

Non-Performing Loans and Terms of Credit of Public Sector Banks in India: An Empirical Assessment

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This paper explores an empirical approach to the analysis of commercial banks' non-performing loans (NPLs) in the Indian context. The empirical analysis evaluates as to how banks' non-performing loans are influenced by three major sets of economic and financial factors, *i.e.*, terms of credit, bank size induced risk preferences and macroeconomic shocks. The empirical results from panel regression models suggest that terms of credit variables have significant effect on the banks' non-performing loans in the presence of bank size induced risk preferences and macroeconomic shocks. Moreover, alternative measures of bank size could give rise to differential impact on bank's non-performing loans. In regard to terms of credit variables, changes in the cost of credit in terms of expectation of higher interest rate induce rise in NPAs. On the other hand, factors like horizon of maturity of credit, better credit culture, favorable macroeconomic and business conditions lead to lowering of NPAs. Business cycle may have differential implications adducing to differential response of borrowers and lenders.

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Introduction

Financial stability is considered as *sine qua non* of sustained and rapid economic progress. Among various indicators of financial stability, banks' non-performing loan assumes critical importance since it reflects on the asset quality, credit risk and efficiency in the allocation of resources to productive sectors. A common perspective is that the problem of banks' non-performing loans is ascribed to political, economic, social, technological, legal and environmental

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(PESTLE) factors across countries (2003, Bhide, *et.al.*, 2002, Das and Ghosh). During the last decade, the PESTLE framework has undergone significant changes, largely, due to structural transformation of emerging economies, including India, amidst reform of financial sector, economic integration induced by rapid increase in the pace of globalisation and advances in information technology. Moreover, Government intervention in the credit market has eased considerably. Advances in technology have facilitated rapid exchange of information across markets, creation of newer financial products, and reduction in transaction costs, thus, contributing to enhanced operational efficiency of banks and financial institutions. The institutional infrastructure has been strengthened in various ways. Countries have adopted international best practices pertaining to prudential regulation and supervision. In the sphere of legal environment, several measures have been undertaken in the areas of debt recovery, securitisation and asset reconstruction, resolution of defaults and non-performing loans, besides changes and amendments to the archaic laws pertaining to banking and financial sector. Overall, these developments have led to structural change in the financial sector, which has created conducive environment for market mechanism, in general, and economic factors, in particular, for playing a critical role in influencing the portfolios of banks and financial institutions.

It is in this context that this study has undertaken an empirical analysis for evaluating the impact of economic and financial factors on banks' non-performing loans. The distinguishing feature of the study is that it provides a framework for analysis of underlying behaviour of borrowers' in terms of their loan repayments in response to lending terms of banks and other macroeconomic indicators. The study is organised into four sections. Section I briefly reviews the extant literature focusing on the proximate determinants of non-performing loans (NPLs) in the light of cross-country evidences. Section II presents stylised facts about Non-Performing Assets (NPAs) and terms of credit variables. Section III postulates a theoretical analysis of the problem of NPL in the Indian context, which provides an underlying framework for the empirical analysis in Section IV. Section V concludes with some policy implications.

Section I

Review of Literature

In the banking literature, the problem of NPLs has been revisited in several theoretical and empirical studies. A synoptic review of the literature brings to the fore insights into the determinants of NPL across countries. A considered view is that banks' lending policy could have crucial influence on non-performing loans (Reddy, 2004). Reddy (2004) critically examined various issues pertaining to terms of credit of Indian banks. In this context, it was viewed that 'the element of power has no bearing on the illegal activity. A default is not entirely an irrational decision. Rather a defaulter takes into account probabilistic assessment of various costs and benefits of his decision'. Mohan (2003)¹ conceptualised 'lazy banking' while critically reflecting on banks' investment portfolio and lending policy. In a study of institutional finance structure and implications for industrial growth, Mohan (2004) emphasised on key lending terms of credit, such as maturity and interest-terms of loans to corporate sector. The Indian viewpoint alluding to the concepts of 'credit culture' owing to Reddy (2004) and 'lazy banking' owing to Mohan (2003a) has an international perspective since several studies in the banking literature agree that banks' lending policy is a major driver of non-performing loans (McGoven, 1993, Christine 1995, Sergio, 1996, Bloem and Gorters, 2001).

In the seminal study on 'credit policy, systems, and culture', Reddy (2004) raised various critical issues pertaining to credit delivery mechanism of the Indian banking sector. The study focused on the terms of credit such as interest rate charged to various productive activities and borrowers, the approach to risk management, and portfolio management in general. There are three pillars on which India's credit system was based in the past; fixing of prices of credit or interest rate as well as quantum of credit linked with purpose; insisting on collateral; and prescribing the end-use of credit. Interest rate prescription and fixing quantum has, however, been significantly reduced in the recent period. The study also highlighted the issues in security-based or collateralised lending, which need careful

examination in the context of growing services sector. Given the fungibility of resources, multiple sources of flow of resources, as well as application of funds, the relevance and feasibility of end-use restrictions on credit need a critical review. The link between formal and informal sectors shows that significant divergence in lending terms between the two sectors still persists, despite the fact that the interest rate in informal markets is far higher than that of the formal sectors- the banking sector. The convergence between formal and informal sectors could be achieved by pushing the supply of credit in the formal sector following a supply leading approach to reduce the price or interest rate. Furthermore, in the context of NPAs on account of priority sector lending, it was pointed out that the statistics may or may not confirm this. There may be only a marginal difference in the NPAs of banks' lending to priority sector and the banks lending to private corporate sector. Against this background, the study suggested that given the deficiencies in these areas, it is imperative that banks need to be guided by fairness based on economic and financial decisions rather than system of conventions, if reform has to serve the meaningful purpose. Experience shows that policies of liberalisation, deregulation and enabling environment of comfortable liquidity at a reasonable price do not automatically translate themselves into enhanced credit flow.

Although public sector banks have recorded improvements in profitability, efficiency (in terms of intermediation costs) and asset quality in the 1990s, they continue to have higher interest rate spreads but at the same time earn lower rates of return, reflecting higher operating costs (Mohan, 2004). Consequently, asset quality is weaker so that loan loss provisions continue to be higher. This suggests that, whereas, there is greater scope for enhancing the asset quality of banks, in general, public sector banks, in particular, need to reduce the operating costs further. The tenure of funds provided by banks either as loans or investments depends critically on the overall asset-liability position. An inherent difficulty in this regard is that since deposit liabilities of banks often tend to be of relatively shorter maturity, long-term lending could induce the problem of asset-liability mismatches.

The maturity profile of commercial bank deposits shows that less than one fifth is of a tenor of more than three years. On the asset side, nearly 40 per cent has already been invested in assets of over three year maturity. Banks also have some capacity to invest in longer term assets, but this capacity will remain highly limited until the fiscal deficit remains as high as it is and the Government demand for investment in long dated bonds remains high. Some enhancement of their capacity to invest in infrastructure, industry and agriculture in longer gestation projects can be achieved by allowing a limited recourse to longer term bond issues.

In an another study, Mohan (2003) observed that lending rates of banks have not come down as much as deposit rates and interest rates on Government bonds. While banks have reduced their prime lending rates (PLRs) to some extent and are also extending sub-PLR loans, effective lending rates continue to remain high. This development has adverse systemic implications, especially in a country like India where interest cost as a proportion of sales of corporates are much higher as compared to many emerging economies.

The problem of NPAs is related to several internal and external factors confronting the borrowers (Muniappan, 2002). The internal factors are diversion of funds for expansion/diversification/modernisation, taking up new projects, helping/promoting associate concerns, time/cost overruns during the project implementation stage, business (product, marketing, *etc.*) failure, inefficient management, strained labour relations, inappropriate technology/technical problems, product obsolescence, *etc.*, while external factors are recession, non-payment in other countries, inputs/power shortage, price escalation, accidents and natural calamities. In the Indian context, Rajaraman and Vasishtha (2002) in an empirical study provided an evidence of significant bivariate relationship between an operating inefficiency indicator and the problem loans of public sector banks. In a similar manner, largely from lenders' perspective, Das and Ghosh (2003) empirically examined non-performing loans of India's public sector banks in terms of various indicators such as asset size, credit growth and macroeconomic condition, and operating efficiency indicators.

Sergio (1996) in a study of non-performing loans in Italy found evidence that, an increase in the riskiness of loan assets is rooted in a bank's lending policy adducing to relatively unselective and inadequate assessment of sectoral prospects. Interestingly, this study refuted that business cycle could be a primary reason for banks' NPLs. The study emphasised that increase in bad debts as a consequence of recession alone is not empirically demonstrated. It was viewed that the bank-firm relationship will thus, prove effective not so much because it overcomes informational asymmetry but because it recoups certain canons of appraisal.

