10 and above	6 and above	5 and above
Well Capitalised	[8, 10)	[4, 6)	[4,5)
ZONE II			
Under Capitalised	[6, 8)	Less than 4%	Less than 4%
Significantly Undercapitalised	[4, 6)	Less than 3 %	Less than 3%
Critically Undercapitalised	Less than 4	Tangible equity less than or equal to 2 per cent	

Table 3.5 shows the number of public sector banks by PCA zone over the period 1997 to 1999. The choice of the period is dictated by two considerations. The first was the availability of data for the same. More importantly however, since the introduction of prudential norms pertaining to capital adequacy standards, in 1992-93, banks were initially in a state of flux, adjusting their balance sheets in response to the new guidelines. Consequent upon the introduction of off-site returns data in 1997, it is now possible to check the feasibility of implementation of a framework for PCA in the Indian context.

Table 3.5: Categorisation of PSBs according to capital status: 1996-99

PCA Zone	1996	1997	1998	1999
Zone 1				
Absolutely Capitalised	6	16	23	23
Well Capitalised	13	9	3	3
Zone II				
Under Capitalised	1	0		
Significantly Undercapitalised	5	1		
Critically Undercapitalised	2	1	1	1
Total	27	27	27	27

As Table 3.5 reveals, at year-end 1996, 19 public sector banks were classified as absolutely/well capitalised. In 1997, the number increased to 25. By 1998, only one bank was in the undercapitalised category; the capitalised banks, numbering 26, by contrast, accounted for 76 per cent of total assets of SCBs. The figure has remained at 26 for 1999, with these banks accounting for 78 per cent of total assets.

It seems reasonable to assume that the introduction of capital adequacy standards have, in general, been effective in increasing the capital ratios of banks. This position has however, not been without its critics. For one, it has been argued that regulatory capital standards may have led banks to increasing levels of portfolio risk. Research by Koehn and Santomero (1980) and Kim and Santomero (1988) have shown, using the mean variance framework, that regulatory capital standards cause leverage and risk to become substitutes and that as regulators require banks to meet more stringent capital standards, banks respond by choosing assets with greater risk.[v] Thus, increases in minimum capital standards by bank regulators cause banks to increase not only their capital ratios, but also have the unintended effect of causing them to increase their level of risk.

While one primary purpose of early liquidation/closure is to prevent banks from taking increasing levels of risk as they approach insolvency, research by Davies and McManus (1991) demonstrates that early closure may fail to protect the deposit insurance fund from losses because it creates incentives for banks to increase portfolio risk by increasing their holdings of high-risk assets. An even more recent study by Dahl and Spivey (1995) on undercapitalised banks regarding identification of factors that influenced bank recovery to a position of adequate capitalisation notes that (a) there appears to be only a limited capacity for banks to 'correct' positions of undercapitalisation by growth limitations or dividend restrictions and (b) the impact of profitability on recovery is greater, the longer a bank remains undercapitalised. As such, the design of the PCA standards has important implications not only for optimal capital levels, but also for the level of risk, and ultimately, the safety and soundness of the banking system as a whole.

III.5 Model Specification

To examine the possible impact of the PCA standard on bank capital ratios and portfolio risk levels, a simultaneous equation framework is developed, on the lines of Shrieves and Dahl (1992) and is modified to incorporate PCA zones. In their model, observed changes in bank capital ratios and portfolio risk levels are decomposed into two components, a discretionary adjustment and a change caused by an exogenously determined random shock, such that

$$\Delta CAP_{j,t} = \Delta^d CAP_{j,t} + E_{j,t} \quad \textbf{(3.1)}$$

$$\Delta RISK_{j,t} = \Delta^d RISK_{j,t} + U_{j,t} \quad \textbf{(3.2)}$$

where ΔCAP and ΔRISK are observed changes in capital ratios and risk levels for bank j in period t, Δ^dCAP and Δ^dRISK represent discretionary adjustments in capital ratios and risk levels and E and U are exogenous shocks. Recognising that banks may not be able to adjust their desired capital ratios and risk levels instantaneously, the discretionary changes in capital and risk are modeled using a partial adjustment framework. As a result:

$$\Delta CAP_{j,t} = a\,(CAP^*_{j,t} - CAP_{j,t-1}) + E_{j,t} \quad \textbf{(3.3)}$$

$$\Delta RISK_{j,t} = b\,(RISK^*_{j,t} - RISK_{j,t-1}) + U_{j,t} \quad \textbf{(3.4)}$$

Thus, 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. The target capital ratio and risk levels are not observable, but are assumed to depend upon some set of observable variables, including the size of the bank (SIZE), bank's net income to total assets in period (t-1) (TOTINC), changes in portfolio risk ($\Delta RISK_{j,t}$) and capital ratios ($\Delta CAP_{j,t}$), while the exogenous shock that could affect bank capital ratios or risk levels is the regulatory pressure brought about by PCA.