In a study of loan loss of US banks, McGoven (1993) argued that 'character' has historically been a paramount factor of credit and a major determinant in the decision to lend money. Banks have suffered loan losses through relaxed lending standards, unguaranteed credits, the influence of the 1980s culture, and the borrowers' perceptions. It was suggested that bankers should make a fairly accurate personality-morale profile assessment of prospective and current borrowers and guarantors. Besides considering personal interaction, the banker should (i) try to draw some conclusions about staff morale and loyalty, (ii) study the person's personal credit report, (iii) do trade-credit reference checking, (iv) check references from present and former bankers, and (v) determine how the borrower handles stress. In addition, banks can minimise risks by securing the borrower's guarantee, using Government guaranteed loan programs, and requiring conservative loan-to-value ratios.

Bloem and Gorter (2001) suggested that a more or less predictable level of non-performing loans, though it may vary slightly from year to year, is caused by an inevitable number of 'wrong economic decisions' by individuals and plain bad luck (inclement weather, unexpected price changes for certain products, *etc.*). Under such circumstances, the holders of loans can make an allowance for a normal share of non-performance in the form of bad loan provisions, or they may spread the risk by taking out insurance. Enterprises may well be able to pass a large portion of these costs to customers in the form of higher prices. For instance, the interest margin applied by

financial institutions will include a premium for the risk of non-performance on granted loans.

Bercoff, Giovanniz *and* Grimardx (2002) using accelerated failure time (AFT) model in their study of Argentina's banking sector's weakness measured by the ratio of non-performing loans to total loans found that both bank specific indicators such as asset growth, the ratio of net worth to net assets, the ratio of operating cost to assets, exposure to peso loans, and institutional characteristics relating to private bank and foreign bank and macroeconomic variables including credit growth, foreign interest rate, reserve adequacy (imports/reserves) and monetary expansion (M2/reserves), besides the *tequila* effect were reasons behind the banking fragility. Their empirical results suggested that bank size measured by log of assets had a positive effect but asset growth had a negative effect on NPLs. The variables such as operating cost, exposure to peso loans, credit growth, and foreign interest rate had negative effect on NPLs. The macroeconomic variables such as money multiplier, and reserve adequacy, institutional characteristics and *tequila* effect had positive influence on NPLs.

Fuentes and Maquieira (1998) undertook an indepth analysis of loan losses due to the composition of lending by type of contract, volume of lending, cost of credit and default rates in the Chilean credit market. Their empirical analysis examined different variables which may affect loan repayment: (a) limitations on the access to credit; (b) macroeconomic stability; (c) collection technology; (d) bankruptcy code; (e) information sharing; (f) the judicial system; (g) prescreening techniques; and (h) major changes in financial market regulation. They concluded that a satisfactory performance of the Chilean credit market, in terms of loan repayments hinges on a good information sharing system, an advanced collection technology, macroeconomic performance and major changes in the financial market regulation. In another study of Chile, Fuentes and Maquieira (2003) analysed the effect of legal reforms and institutional changes on credit market development and the low level of unpaid debt in the Chilean banking sector. Using

time series data on yearly basis (1960-1997), they concluded that both information sharing and deep financial market liberalisation were positively related to the credit market development. They also reported less dependence of unpaid loans with respect to the business cycle compared to interest rate of the Chilean economy.

Altman, Resti and Sironi (2001) analysed corporate bond recovery rate adducing to bond default rate, macroeconomic variables such as GDP and growth rate, amount of bonds outstanding, amount of default, return on default bonds, and stock return. It was suggested that default rate, amount of bonds, default bonds, and economic recession had negative effect, while the GDP growth rate, and stock return had positive effect on corporate recovery rate.

Lis, *et.al.*, (2000) used a simultaneous equation model in which they explained bank loan losses in Spain using a host of indicators, which included GDP growth rate, debt-equity ratios of firms, regulation regime, loan growth, bank branch growth rates, bank size (assets over total size), collateral loans, net interest margin, capital-asset ratio (CAR) and market power of default companies. They found that GDP growth (contemporaneous, as well as one period lag term), bank size, and CAR, had negative effect while loan growth, collateral, net-interest margin, debt-equity, market power, regulation regime and lagged dependent variable had positive effect on problem loans. The effect of branch growth could vary with different lags.

Kent and D'Arcy (2000) while examining the relationship between cyclical lending behaviour of banks in Australia argued that, the potential for banks to experience substantial losses on their loan portfolios increases towards the peak of the expansionary phase of the cycle. However, towards the top of the cycle, banks appear to be relatively healthy - that is, non-performing loans are low and profits are high, reflecting the fact that even the riskiest of borrowers tend to benefit from buoyant economic conditions. While the risk inherent in banks' lending portfolios peaks at the top of the cycle, this risk

tends to be realized during the contractionary phase of the business cycle. At this time, banks' non-performing loans increase, profits decline and substantial losses to capital may become apparent. Eventually, the economy reaches a trough and turns towards a new expansionary phase, as a result the risk of future losses reaches a low point, even though banks may still appear relatively unhealthy at this stage in the cycle.

Jimenez and Saurina (2003) used logit model for analysing the determinants of the probability of default (PD) of bank loans in terms of variables such as collateral, type of lender and bank-borrower relationship while controlling for the other explanatory variables such as size of loan, size of borrower, maturity structure of loans and currency composition of loans. Their empirical results suggested that collateralised loans had a higher PD, loans granted by savings banks were riskier and a close bank-borrower relationship had a positive effect on the willingness to take more risk. At the same time, size of bank loan had a negative effect on default while maturity term of loans, *i.e.*, short-term loans of less than 1-year maturity had a significant positive effect on default.

The brief review of the literature is used to formulate theoretical analysis of non-performing loans undertaken in Section III. The following section highlights the underlying cross-section differences across banks in India using some stylized facts about banks non-performing assets, credit portfolio, and terms of credit, particularly, cost conditions.

Section II

Stylised Facts About NPAs in India

Cross-Country Perspective

Globally, the level of non-performing loans is estimated at about US \$1.3 trillion during 2003, of which the Asian region accounts for about US \$ 1 trillion, or about 77 per cent of global NPLs (Table 1). Within Asia, Japan and China have NPLs at about US \$ 330 billion and US \$ 307 billion thus, together accounting for 49 per cent of global NPLs. Other hot spots of NPLs in the Asian

Table 1: Global Non-Performing Loans : 2003*

Countries	NPLs (US \$ billion)	Share in Global (per cent)
Japan	330	25.4
China	307	23.6
Taiwan	19.1	1.5
Thailand	18.8	1.5
Philippines	9.0	0.7
Indonesia	16.9	1.3
India	30	2.3
Korea	15.0	1.2
Total	746	57.4
Asia	1000	76.9
Germany	283	21.8
Turkey	8.0	0.6
Global	1300	100.0

* NPLs of all financial institutions.

Source: Global NPL Report 2004, Ernst and Young.

region are Taiwan (US \$ 19 billion), Thailand (US\$ 18.8 billion), Indonesia (US \$ 16.9 billion) and Philippines (US \$ 9 billion). India's NPLs of the financial sector as a whole is reported at about US\$ 30 billion, which works out to a little over 2 per cent of global NPLs². On the basis of information provided in the Report on Trend and Progress of Banking in India, 2002-03, the level of gross NPAs of public sector banks is estimated at Rs. 68,714 crore, which is equivalent to about US \$ 15 billion, *i.e.*, about 1 per cent of global NPAs.

In terms of the ratio of NPLs to total assets of banking sector, there is evidence that the performance of the Asian region is far lower than Europe and US (Table 2). The trend in the NPL ratios of select countries, particularly the emerging countries of East Asia, during the last five-six years provides an interesting insight about the impact of structural reform on the accumulation of non-performing loans by banks. In emerging countries like Thailand and Indonesia, structural reform after the Asian crisis had an immediate impact of removing the accumulated excesses from the financial sector and consequently induced a sharp reduction in NPAs

Table 2: Ratio of Non-Performing Loans to Total Loans

(Per cent)

Countries	1998	1999	2000	2001	2002	2003
Brazil	10.2	8.7	8.4	5.7	5.3	5.7
Chile	1.5	1.7	1.7	1.6	1.8	1.8
Mexico	11.3	8.9	5.8	5.1	4.6	3.7
United Kingdom	3.2	3.0	2.5	2.6	2.6	2.2
United States	1.0	0.9	1.1	1.4	1.6	1.3
Japan	5.4	5.8	6.1	6.6	8.9	7.2
France	6.3	5.7	5	5	5	4.9
Germany	4.5	4.6	5.1	4.9	5	-
Greece	13.6	15.5	12.3	9.2	8.1	8.4
Italy	9.1	8.5	7.7	6.7	6.5	-
Russia	17.3	13.4	7.7	6.3	6.5	6.1
Turkey	6.7	9.7	9.2	29.3	17.6	14.2
Argentina	5.3	7.1	8.7	13.2	17.5	22.7
China	-	28.5	22.4	29.8	25.5	22.0
India	14.4	14.7	12.7	11.4	10.4	8.8
Indonesia	48.6	32.9	18.8	11.9	5.8	-
Korea	7.4	8.3	6.6	2.9	1.9	2.3
Malayasia	18.6	16.6	15.4	17.8	15.9	14.8
Philippines	11.0	12.7	14.9	16.9	15.4	15.2
Thailand	42.9	38.6	17.7	10.5	15.8	15.5
Srilanka	16.6	16.6	15	16.9	15.7	13.9
Bangladesh	40.7	41.1	34.9	31.5	28	-
Pakistan	23.1	25.9	23.5	23.3	23.7	20.7

Source: Global Financial Stability Report, April 2004, IMF.

ratio. In Thailand, the NPLs ratio declined by about 25 percentage points from about 43 per cent in 1998 to about 18 per cent in 2003. In a similar manner, the NPAs ratio in Indonesia declined by about 30 percentage points from about 49 per cent in 1998 to 19 per cent in 2003.

Trend in NPAs in India

In absolute terms, the volume of gross NPAs of public sector banks had increased continuously, except for the year 1995 (Table 3). During the entire period, Gross non-performing assets (GNPA) have increased at a trend rate of 4 per cent. The annual growth rate of gross NPAs of public sector banks shows a decelerating trend since 2000 (Chart1). In terms of various NPA ratios, such as GNPA

Table 3 : Gross NPAs of Public Sector Banks in India

Year	Rs. billion	US \$ billion
1993	392.5	12.81
1994	410.4	13.08
1995	383.8	12.22
1996	416.6	12.45
1997	435.8	12.28
1998	456.5	12.28
1999	517.1	12.29
2000	530.3	12.24
2001	546.7	11.97
2002	564.7	11.84
2003	540.9	11.18

Source : Report on Trend and Progress of Banking in India, RBI, Various Issues.

to gross advances, GNPA's to total assets, and net NPAs to total assets and net NPAs to net advances, public sector banks have achieved remarkable improvement (Table 4).

The ratio of gross NPAs to advances has declined at a trend rate of about 9.6 per cent from the level of about 23-25 per cent during 1993-94 to about 9 per cent by end-March 2003. On the other hand, the net NPAs to assets ratio has declined by 50 per cent from the level of 4 per cent in 1995 to about 2 per cent in 2003. The

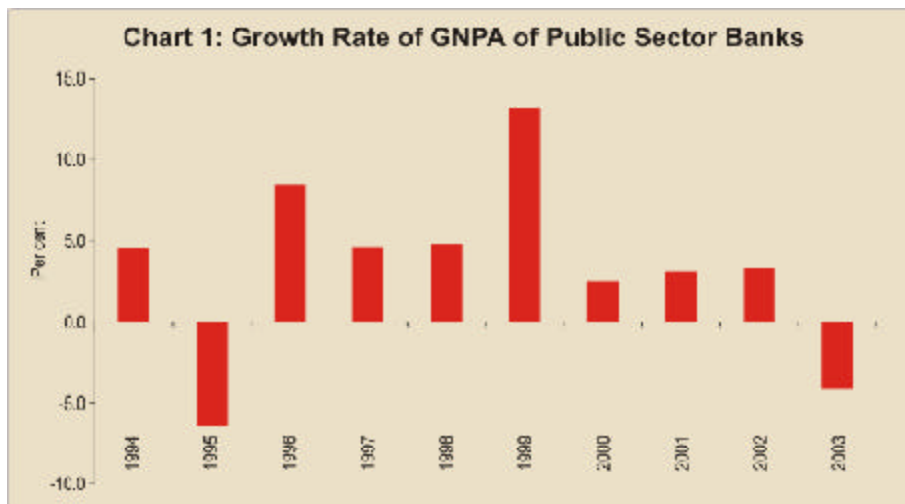


Table 4: NPA Ratios of Public Sector Banks in India

(Per cent)

Year	Gross NPAs to Advances Ratio (GNPA)	Gross NPAs to Assets Ratio (GNPAS)	Net NPAs to Net Advances Ratio (NPA)	Net NPAs to Asset Ratio (NPAS)
1993	23.2	11.8	–	–
1994	24.8	10.8	–	–
1995	19.5	8.7	10.7	4.0
1996	18.0	8.2	8.9	3.6
1997	17.8	7.8	9.2	3.6
1998	16.0	7.0	8.2	3.3
1999	15.9	6.7	8.1	3.1
2000	14.0	6.0	7.4	2.9
2001	12.4	5.3	6.7	2.7
2002	11.1	4.9	5.8	2.4
2003	9.4	4.2	4.5	1.9

Source: Report on Trend and Progress of Banking in India, RBI, Various Issues.

GNPAs ratio declined by 5 percentage points in the year 1994-95, and another 1.5 per centage point in the subsequent year 1995-96. Thus, in two-year span, the ratio of GNPAs was reduced by 6.5 percentage points, reflecting the immediate effect of structural reforms. Since 1996, the reduction of NPAs has been almost gradual, reflecting on reform induced market forces determining the level of NPAs.

Across the banks, the frequency distribution of gross and net NPAs to advances ratio of public sector banks provides some useful insights. During 1995-96, in the category of gross-NPAs to gross advances ratio upto 6 per cent, there was only one bank, but by end-March 2003, there were 5 such banks (Table 5). For the category of gross-NPA to gross advance ratio upto 8 per cent, the number of banks have increased from 1 during 1995-96 to 10 by end-March 2003. As at end-March 2003, about one-third of public sector banks had the ratio of GNPAs to gross advances upto 7-8 per cent, about 60 per cent banks had NPAs upto 9-10 per cent, three-fourth had NPAs upto 12 per cent and about 90 per cent banks had NPAs upto 15 per cent. There was, however, not a single bank having NPAs more than 20 per cent.

**Table 5: Non-Performing Assets of Public Sector Banks in India
(Gross NPAs to Gross Advances)**

	1996	1997	1998	1999	2000	2001	2002	2003
	Statistics							
Minimum	5.68	7.36	6.16	5.66	5.39	5.21	5.19	4.8
Median	17.89	16.92	14.83	14.68	13.19	11.71	10.18	8.55
Maximum	38	39.12	38.96	38.7	32.77	25.31	24.11	19.25
Category	Frequency Distribution (Number of Public Sector Banks)							
<=4	0	0	0	0	0	0	0	0
<=6	1	0	0	1	2	2	2	5
<=7	1	0	1	2	2	3	5	8
<=8	1	1	2	2	4	5	6	10
<=9	1	1	2	2	4	5	7	15
<=10	2	2	3	3	5	9	12	16
<=12	5	6	8	5	9	15	18	20
<=15	12	8	14	14	19	21	21	24
<=18	15	15	19	21	22	23	25	26
<=20	16	19	21	22	25	24	26	27
<=22	20	21	22	23	25	26	26	27
<=24	23	22	23	25	25	26	26	27
>24	4	5	4	2	2	1	1	0
Category	Frequency Distribution (As a per cent of total Public Sector Banks)							
<=4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<=6	3.7	0.0	0.0	3.7	7.4	7.4	7.4	18.5
<=7	3.7	0.0	3.7	7.4	7.4	11.1	18.5	29.6
<=8	3.7	3.7	7.4	7.4	14.8	18.5	22.2	37.0
<=9	3.7	3.7	7.4	7.4	14.8	18.5	25.9	55.6
<=10	7.4	7.4	11.1	11.1	18.5	33.3	44.4	59.3
<=12	18.5	22.2	29.6	18.5	33.3	55.6	66.7	74.1
<=15	44.4	29.6	51.9	51.9	70.4	77.8	77.8	88.9
<=18	55.6	55.6	70.4	77.8	81.5	85.2	92.6	96.3
<=20	59.3	70.4	77.8	81.5	92.6	88.9	96.3	100.0
<=22	74.1	77.8	81.5	85.2	92.6	96.3	96.3	100.0
<=24	85.2	81.5	85.2	92.6	92.6	96.3	96.3	100.0
>24	14.8	18.5	14.8	7.4	7.4	3.7	3.7	0.0

The distribution of banks' net NPAs to net advances ratio provides a more consolidated picture (Table 6). By end-March 2003, about two-third of banks had NPAs upto 5 per cent, compared to only 11 per cent of banks during 1995-96. About 93 per cent of banks had NPAs within the range of 8-10 per cent and no bank had NPAs above 12 per cent.