Specifically, SIZE is measured as the natural log of total assets. As noted by Shrieves and Dahl (1992), size may have an impact on a bank's capital ratios and the level of portfolio risk because larger banks have greater access to capital markets. Following Dahl and Shrieves (1990), the ratio of net interest income to total assets in period (t-1), TOTINC, is included to recognise the ability of profitable banks to increase their capital ratios by using retained earnings. In addition, as noted by the partial adjustment model, lagged capital ratios and risk levels are included to measure the fact that banks adjust their capital ratios and risk levels to their target levels over time.

To recognize the possible simultaneous relationship between capital and risk, $\Delta CAP_{j,t}$ and $\Delta RISK_{j,t}$ are included in the risk and capital equations, respectively. Shrieves and Dahl (1992) note that a positive relationship between changes in capital and risk may signify, among other possibilities, the unintended impact of minimum regulatory capital requirements or even managerial risk aversion, while Jacques and Nigro (1997) note that a negative relationship may result because of methodological flaws in the capital standards underlying PCA.[vi] Empirical estimation of the simultaneous equation system requires measures of both bank capital and portfolio risk. Following previous research, portfolio risk is measured in two ways: using the ratio of total risk weighted assets

to total assets (RISK) and gross non-performing loans as percentage of total assets (GNPA)[vii]. Avery and Berger (1991) have shown that RISK correlates with risky behaviour, while other studies (Berger, 1995, Shrieves and Dahl, 1992) using non-performing loans (GNPA).

Since regulatory influence is a cornerstone of the hypotheses involving regulatory costs and minimum capital standards, a binary variable (PCAA) reflecting the degree of regulatory pressure is also included as a determinant of target capital and risk levels. This variable is defined as follows:

PCAA=1, if a bank is adequately/well capitalised; otherwise=0.

These variables allow banks across different PCA zones to respond differently, both in capital ratios and portfolio risk. A priori, banks in undercapitalised group would be expected to have the strongest response because PCA imposes penalties on their activities. Furthermore, adequately/well capitalised banks, PCAA, may increase their capital ratios or reduce their portfolio risk if they perceive a significant penalty for not being considered well capitalised, or if they desire to hold a buffer stock of capital as a cushion against shocks to equity (Wall and Peterson, 1995). Besides being included as a separate variable, PCA is included in an interaction with the lagged capital ratios. The use of this term allows banks in different PCA zones to have different speed of adjustment to their target capital ratios. As such, banks in the undercapitalised PCA zones would be expected to adjust their capital ratios at faster rates than well/adequately capitalised banks. An alternative method of accounting for the 'regulatory effect' is to stratify the sample relative to the regulatory benchmark total capital, tier-I capital and the leverage ratio levels, and estimate the model separately for each subset of banks. This approach has the advantage of allowing all model coefficients to differ across the capital strata, and provides additional insights as to the role of regulatory influence as a determinant of the observed relationship between changes in risk and capital.

Given these variables, equations 3.1 and 3.2 can be written as[viii]:

$$\Delta CAP_{j,t} = m_0 + m_1 SIZE + m_2 TOTINC + m_3 \Delta RISK_{j,t} + m_4 PCAA + (m_5 + m_6 PCAA) CAP_{j,t-1} + m_7 GNPA + x_{j,t} \quad \textbf{(3.5)}$$

$$\Delta RISK_{j,t} = g_0 + g_1 SIZE + g_2 \Delta CAP_{j,t} + g_3 RISK_{j,t-1} + g_4 PCAA + g_5 GNPA + z_{j,t} \quad \textbf{(3.6)}$$

where $\xi_{j,t}$ and $\zeta_{j,t}$ are error terms, and $PCAA*CAP_{j,t-1}$ is the interaction term, which allows a bank's speed of adjustment to be influenced by the PCA zone in which the bank is in[ix].

Since the right hand side of both equations include endogenous variables, simultaneous estimation of equations (3.5) and (3.6) is carried out by two-stage least squares. Under the null hypothesis that changes in risk and capital do not influence one another, the coefficients μ_3, μ_5, γ_2 and λ_2 will not be significantly different from zero.