Table 6: Non-Performing Assets of Public Sector Banks in India
(Net NPAs to Net Advances)

	1996	1997	1998	1999	2000	2001	2002	2003
	Statistics							
Minimum	2.26	3.63	2.92	1.98	1.92	1.98	2.31	1.44
Median	8.39	9.32	7.66	8.7	7.87	6.86	5.72	4.38
Maximum	23.87	25.24	26.01	21.67	16.18	18.29	16.31	11.82
Category	Frequency Distribution (Number of Public Sector Banks)							
<=4 per cent	3	1	2	2	4	3	6	11
<=5	3	2	3	4	4	6	10	17
<=6	5	4	4	4	5	8	16	21
<=7	8	8	7	6	10	15	20	24
<=8	12	11	14	12	15	21	23	25
<=9	16	13	16	17	20	21	24	25
<=10	19	17	17	18	22	22	24	25
<=11	19	18	20	23	22	23	23	24
<=12	22	21	22	24	23	25	26	27
<=13	23	22	24	25	25	26	26	27
<=14	24	25	25	25	26	26	26	27
>=15	3	2	2	2	1	1	1	0
Category	Frequency Distribution (As a per cent of total Public Sector Banks)							
<=4	11.1	3.7	7.4	7.4	14.8	11.1	22.2	40.7
<=5	11.1	7.4	11.1	14.8	14.8	22.2	37.0	63.0
<=6	18.5	14.8	14.8	14.8	18.5	29.6	59.3	77.8
<=7	29.6	29.6	25.9	22.2	37.0	55.6	74.1	88.9
<=8	44.4	40.7	51.9	44.4	55.6	77.8	85.2	92.6
<=9	59.3	48.1	59.3	63.0	74.1	77.8	88.9	92.6
<=10	70.4	63.0	63.0	66.7	81.5	81.5	88.9	92.6
<=12	81.5	77.8	81.5	88.9	85.2	92.6	96.3	100.0
<=13	85.2	81.5	88.9	92.6	92.6	96.3	96.3	100.0
<=14	88.9	92.6	92.6	92.6	96.3	96.3	96.3	100.0
>=15	11.1	7.4	7.4	7.4	3.7	3.7	3.7	0.0

Source : Based on data from Annual Accounts of Banks in India, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

Terms of Credit

A comparative position of GNPA's to advances ratio and the terms of credit variables including maturity (share of term loans in total advances), interest cost of deposits, operating expenses to asset ratio, total expenses to asset ratio, and credit-deposit ratio of public sector banks in India during the last ten years presents an interesting picture (Table 7). There is evidence that, for the public sector bank group, the

Table 7: Terms of Credit and Non-Performing Assets of Public Sector Banks in India

(Per cent)

	Gross NPAs to Advances Ratio (GNPA)	Maturity (Share of Term loans in Advances)	Interest Cost of Deposits (RD)	Operating Cost to Total Assets Ratio (OE)	Total Expenses to Assets Ratio (IE)	Credit-Deposit Ratio (CDR)
1993	23.2	30.5	7.7	2.86	10.2	54.3
1994	24.8	28.3	7.2	2.75	9.2	46.9
1995	19.5	25.5	6.5	2.87	8.7	49.8
1996	18.0	26.9	7.0	3.04	9.3	50.7
1997	17.8	29.6	7.6	2.92	9.6	47.5
1998	16.0	32.2	7.2	2.76	9.1	47.3
1999	15.9	33.9	7.3	2.72	9.1	46.4
2000	14.0	35.0	7.2	2.59	9.0	47.3
2001	12.4	35.2	6.9	2.78	9.0	48.5
2002	11.1	35.7	6.8	2.40	8.5	50.6
2003	9.4	39.2	6.1	2.34	7.8	51.4

Source: Statistical Tables Relating to Banks in India and Report on Trend and Progress of Banking in India, RBI, Various Issues.

GNPA ratio has declined from 23 per cent in 1993 to 9 per cent in 2003, amidst an increase in the loan-maturity from 31 per cent to about 39 per cent, declining cost condition as reflected in declining interest cost of deposits, operating expenses and total expenses, and reduction in credit-deposit ratio during the same period.

Loan-Maturity

The data on maturity terms of bank loans, defined over time dimension, is available for public sector banks group as a whole for the last three years (Table 8). The share of short-term loans upto one year, accounts for about 40-42 per cent of total loans followed by loans with one to three years of maturity, which account for 33-36 per cent of bank loans and three to five years of maturity accounting for the remaining 23-25 per cent. The share of bank loans above one year maturity accounts for about 60 per cent. Although, the data for last three-year in respect of loan maturity shows no clear trend across the maturity spectrum, there is evidence that banks' prefer largely term loans for more than 1 year maturity.

Data on maturity of loan defined as the share of term-loans in total advances are available for reasonably long period of time across

**Table 8: Loan Maturity Profile of Public Sector Banks :
Percentage Distribution of Loans Across Maturity Spectrum**

Year	2001	2002	2003
Maturity			
<=1 Year	40.6	41.6	39.3
1-3 Year	36.1	33.2	35.2
3-5 Year	10.4	11.4	11.7
>=5 Year	13.3	13.8	13.8
Above 1 year	59.8	58.4	60.7

banks. In this regard, information for the public sector as a whole shows that there is, on an average, an increasing trend in the share of term loans in total advances since 1996, reflecting banks' approach to a better portfolio management (Table 9). However, the cross-section statistics such as minimum and maximum values and standard deviation of loan-maturity across banks provide evidence of differential portfolio strategies of banks over time. The differential range of maturity, which was more pronounced during early 1990s, has narrowed during the late 1990s due to increasing competition. During the early 1990s, at the bottom end, some banks could provide only 10-15 per cent of term loans, while at the upper end, some banks

Table 9: Maturity: Share of Term Loans in Total Advances

(Per cent)

Year	Mean	Median	Maximum	Minimum	Volatility
1992	0.33	0.31	0.63	0.15	11.2
1993	0.31	0.27	0.65	0.17	11.6
1994	0.28	0.27	0.60	0.10	10.3
1995	0.26	0.25	0.41	0.11	8.5
1996	0.27	0.26	0.45	0.12	9.0
1997	0.30	0.27	0.57	0.14	10.7
1998	0.32	0.30	0.76	0.15	12.7
1999	0.34	0.35	0.61	0.18	10.3
2000	0.35	0.35	0.64	0.19	10.2
2001	0.35	0.35	0.55	0.23	8.2
2002	0.36	0.37	0.45	0.23	6.0
2003	0.39	0.40	0.47	0.27	5.4

Source: Annual Accounts of Banking, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

could provide as high as 60-65 per cent of term loans in the credit portfolio. Nevertheless, the upswings and downswings in the cross section volatility statistics of loan maturity over time reflect bank specific dynamic portfolio management strategies.

Cost Condition

The movement of banks' prime lending rate (PLR) over the years reflects the general cost condition for borrowers. The prime lending rate of State Bank of India (SBI) has declined by about 750 basis points from the peak of 19 per cent in 1991-92 to 11.50 per cent during 2002-03 (Table 10). For other commercial banks too, there has been decline in PLR. From the level of 1995-96, SBI's PLR has declined by about 300-450 basis points and similarly for other banks, the PLR has declined somewhat more by about 475 basis points. Another striking feature of distribution of loans across various ranges of interest rates is that the decline in the estimated weighted average lending rate is less than the PLR. For instance, during the period 1995-96 to 2001-02, the PLR of banks has declined by 450-500 basis points, while weighted lending rate has declined by about 300 basis points.

Table 10: Prime Lending Rate

(Per cent)

	PLR of SBI	PLR of Other Banks	Weighted Lending Rate@
1991-92	19.00	16.50	16.5
1992-93	17.00	19.00	16.8
1993-94	14.00	19.00	16.5
1994-95	15.00	15.00	16.1
1995-96	16.50	16.50	17.1
1996-97	14.50-15.00	14.50	16.9
1997-98	14.00	14.00	16.3
1998-99	12.00-13.00	12.00-14.00	15.5
1999-00	12.00-12.50	12.00	15.0
2000-01	11.00- 12.00	11.50	14.3
2001-02	11.00-12.00	11.50	13.9
2002-03	10.75-11.50	10.75	

Source: Handbook of Statistics on the Indian Economy, 2002-03, RBI.
@Rakesh Mohan (2002)

The prime-lending rate, however, is not a fully representative cost of lending for the borrowers as banks lend to different borrowers at different lending rates. Moreover, banks have freedom to lend below PLR to some borrowers. Data on distribution of credit across various ranges of interest rate shows that loans provided at PLR could be about 20-30 per cent of total loans (Table 11).

As the PLR may not be a representative cost of lending, a measure of underlying cost including actual interest costs of deposits and operating expenses, which are available from balance sheets of various banks provide useful insights into the cost structure of public sector banks. In terms of interest cost of deposits, there is evidence that, on an average, effective cost of deposits for public sector banks as a whole³, has remained almost steady during 1991-92 to 2000-01 (Table 12). Since 2001-02, however, the interest cost of deposits has declined by about 80 basis points. What is most striking in this regard

Table 11: Distribution of Outstanding Credit across Interest Rate Range

Year	1995	1996	1997	1998	1999	2000	2001	2002
PLR (SBI)	15.0	16.5	14.5-15.0	14.0	12.0-13.0	12.0-12.5	11.0-12.0	11.0-12.0
PLR (Others)	15.0	16.5	14.5	14.0	12.0-14.0	12.0	11.5	11.5
Interest Rate Range	Distribution of Outstanding Credit (Per cent)							
Upto 6	2.3	1.3	1.1	1.0	0.3	0.2	0.2	0.1
6-10	2.1	0.8	0.5	0.4	3.7	1.0	0.6	3.2
10-12	2.3	1.5	1.4	2.3	3.3	8.0	17.0	24.5
12-14	10.6	11.1	10.7	13.2	20.4	26.8	28.6	22.5
14-15	6.7	8.1	10.9	14.9	9.7	11.5	12.6	14.1
15-16	20.3	9.1	9.6	11.7	14.0	17.9	15.7	15.5
16-17	17.3	7.9	8.3	13.7	20.2	17.1	14.1	12.5
17-18	15.6	18.1	17.2	14.3	13.1	8.6	5.2	2.9
Above 18	22.8	42.2	40.2	28.5	15.4	9.0	6.1	4.5
Total	100	100	100	100	100	100	100	100
Volatility	8.2	12.9	12.3	8.9	7.4	8.4	9.1	8.9

Source: Statistical Tables Relating to Banks in India, RBI, Various Issues.

Table 12: Ratio of Interest Cost to Deposits

(Per cent)

Year	Minimum	Maximum	Average	Volatility
1992	5.6	8.1	7.1	51.6
1993	6.7	8.7	7.7	50.8
1994	5.8	8.4	7.2	60.4
1995	4.6	8.3	6.5	63.3
1996	6.1	9.0	7.0	56.0
1997	6.8	9.3	7.6	52.6
1998	6.3	8.8	7.2	50.5
1999	6.5	8.4	7.3	48.3
2000	6.3	8.1	7.2	47.1
2001	6.1	7.8	6.9	48.1
2002	5.6	7.6	6.8	51.2
2003	5.3	6.8	6.1	46.7

Source: Based on data from Annual Accounts of Banks in India, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

is that interest cost varies across banks since the range of cross-section minimum and maximum values of interest cost differs over time. The range of interest rate has shown a marked decline after 2001-02 compared to the period of the early 1990s.

On the other hand, the average operating cost ratio for banks has declined marginally in the recent years as compared to the period of the 1990s (Table 13). Across banks, the range of minimum and

Table 13: Ratio of Operating Expenses to Assets

(Per cent)

Year	Minimum	Maximum	Average	Volatility
1990	1.7	3.7	2.6	45.6
1991	1.7	3.7	2.6	49.0
1992	2.1	3.9	2.9	51.0
1993	2.0	3.6	2.9	47.7
1994	2.2	3.3	2.7	36.8
1995	2.0	3.9	2.9	42.7
1996	2.1	3.7	3.0	40.7
1997	2.2	3.6	2.9	35.5
1998	2.0	3.4	2.8	38.1
1999	1.8	3.6	2.7	42.6
2000	1.7	3.4	2.6	37.1
2001	1.7	3.8	2.8	44.2
2002	1.6	3.3	2.4	42.4
2003	1.7	3.3	2.3	41.8

Table 14: Ratio of Total Expenses to Assets

(Per cent)

Year	Minimum	Maximum	Average	Volatility
1990	6.9	9.9	8.3	81.8
1991	6.6	10.0	8.5	80.6
1992	7.9	13.2	10.0	110.5
1993	8.1	11.0	10.2	74.6
1994	7.6	10.3	9.2	74.3
1995	6.2	10.1	8.7	75.1
1996	8.1	11.2	9.3	75.1
1997	8.5	11.3	9.6	69.3
1998	7.7	10.2	9.1	55.0
1999	8.3	10.1	9.1	49.1
2000	8.0	10.0	9.0	45.1
2001	7.8	10.3	9.0	59.7
2002	6.9	9.7	8.5	68.0
2003	6.4	9.2	7.8	65.9

Source: Based on data from Annual Accounts of Banks in India, 2002 and Statistical Tables Relating to Banks in India, RBI, Various Issues.

maximum operating cost remains steady indicating the continuity of cross section variability. Reflecting the movement in interest cost of deposits and operating costs, average total cost ratio shows a steady movement for most part of the 1990s and showing at times some firmness in the trend (Table 14). The variability across banks continues to be high.

Credit Deployment

The average credit deposit ratio shows a declining trend during the 1990's and an increasing trend thereafter. However, there is significant difference across banks as reflected in the cross-section minimum and maximum values of credit-deposit ratio. Although the variability in credit-deposit ratio has somewhat declined, it has remained steady since 1999-2000 (Table 15).

The ratio of credit to GDP ratio indicates as to how banks have been supporting economic activity of borrowers in general. Since 1990-91, the ratio of bank credit to real GDP shows a continuous improvement except for the year 1994 and 1997, when there was a

Table 15: Credit-Deposit Ratio of Public Sector Banks*

Year	Minimum	Maximum	Average	Volatility
1990	46.6	79.3	56.5	7.4
1991	47.0	81.0	56.7	7.6
1992	43.1	73.7	57.2	8.1
1993	43.2	71.9	54.3	7.2
1994	34.6	58.0	46.9	6.7
1995	33.7	65.3	49.8	8.1
1996	32.4	63.6	50.7	7.6
1997	29.3	58.3	47.5	7.7
1998	28.0	60.0	47.3	7.5
1999	26.5	56.9	46.4	6.6
2000	27.2	56.7	47.3	6.5
2001	31.1	61.6	48.5	6.2
2002	34.8	64.2	50.6	6.3
2003	35.0	66.1	51.4	6.3

*Estimated

Source: Statistical Tables Relating to Banks in India, Various Issues, RBI.

marginal decline. The ratio of bank credit to nominal GDP, however, shows a mixed trend. It declined during first half of the 1990s and improved towards the late 1990s, especially since 1999-2000 (Table 16).

Table 16: Bank Credit Support for Economic Activity

Year	Ratio of Credit to Real GDP (Per cent)	Ratio of Credit to Nominal GDP (Per cent)
1990	17.3	26.0
1991	18.8	25.6
1992	20.4	24.3
1993	20.9	22.9
1994	18.8	18.8
1995	21.2	19.4
1996	23.1	19.3
1997	22.7	17.7
1998	25.6	18.7
1999	27.5	18.6
2000	30.7	20.0
2001	34.6	21.6
2002	38.0	23.0
2003	41.6	24.6

Section III

Non-Performing Loans: A Theoretical Perspective

A credit transaction involves a contract between two parties: the borrower and the creditor (banks) subject to a mutual agreement on the terms of credit. The terms of credit are defined over five critical financial parameters: amount of credit, interest rate, maturity of loans, frequency of loan servicing and collateral. Optimising decision pertaining to the terms of credit could differ from the borrower to that of the creditor (banks). As such, the mutual agreement between the borrower and the creditor may not necessarily imply an optimal configuration for both. At this juncture, distinction between a defaulter and a non-performing loan account is in order. A default entails violation of the loan contract or the agreed terms of the contract, while a non-performing loan entails that the borrower does not renege from the loan contract but fails to comply the repayment schedule due to evolving unfavourable conditions. However, from the perspective of corporate finance, a common perspective is that both the cases of 'defaulter' and 'non-performer' imply similar financial implications, *i.e.*, financial loss to banks. Moreover, in the Indian context, regulatory and supervisory process does not focus on such a distinction between default and non-performer as far as prudential norms are concerned. The NPL is defined as past due concept, taking into account either non-payment of interest due, principal or both. For simplicity, this common perspective prevails in the rest of the theoretical analysis. The most important reason for default could be mismatch between borrower's terms of credit and creditor's terms of credit. The problem of default can be elucidated as follows.

Let the borrower makes an internal assessment of his economic activity for which he requires external financing support. An optimal configuration for the borrower involves that he could carve out a contract $C(A^*, r^*, m^*, n^*, S^*)$ defined over the amount of finance (A^*), interest rate (r^*), maturity (m^*), instalments (n^*) and collateral (S^*) for his profitable economic activity. On the other hand, based on competing portfolio considerations, the creditor could carve out a contract $C(A, r, m, n, S)$. When a borrower enters the credit market,

he searches for a bank that could agree to his terms of credit. It may not, however, be possible for him to find a suitable creditor. Since the borrower faces financial constraint, he will have to compromise and agree to the terms of credit stipulated by the creditor. Once the financial constraint is overcome, the borrower explores the opportunity for making changes to the loan contract. In this regard, a decision to default entails that he wants to turn an unfavourable loan contract to a favourable one. The default option however, involves both costs and benefits. The benefits from default could accrue from each of the parameters of the loan contract.

First, let us consider the parameter loan-maturity (m). A default option entails that the borrower wants to lengthen the maturity of the loan. By lengthening the maturity of the loan, *ceteris paribus*, the defaulter could reduce the real burden of credit since the present value of credit would decrease with increase in loan maturity. However, if the borrower is highly bank dependent, a borrower may not consider defaulting on a short-term loan, even though such loans involve high present value of debt burden. In this case, the default option will affect the credit worthiness of the borrower, for which he may find difficulty in approaching banks for further financial support. Moreover, if macroeconomic conditions turn more favourable, implying strong business growth, the borrower would require an increasing financial support from banks to expand his business. In this situation, if the borrower has availed a short-term loan, he would not prefer default option in order to maintain his credit worthiness. Second, if the borrower anticipates that interest rates (r) are likely to move upward in the future, a default option would benefit him enjoy the existing credit facility at a relatively lower interest rate. On the contrary, if interest rates are likely to fall, the borrower would prefer repaying the loan amount in due course of time or even earlier, if possible, through pre-payment. Third, the default option also provides an opportunity for the borrower to use the installment payments (n) for investment in more profitable activities. However, installment of loan constitutes a method of payment, which could be similar across the banks. Accordingly, this may not be a major factor of influence on loan defaults. Fourth, the amount of credit (A) could play a critical

role in influencing the borrower's decision to default on bank loans. A very large amount of credit, *ceteris paribus*, involves high present value of loan burden. The amount of loan will have significant effect on legal cost and may not induce defaults under certain circumstances. Moreover, for a genuine bank dependent borrower, default may not be an option since it would involve reputation cost, which in turn, could affect the borrower's recourse to refinancing or fresh financing for other productive activities. Secondly, for a genuine borrower, the amount of credit could influence borrower's decision pertaining to adequacy of finance to carry on the profitable activity. In other words, the amount of credit relative to measure of economic activity and the level of funds of banks rather than credit itself could be important for borrowers (Mohan, 2004).