III.6 Empirical Estimation

It has been stated earlier that data set for the present study spans from 1997:Q1 to 1999:Q4. In this present context, the analysis for a particular year needs to take into account the data for the year as well as those for the previous as well as the subsequent year. In view of the above, the present exercise focuses on 1998 (which uses data for 1997, 1998 and 1999). With greater availability of data, it is possible to carry out the analysis for other years as well. As noted earlier, a significant decline occurred in the number of all types of undercapitalised institutions post introduction of capital adequacy norms. Alternately, in studying the impact of risk based capital standards, Haubrich and Watchel (1993) note that because the composition of bank portfolios can be changed quickly, and because banks appear to have experienced a period of learning, the impact appears more clearly after the implementation date. The same argument may be true for PCA, although learning by banks may be less significant with regard to PCA because all of the capital ratios defined in the PCA standards had been in effect since at least December 1990.[x]

III.7 Results and Discussion

The study examines 27 public sector banks using year-end data for 1998. In carrying out the above exercise, the paper uses confidential supervisory data for Indian public sector banks to address some of the issues addressed above. The non-performing assets and capital adequacy are obtained from the Report on Trend and Progress of Banking in India (various years). The procedure used for estimation is the two-stage least squares method, which recognises the endogeneity of both bank capital ratios and risk levels, and unlike ordinary least squares, provide consistent parameter estimates.

The results of estimating the simultaneous equation system is presented in Tables 3.6 and 3.7. Table 3.6 uses the ratio of risk-weighted assets to total assets to measure portfolio risk (RISK), while table 3.7 measures risk using the ratio of gross non-performing loans to total assets (GNPA).

Table 3.6: Two Stage Least Squares Estimates of Prompt Corrective Action (PCA) on Risk (RWA) and Capital

Variable/Year	1998	
	∆CAPITAL	∆RISK
Constant	18.64 (3.44)*	0.06 (0.64)
Size	-0.75 (-1.54)	-0.001 (-0.11)
Total Income	1.11 (0.04)	0.08 (0.16)
Capital (t-1)	-0.72 (-7.73)*	--
Risk (t-1)	--	-0.09 (-1.15)
∆ Capital	--	-0.004 (-1.47)
∆ Risk	-66.73 (-4.2)*	--
PCAA	-8.75 (-2.24)#	0.005 (0.29)
PCAA*Capital(t-1)	0.87 (2.67)*	--
R^2	0.87	0.54

Figures in brackets indicate t-ratios.
* significant at 1 %
# significant at 10 %

Table 3.7: Two Stage Least Squares Estimates of Prompt Corrective Action (PCA) on Risk (GNPA) and Capital

Variable/Year	1998	
	∆CAPITAL	GNPA
Constant	11.50 (2.07)#	3.79 (0.82)
Size	-0.57 (-1.21)	-0.16 (-0.33)
Total Income	-36.01 (-1.23)	46.21 (2.17)#
Capital (t-1)	-0.61 (-5.58)*	--
Risk (t-1)	--	10.83 (3.49)*
∆ Capital	--	0.39

		(4.36)*
GNPA	0.19 (0.75)	--
PCAA	-2.26 (-0.65)	-2.15 (-2.53)*
PCAA*Capital(t-1)	0.35 (1.21)	--
R^2	0.85	0.90

Figures in brackets indicate t-ratios
* significant at 1 %
# significant at 10 %

All the variables used to explain variations in capital ratios and risk levels are statistically significant in some of the equations. Bank size (SIZE) had a negative and significant impact on capital ratios. the total income (TOTINC) variable, had a positive and significant impact on capital ratios, suggesting that one reason for increasing capital ratios by banks in 1998 was the increase in their income levels. The parameter estimate on lagged risk ($RISK_{j,t-1}$) in the risk equation was -0.09, while the parameter estimate on lagged capital ($CAP_{j,t-1}$) in the capital equation was 0.72. These results imply that in 1998, banks adjusted their capital ratios significantly but their risk positions relatively slowly to the respective target levels. Finally, the results of table 3.6 and 3.7 suggest that changes in capital and risk are negatively related, which is consistent with the recent work of Jacques and Nigro (1997)[i]. This result is not surprising because an undercapitalised bank can meet the risk-based requirement by raising capital, reducing portfolio risk or both, while a bank with a ratio above the risk-based minimum may decrease capital or increase risk.

III.8 Impact of PCA on Capital

In examining the impact of PCA, the results of Table 3.6 and Table 3.7 provide some interesting insights. In the capital equation of each table, the impact of the regulatory pressure variable are captured by an intercept term PCAA and a speed of adjustment term $PCAA*CAP_{t-1}$. For adequately and well-capitalised banks (PCAA), regulatory pressure had a negative impact on capital ratios in 1998, with a parameter estimate of –8.75. Furthermore, the coefficient on the speed of adjustment term for capitalised banks is statistically significant. These results, taken together, suggests that banks classified as adequately capitalised decrease their capital ratios and the speed with which they adjust their capital ratios in response to PCA. Furthermore, this result is consistent with the hypothesis that banks held capital above the regulatory minimum as a buffer against shocks that could cause their capital ratios to fall below the adequately capitalised thresholds.