From the cost side, a defaulting borrower is likely to face three major costs: reputation cost, legal and bankruptcy costs and penalty charged by banks after disposal of the case in the court. The reputation cost for the defaulter is likely to be higher, if there is provision for exchange of information on defaults across banks or creditors. In the case of a company registered in the stock market, reputation cost could arise from the adverse movement of the company's stock price. For all companies, loss of reputation could signal bad financial condition and thus, affect overall business. In fact, it is precisely with this objective that Credit Information Bureau (CIB) receives policy support in most countries.

The legal cost will arise if banks are prompt in filing suits against the defaulters. Basically, the legal cost will involve two principal components: initial fixed cost on account of stamp duties in response to defend the loan suits and other costs on account of preparation of the law suit and a fixed sum, which could be charged by lawyers in order to pursue the case. Thus, from the perspective of Government regulation, higher the stamp duty, higher the legal costs and lower incentive for defaults. An interesting point to note here is that for very small borrowers, the fixed cost of legal suit could be higher than the credit amount, thus, providing no incentive for defaults. The variable cost of a lawsuit will depend on the charges of the lawyer every time he has to attend the case.

Longer the duration of the case, higher will be the legal costs. At the same time, it is to be noted that longer the duration of the case, the borrower benefits from extended maturity of the loan.

Thus, in view of the above, it is now apparent that before choosing the default option, a rational borrower has to make an assessment of all the benefits and costs (Reddy, 2004).

Section IV

Empirical Analysis

The basic framework for an empirical analysis involves a panel regression model of the following form:

$$NPA_{j,t} = F(E_t, ToC_j, B_j, S, P)$$

where $NPA_{j,t}$ is defined as j th bank's gross non-performing assets to gross advances or net non-performing assets to net advances in period t ; macroeconomic environment (E) is captured through the growth rate of aggregate economic activity (GDP); terms of credit (ToC) is defined over banks loan maturity (M), interest rate (R) and collateral value (S) backing the credit to the borrower; the set of bank specific indicators (B) include a measure of bank size (A), and credit orientation or culture reflecting a bank's preference for credit measured by credit-deposit ratio (CDR) relative to that of the banking industry, and P is a measure of loan exposure to priority sector. In this study, the panel regression model is estimated subject to cross-section specific fixed coefficients (intercepts) in order to capture the effect of the differential social and geo-political environment confronting banks' operations. The exact specification of the model is as follows:

$$\begin{aligned} (GNPA_{j,t}) = & C_j + b_1(A_{j,t}) + b_2M_{j,t} + b_3(R_{j,t} - R_{j,t}^E) + b_4G^E_t \\ & + b_6P_{j,t-1} + b_7CDR_{j,t} + b_8SR_t \end{aligned}$$

where $GNPA_j$ is the ratio of gross non-performing assets to gross advances of a bank, C_j - fixed coefficient, A_j - the ratio of a bank's

asset to the total asset of the bank group, R_j - the difference between the current and past cost conditions, *i.e.*, ratio of total cost to assets of a bank and the average of last three-values of R_j , G^E - expected (one period lag) of the GDP growth rate to capture borrower's response to macroeconomic and business environment, P- the ratio of a bank's priority sector loan to total advances, CDR_j - the difference between credit-deposit ratio of a bank and the bank-group credit-deposit ratio and SR is the expected change in asset (stock) return. A detailed analysis of the explanatory variables used in the model is discussed in the following paragraphs.

Most studies use the logarithm transformation of total assets, capital or deposits of a bank as a measure of bank size. An appropriate way of characterising the competitive bank size, however, entails that the measure should be relative to the industry, group or sector as a whole. Accordingly, in this study, the measure of an individual bank's size is defined in terms of its total assets relative to the aggregate assets of the banking industry and/or group, *i.e.*, the ratio of total assets of an individual bank to total assets of banking sector/group.

For measuring interest cost of credit, it is relevant to use bank-wise lending rate of interest. However, data on bank-wise lending rates are not available on a time series basis. In this study, an alternative indicator of cost of credit has been considered - the ratio of total expenses (operating expenses plus interest cost of deposits) to total assets. The cost variable indicating the pricing terms of credit serves a meaningful purpose under the assumption that banks, which engage in costly operations are most likely to charge higher interest rate on loans and investments. Such characterisation of cost condition is consistent with bank's lending behaviour, as discussed in Reddy (2004).

Again, there are severe data constraints for arriving at an indicator of average maturity of loans across banks. Taking clues from various research studies on the subject and also studies in other areas of finance, particularly, the literature on Government bonds, the maturity term of loans is approximated by the share of term loans in total advances. Such characterisation of the loan maturity has a meaningful

interpretation. A borrower gains from higher maturity of loans due to lower time value of money or present value of credit contract. If a bank provides more term loans, *ceteris paribus*, it is most likely to face fewer defaulting borrowers.

The measure of customer friendliness and credit culture can be measured in different ways. One, it can be measured by a bank's credit-deposit ratio deviating from the industry average credit-deposit ratio. Two, the share of an individual bank credit in total bank credit could be another indicator. However, the share of bank credit indicator will be similar to the asset measure of bank size giving rise to misleading results. Thus, a bank's credit-deposit ratio relative to that of industry is considered. As noted earlier, a relatively more customer friendly bank is most likely to face lower defaults as the borrower will have the expectation of turning back to the bank for further financing requirement.

There cannot be a precise measure of value of collateral or securities backing loans since banks provide loans to various customers across different class of economic activities, which in turn have different types of assets and/or collateral and securities. Nevertheless, as an approximation, it is possible to capture asset price effect on non-performing loans using expected stock market return. Such an approach is based on the premises that changes in stock prices reflect the changes in underlying value of the firms. Higher stock return implies higher value of collateral backing loans and the borrower would not take risk on default. However, from lenders side, high collateral value may induce soft lending and higher level of risky loans. Thus, the effect of stock return on the NPLs is subject to an empirical assessment.

Alluding to various studies, macroeconomic environment, in particular, the aggregate economic activity and business cycle may have differential effect on NPLs due to differential response of borrowers and lenders. Under the assumptions of financial constraint, cash-in-advance economy, and bank dependent system, borrowers' decision on loan repayment would depend upon the expected state of business condition captured through growth path of the economy. A

positive outlook on business condition would entail greater dependence of economic agents including firms on banks for debt financing and thus, favourable loan repayment response of borrowers in order to maintain credit worthiness. On the contrary, from lenders point of view, studies suggest that the expansion phase of macroeconomic activity is likely to amplify asymmetric information and moral hazard for which banks are likely to engage in soft lending, choose more risky borrowers and consequently, face higher loan defaults. Thus, the direction of the effect of macroeconomic shocks on loan losses would depend on the combination of differential response of borrowers and lenders. Accordingly, the empirical analysis has used lagged growth rate of GDP for capturing borrowers response to expected macroeconomic environment and business prospects.

Panel Regression Results

The essence of a cross section analysis is to provide meaningful analysis of inter-linkages among economic and financial variables after duly recognising the heterogeneous nature of economic agents and their behaviour. If economic agents were similar, a time series analysis would serve a meaningful purpose. The panel regression methodology recognises individual characteristics as well as regularity and/or continuity in the cross-section units in order to establish a meaningful relationship between different economic and financial variables. In this context, a pertinent question arises whether public sector banks are homogeneous or heterogeneous in nature. From an institutional perspective, it may be argued that public sector banks are similar entities. However, economic behaviour of each bank as reflected in their loan portfolio, cost structure and performance could not be similar for which a cross section analysis assumes utmost importance.

Since the emphasis of the study is on analysis of borrowers loan repayment response to terms of credit, the appropriate approach entails an empirical evaluation of the ratio of NPAs to advances rather than NPAs to assets ratio. Between the two NPA ratios, *i.e.*, the gross

NPAs to gross advances and net-NPAs to net advances, the former is appropriate for modelling borrowers' behaviour, while the later involves a mix of borrowers' as well as lenders' behaviour since net-NPAs incorporate lenders' decisions about loan loss provisions. The empirical analysis involves various scenarios for modeling gross as well as net NPAs under different formulations:

1. Model without Priority sector and collateral value
2. Model with Priority sector but without collateral value
3. Model with Priority sector and collateral value
4. Business Cycle Effect
5. Competitive Portfolio Effect
6. Testing for Sample Sensitivity

1. Without Priority Sector Loans and Collateral Value

The empirical results of various models are summarised in Annex I. In the first scenario, for the model of gross NPAs to gross advances ratio (Model M-1), the results are as follows:

- (i) Bank size, as measured by the ratio of a bank's assets to the total assets of all public sector banks has statistically significant negative impact, implying that larger the bank, lower the level of gross NPAs. The estimated coefficient indicates that if a bank's asset grows by 1 per cent relative to that of the industry, then its gross NPAs would be reduced by 1.8 per cent.
- (ii) The maturity terms of credit have significant negative impact, indicating that higher term loans induce lower NPAs. The estimated coefficient of maturity indicates that about 16 per cent increase in the share of term loan could reduce the ratio of gross NPA to gross advances by about 1 percentage point.
- (iii) The changes in cost terms of credit, *i.e.*, the difference between current cost and past cost conditions have positive impact on NPAs, implying that the expectation of higher interest rate induced changes in cost conditions would fuel further increase in non-performing loans. The estimated coefficient indicates that

if the current interest cost increases by 2.5 percentage points relative to past cost terms, banks gross NPAs would rise by 1 per cent of gross advances.

- (iv) Interestingly, the measure of credit orientation, defined by a bank's credit-deposit ratio relative to that of the industry has significant negative influence on NPAs, implying that borrowers attach considerable importance to relatively more credit (customer) oriented banks. The estimated coefficient suggests that if a bank's credit-deposit ratio is higher by 5 per cent, its level of gross NPAs would be lower by about 1 per cent. Thus, high credit culture has favourable effect of lowering banks' NPAs.
- (v) The expectation of higher growth reflecting favourable macroeconomic and business conditions has negative influence on NPAs, suggesting that increased economic activity leads to lower financial distress of borrowers and thus, lower NPAs for banks. The growth rate of 4 per cent has the potential of reducing gross NPAs by 1 per cent.

When the above model is replicated for the ratio of net-NPAs to net-advances (Model M-2), none of the explanatory variables recorded change in the sign of their respective coefficients, thus, implying similar effect of variables and the nature of stability in the postulated empirical model. However, size of the estimated coefficients changes as the impact of loan-maturity, and cost-terms of credit gets amplified, while the effect of bank size, credit orientation and business cycle is moderated for net NPAs ratios.

A change in the definition of size, in terms of the ratio of an individual bank's capital and reserves and surplus to that of the industry as a whole, assuming all other variables remaining in the same form, however, produces some interesting results (Models M-3 & M-4). When the bank size is measured in terms of assets (Models M-1 & M-2), the bank size has negative impact on NPAs, while the measure of bank size in terms of capital (Model M-3 & M-4) gives somewhat opposite result. The measure of bank size in terms of capital has positive and significant effect on gross NPAs but negligible effect

on net NPAs. This implies that as the size of the bank in relation to the industry increases in terms of its capital, then it is likely that its gross NPAs would also rise. The sign condition for remaining explanatory variables, such as maturity, cost, credit orientation, and business cycle does not change, though, the magnitude of the coefficients for these variables are different from the Models M-1 & M-2. In models M-3, and M-4, the maturity, cost, and credit orientation variables, which broadly characterise the overall financial terms of credit, have sharper effect on both gross and net NPAs, while business cycle has sharper effect on gross NPAs but similar effect on net NPAs compared to models M-1 & M-2.

In another scenario, Models M-1 and M-2 were replicated with a change in the definition of cost of credit, where total cost is expressed as a ratio of total advances plus investments rather than total assets. In this case, all the explanatory variables had not only similar sign but also similar magnitude of their respective coefficients. On the other hand, subject to this definition of cost of credit, a change in the definition of bank size in terms of bank capital produced results, which were similar to Models M-3 and M-4.

2. With Priority Sector Loans but Without Implications of Collateral Value

There is a view that banks' exposure to priority sector lending also contributes to higher NPAs. The impact of banks exposure to priority sector loan was examined by introducing an additional variable defined as the ratio of a bank's priority sector lending to its total advances. In contemporaneous terms, the impact of exposure to priority sector loans turned positive and significant for gross NPAs but positive and non-significant for net NPAs. However, a sizeable component of priority sector loans to agriculture, exports and small industry comprise short-term loans upto one-year. Thus, a plausible result was found when the exposure to priority sector loans was allowed with a one-period lag, which had positive and significant effect on both gross and net NPAs. The effect of priority sector exposure was not as high as the effect of other explanatory variables

except the maturity term of loans. The impact of exposure to priority sector loans on gross NPAs (Model M-5) was somewhat higher than that on the net NPAs (Model M-6). In comparison to Model M-1, (*i.e.*, the equation of gross NPAs without priority sector), it is evident from Model M-5, that the exposure to the priority sector accentuates the effects of credit portfolio, terms of credit and macroeconomic environment. The results were more or less in the same direction in the case of net NPAs.

3. *With Priority Sector Loans as well as Collateral Value*

Initially, the empirical exercise with inclusion of contemporaneous term of the return on stock portfolio (measured by first difference of logarithm transferred stock price index) as an explanatory variable revealed positive and significant effect for gross as well as net NPAs. However, when the stock return was included with one period lag, the estimated coefficient of stock return turned significantly negative in the equation of gross NPAs (Model M-7) but not significant in the equation of net-NPAs (Model M-8). This implies that stock returns have differential implications for banks' NPAs adducing to differential response of borrowers and lenders (banks) to changes in asset prices and collateral value. As expected, inclusion of stock return has inflated the coefficient of bank size, maturity, and macroeconomic shock, but reduced the impact of cost and exposure to priority sector.

4. *Business Cycle Effect*

In the above, the empirical models analysed loan defaults under the situation when economic agents' form expectation about the state of economic condition in terms of lagged GDP growth rate. From an alternative perspective, the empirical analysis investigated as to how a change in the assumption about economic environment will impinge on the sign condition of terms of lending variables and thus, have differential implications for loan defaults. As pointed out in the review of literature, business cycle can have differential implications for borrowers and lenders. From borrowers' perspective, increased economic activities

would imply an improvement in the financial conditions and thus, lower defaults. On the other hand, from lenders perspective, research studies, which support pro-cyclical bank lending hypothesis, argue that the periods of increased economic activity may involve greater risk taking by banks and higher loan losses. Accordingly, the empirical analysis examined three alternate scenarios: (i) contemporaneous term of GDP growth rate in the place of lagged GDP growth rate, (ii) contemporaneous as well as lagged GDP growth rate; and (iii) contemporaneous GDP growth and cyclical component (defined as change in the growth rate, which characterise current growth rate less expected growth rate) while keeping unchanged all other explanatory variables. The results of the exercise are set out in Annex II.

It is evident that in the first scenario (S1) contemporaneous growth rate of GDP has positive effect on gross NPAs. The sign condition of all variables but stock return has remained unchanged in all scenarios for models of gross NPAs. Stock return has positive effect as opposed to negative effect derived earlier. In the second scenario (S2), however, current growth rate turned out positive but insignificant while lagged growth rate turned out negative and significant. Stock return turned negative but significant with higher probability, *i.e.*, at about 10 per cent level of significance. In the third scenario, contemporaneous GDP growth rate has negative but insignificant effect, while the cyclical component of GDP growth rate has positive and significant effect on gross NPAs. Stock return was having negative effect at higher level of significance. For all three scenarios, the contemporaneous GDP growth rate has positive and significant effect on net NPAs. However, in the second scenario, the one-period lag GDP growth rate has significant positive effect while the cyclical growth rate has significant negative effect on net NPAs. The sign condition of stock return has significant positive effect on net NPAs. Thus, the empirical results corroborate differential response of borrowers and lenders to asset prices and macroeconomic and business cycle conditions.

5. *Competitive Portfolio Effect*

The empirical analysis undertaken above suggested that positive deviation of an individual bank's credit-deposit ratio from that of industry's average could have favourable effect on reducing NPAs. This explains how a bank can gain from strategic competitive portfolio management. However, the empirical analysis did not specify to what extent such competitive advantage could accrue. In this regard, there is a need for a sensitive analysis to arrive at robust findings. The sensitive analysis investigates the non-linear effect of portfolio adjustment by introducing an additional variable (Z), which is defined below.

Let a dummy variable D_j is defined as

$$D_j = \begin{cases} 1, & \text{if } (CDR_j - CDR) \geq k, \\ 0, & \text{otherwise} \end{cases}$$

where D takes values 1 when $(CDR_i - CDR)$ is greater than or equal to some positive value of k , and zero otherwise. The Z variable is defined as

$$Z_j = D_j * (CDR_i - CDR)$$

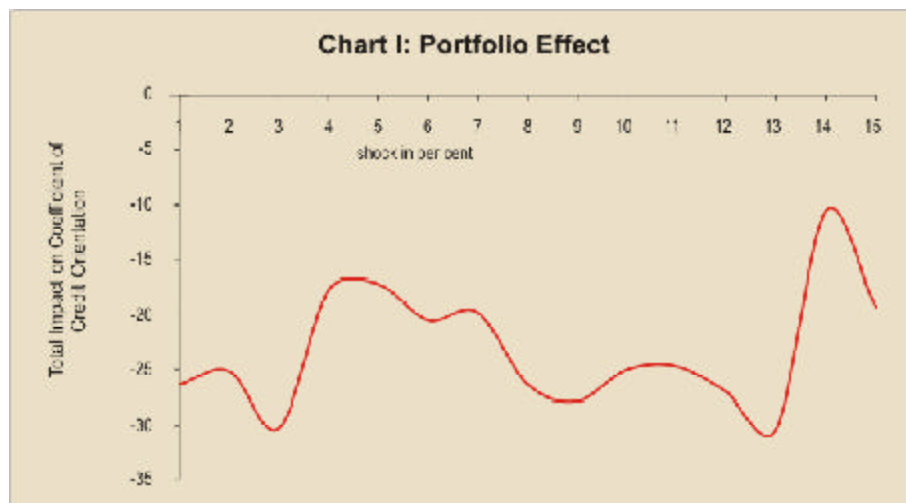
which implies that Z takes a non-zero value $(CDR_i - CDR)$ when $(CDR_i - CDR)$ is greater than or equal to k , and zero otherwise.