III.9 Impact of PCA on Risk

With respect to portfolio risk, the results of Table 3.6 and 3.7 provide some evidence that the regulatory pressure brought about by PCA led both adequately capitalised to decrease their level of portfolio risk. The result with respect to risk in Table 3.6 is significant, when portfolio risk is measured using RWA, the results suggests that adequately capitalised banks (PCAA) significantly decreased their portfolio risk in 1998, when risk is measured using GNPA.

III.10 Concluding Observations

The purpose of this exercise has been to investigate the impact of PCA standards on bank capital ratios and portfolio risk. The results suggest that in 1998, capitalised banks and undercapitalised banks increased their capital ratios and the rate at which they adjusted the same in response to the PCA standards. In addition, the study finds evidence that PCA

standards led to significant reductions in portfolio risk. While the results do not guarantee that bank capital levels are adequate relative to the risk in bank portfolios, they suggests a framework for operationalising the concept of PCA in the Indian context.

---

i Jordan (1998) suggests that the banking crisis in New England (defined as the First District of the Federal Reserve System) was resolved at far less cost because action was taken quickly and strict regulatory oversight prevented bankers increasing the riskiness of their operations.

ii In a detailed examination of 29 systemic banking crises, Caprio and Klingebiel (1996) concluded that political factors (government interference and connected lending) were important in at least one-third of the crises, volatility factors (primarily, terms-of-trade deterioration and recession) in one-half to two-thirds of them and deficient bank management and poor regulation and supervision-broadly defined-in two-third to four-fifths of all cases.

iii Principle 22 of the *Core Principles* dealing with Supervisory Intervention observes that "banking supervisors must have at their disposal adequate supervisory measures to bring about timely corrective action when banks fail to meet prudential requirements such as minimum capital adequacy ratios when there are regulatory violations or where depositors are threatened in any other way. In extreme circumstances this should include the ability to revoke the banking licence or recommend its revocation".

iv The trigger points are as under: for CRAR, three trigger points have been proposed-CRAR of greater than or equal to 6 per cent, but less than 9 per cent, greater than or equal to 3 per cent but less than 6 per cent and less than 3 per cent. For Net NPAs, two trigger points have been proposed-greater than or equal to 10 per cent but less than 15 per cent and greater than 15 per cent. For ROA, the trigger point has been set at less than 0.25.

v The mandatory actions will be directed against those areas of the banks' weakness, such as inadequacy of capital funds vis-à-vis risk weighted assets, high level of non-performing assets or a low level of operating income. The mandatory actions are in the nature of restriction on expansion of risk-weighted assets, submission and implementation of capital restoration plan, prior approval of the Reserve Bank for opening new branches and new lines of business, paying off costly deposits and certificate of deposits, pruning of overheads, special drive to reduce stock of NPAs, review of loan policy, *etc* The discretionary actions will be at the discretion of the Reserve Bank depending on the profile of each bank.

vi Note that the Leverage Ratio is the ratio of tier-I capital to total assets. In the present framework, we use the following transformation to arrive at this ratio

vii LEV=(Tier-I capital/Total Assets)=(Tier-I Ratio)*(Total Risk-weighted Assets/Total Assets).

viii The mean-variance framework has been criticized by some because it fails to incorporate the effects of deposit insurance (See, for instance, Keeley and Furlong, 1990).

ix Shrieves and Dahl (1992) note that a positive relationship between changes in capital ratios and portfolio risk may also occur because of regulatory costs, bankruptcy cost avoidance and managerial risk aversion.

x Loans made in a given year will not be recognised as non-performing until a future period, we use non-performing loans in the following year, although in the Indian case it would be more than a year. Thus, GNPA variable is the ratio of gross non-performing loans to total assets for September 1999.

xi Using GNPA as the other explained variable, we also estimate equation (4') defined as

xii $$GNPA_{j,t} = l_0 + l_1 SIZE + l_2 \Delta CAP_{j,t} + l_3 GNPA_{j,t-1} + l_4 PCAA + x_{j,t} \qquad (3.6')$$

xiii The equations have been checked for simultaneity bias.

xiv A word of caution is necessary because the analysis may be complicated by other factors present during this time period, such as the predominance of public sector ownership of banks, directed credit lending and accounting norms.

xv. The results of Jacques and Nigro (1997) are for the year 1990-91.