The modified regression model will be as follows.

$$Y = a + \mathbf{Sb}_i X_i + \mathbf{q}_1 (CDR_i - CDR) + \mathbf{q}_2 (Z)$$

Thus, the impact of a bank's competitive portfolio $(CDR_i - CDR)$ will be $(\mathbf{q}_1 + \mathbf{q}_2)$ when $(CDR_i - CDR)$ is greater than and equal to k and the impact will be \mathbf{q}_1 otherwise.

The sensitive analysis was carried out for gross NPAs equation (Model M-7) for various values of k in the range of 1-15 per cent implying the extent to which a bank can strategically chose its CDR_i higher than the industry average CDR . The results of the sensitive analysis pertaining to the coefficient of $(CDR_i - CDR)$ and Z are shown in Chart I. It is evident that a bank could exploit competitive portfolio



advantage within a range of about 8-13 per cent difference between its own CDR and that of the industry.

6. *Sample Sensitivity*

The cross-section empirical analysis may be sensitive to the behaviour of a dominant economic unit for which results may not be robust enough for arriving at meaningful conclusion. In this regard, the robustness of the empirical model was examined by removing the largest bank from the sample and re-estimating parameters of the model.

The results of such exercise are outlined in Annex I for gross NPAs (Model M-9) and net NPAs (Model M-10), respectively. From a comparative perspective, the results indicate that the sign condition of parameters does not alter for any explanatory variable, thereby, reiterating the stability of the empirical model. As obvious, the size of various coefficients has changed, *albeit*, marginally. The inclusion of the dominant bank inflates coefficients of all variables except cost and priority sector loan variables. However, the effect is more pronounced on bank size while less pronounced on other variables, in particular, terms of credit variables. Overall, such finding reinforce the robustness of original cross-section analysis, which includes a dominant bank in the sample.

Section V

Conclusion

This study attempted an empirical analysis of the non-performing loans of public sector banks in India and investigated the response of NPLs to terms of credit, bank size and macroeconomic condition. The empirical analysis suggested that terms of credit variables have significant effect on the banks' non-performing loans in the presence of bank size and macroeconomic shocks. Moreover, alternative measures of bank size could give rise to differential impact on bank's non-performing loans. For instance, the bank size measured in terms of assets, has negative impact on NPAs, while the measure of bank size in terms of capital has positive and significant effect on gross NPAs but negligible effect on net NPAs. Thus, appropriate measure of size assumes importance. The empirical analysis suggests that asset measure of size could yield meaningful results relating to borrowers' loan response.

The changes in the cost of credit in terms of expectation of higher interest rate induce increase in NPAs. On the other hand, factors like horizon of maturity of credit, better credit culture, and favorable macroeconomic and business conditions lead to lowering of NPAs.

The results confirm the viewpoint that banks exposure to priority sector lending could not be more important than credit culture and terms of lending variables. The empirical analysis suggests that positive deviation of an individual bank's credit-deposit ratio (CDR), from that of industry's average could have favourable effect on reducing NPAs. Banks could exploit competitive portfolio advantage within a range of about 8-13 per cent difference between their own CDR and that of the industry. The robustness of results was tested by excluding a major bank from the sample and re-estimating parameters of the model. As a result, the sign condition of parameters does not alter for any explanatory variable, thereby, reiterating the stability of the empirical model.

The results of the study are in line with a considered view in the banking literature and provide an important insight for banks'

lending behavior. Appropriate credit culture and lending policy designed with relevant economic and financial factors constituting the terms of credit will make a significant impact on banks non-performing loans.

For further research, there is scope for improvement and additional insights. Over time, as database expands, future studies may use time-dimensional maturity composition of loans, various other formulations of appropriate cost condition and interest rates charged to borrowers for identification of differential response of borrowers and lenders.

Annex I Empirical Analysis of Non-Performing Loans

	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10
Bank Size (Asset measure)	-185.04 (-5.2)	-111.34 (-4.5)			-205.83 (-6.7)	-111.63 (-4.4)	-214.41 (-7.4)	-113.37 (-4.4)	-209.04 (-6.1)	-132.8 (-5.2)
Bank size (measure of Capital and Reserves)			66.45 (4.6)	7.77 (0.5)*						
Maturity	-6.16 (-3.5)	-10.73 (-5.5)	-2.08 (-1.2)*	-10.18 (-4.6)	-9.64 (-5.2)	-10.61 (-5.1)	-6.83 (-3.4)	-10.46 (-4.9)	-7.16 (-3.5)	-10.79 (-5.0)
Cost Condition	48.56 (5.1)	47.77 (5.2)	82.1 (12.7)	59.77 (6.5)	65.79 (7.9)	61.62 (7.1)	48.9 (5.4)	61.65 (7.2)	49.63 (5.3)	61.61 (7.1)
Credit Orientation	-19.05 (-11.60)	-16 (-7.6)	-17.14 (-15.57)	-11.74 (-5.49)	-21.76 (-14.67)	-16.1 (-8.35)	-19 (-11.6)	-16.35 (-8.8)	-18.62 (-11.7)	-17.45 (-9.3)
Expected Macroeconomic Environment	-0.28 (-11.0)	-0.19 (-5.5)	-0.28 (-14.4)	-0.18 (-4.9)	-0.34 (-14.8)	-0.2 (-6.6)	-0.32 (-12.2)	-0.2 (-6.7)	-0.32 (-12.3)	-0.22 (-7.5)
Exposure to Priority sector					16.16 (7.5)	10.61 (4.8)	14.52 (6.9)	10.59 (4.8)	14.5 (7.0)	10.58 (4.7)
Expected Asset return							-0.63 (-5.1)	-0.08 (-0.5)*	-0.58 (-4.7)	-0.17 (-0.2)*
Adjusted R ²	0.98	0.91	0.99	0.87	0.98	0.94	0.98	0.92	0.98	0.94
DW statistics	1.88	1.93	1.88	1.93	1.92	1.96	1.84	1.96	1.82	1.93

* are not significant. Remaining coefficients are all significant at 5 per cent level of significance.

Annex II

Business Cycle Effect on Non-Performing Loans

Variables	Models of Gross NPAs Ratio			Models of Net NPAs Ratio		
	S1	S2	S3	S4	S5	S6
Bank Size (Asset measure)	-190.64 (-6.9)	-210.99 (-7.4)	-210.97 (-7.3)	-120.51 (-5.2)	-147.84 (6.4)	-147.84 (6.4)
Maturity	-6.94 (-3.3)	-6.68 (-3.4)	-6.68 (-3.4)	-10.83 (6.3)	-5.62 (4.7)	-5.62 (4.7)
Cost Condition	18.67 (2.0)*	43.31 (3.9)	43.29 (3.8)	36.78 (4.3)	-42.39 (3.9)	-42.39 (3.9)
Credit Orientation	-18.67 (-10.4)	-18.89 (-11.3)	-18.89 (-11.3)	-15.60 (9.0)	-13.46 (8.7)	-13.46 (8.7)
Exposure to Priority Sector	13.30 (6.3)	14.2 (6.6)	14.22 (6.6)	9.91 (5.0)	5.50 (3.1)	5.50 (3.1)
Expected Stock Return	0.35 (2.1)	-0.46 (-1.6)**	-0.46 (-1.6)**	1.09 (6.8)	3.18 (13.9)	3.19 (13.9)
GDP Growth Rate	0.37 (10.7)	0.07 (0.8)***	-0.20 (-1.4)	0.38 (11.3)	1.02 (14.4)	1.57 (12.5)
GDP Growth Rate (lag)		-0.27 (-3.6)			0.55 (9.6)	
Cyclical GDP Effect (Change in GDP growth rate)			0.27 (3.6)			-0.55 (-9.6)
DW / R2	0.98, DW =1.8 3	0.98, DW =1.82	0.98, 1.82	0.95, 1.9	0.96, 1.64	0.96, 1.64

* significant at 5 per cent, ** significant at 10 per cent, and*** not significant. Remaining coefficients are highly significant at below 5 per cent.

Notes

¹ 'Bonds hold attraction for India's lazy bankers', Times News Network, November 25, 2003

² Source: Global NPL Report, 2004, Ernst and Young.

³ As measured by balance sheet information on interest expenses on account of deposits

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