Pro-cyclical Management of Banks' Non-Performing Loans by the Indian Public Sector Banks

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This study provides an analysis of pro-cyclicality of bank indicators with a focus on the non-performing loans (NPAs) of India's public sector banks. The empirical analysis demonstrates that banks' NPAs are influenced by three major sets of factors, *i.e.,* terms of credit, bank specific indicators relating to asset size, credit orientation, financial innovations (non-interest income), and regulatory capital requirement and the business cycle shocks. Using panel regression model, the study found that the terms of credit variables such as interest rate, maturity and collateral and bank specific variables had significant effect on the banks' non-performing loans in the presence of macroeconomic shocks. The empirical findings support the policy approach to the banking in the Indian context. The credit culture as reflected in the terms of credit variables could play an important role in the banks' management of business cycle impact on loans and credit risk.

JEL Classification : G21, E51, G11, C23
Key Words : Bank credit, non-performing loans, terms of credit, panel regression.

1. INTRODUCTION

Following the implementation of the Basel Accord across several countries, a large literature including Borio, Furpine and Lowe (2001), Borio and Lowe (2002), White (2006) has emerged on the subject of procyclicality of bank indicators. Economists' concern derives from the key lesson learned from the various crises including the recent global crisis originating from an advanced economy like the US, i.e., the procyclicality of financial indicators could contribute to the amplification of the business cycle and thereby, pose problems for macroeconomic policies for stabilization purposes. From policy perspective, many studies have suggested that regulators could adopt counter-cyclical prudential measures for maintaining financial stability and ensuring sustained economic progress. According to White (2006), such a policy framework could entail a new macroeconomic stabilization framework and symmetric policy response to the expansionary and contractionary phases of the financial cycle. Taking inspirations from the literature, this study focuses on the Indian context. There are several motivations for the study. The Indian context could provide crucial insights about the experience of a leading emerging market economy. India adopted financial sector reform in the early 1990s, with a focus on the banking sector that constitutes the predominant component of the financial system. As part of the banking sector reform, India adopted various prudential norms in line with the Basel Accord, apart from introducing measures aimed at strengthening price discovery process in the financial markets and competition in the banking sector based on the recommendations of the two high level committees on banking

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sector. Reflecting the success of financial sector reform, the Indian economy witnessed rapid progress during the post reform period, notwithstanding the episodes of contraction in the economy during the late 1990s and the early part of the current decade due to various adverse external and domestic developments such as the Asian crisis, the world recession and the poor monsoon. The average growth rate of real Gross Domestic Product (GDP) increased to 6.4 per cent and 8.8 per cent during the 1990s and 2003-08, respectively, from the growth rates of 5.8 per cent during the 1980s and 3.5 to 4.0 per cent, the latter often referred to '*hindu growth'* rate, during the 1950s through the 1970s. In tandem with the economic progress, the banking sector also showed significant improvement in terms of various prudential indicators relating to capital, asset quality, management, efficiency and liquidity. In this milieu, several pertinent questions arise. How did Indian banks manage to show improved performance? How did Indian banks overcome the business cycle? Whether bank indicators in India are procyclical in nature? Whether there were several other variables which contributed to the banks' performance over the years. This study is focused on non-performing loans, which reflect on the credit risk management by the banks[*].There is a considered view that loan defaults could be managed by appropriate risk pricing of loans encompassing the terms of credit variables such as interest rate, maturity, collateral, and credit culture. For the empirical evidence, the study uses pooled regression analysis based on the balance sheet data of 27 public sector banks over the period 1996 to 2008. These public sector banks account for the bulk of the banking system in terms of aggregate deposits, credit, and investments. Deriving from the literature on the subject, we demonstrate that apart from the business cycle, the terms of credit variables played an important role with statistically significant effects on the banks' non-performing loans in the presence of bank size induced risk preferences and macroeconomic shocks. The changes in the cost of credit in terms of higher interest rate induce rise in the NPAs. On the other hand, factors like maturity of credit, better credit culture and favorable macroeconomic and business conditions lead to lowering of the NPAs. Business cycle may have differential implications adducing to differential response of borrowers and lenders. These findings have implications for regulation and policy. The remainder of the study is structured in three sections comprising the review of literature, empirical findings, policy implications and conclusion in that order.

[*]According to the Reserve Bank of India, the credit risk is most simply defined as the potential that a bank's borrower or counterparty may fail to meet its obligations in accordance with agreed terms. The goal of credit risk management is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters. Banks need to manage the credit risk inherent in the entire portfolio, as well as, the risk in the individual credits or transactions. Banks should have a keen awareness of the need to identify measure, monitor and control credit risk, as well as, to determine that they hold adequate capital against these risks and they are adequately compensated for risks incurred (see the Master Circular No. DBOD.No.BP.BC. 6 /21.01.002/2009-10 dated July 1, 2009, RBI/2009-2010/37, RBI, www.rbi.org.in).

2. THE LITERATURE

From a cross-country perspective, studies on the problem of loan defaults or non-performing loans (NPLs) bring to the fore several useful perspectives. Sergio (1996) in a study of non-performing loans in Italy found 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. Business cycle could be a primary reason for banks' non-performing loans. But the increase in bad debts as a consequence of recession alone was not empirically demonstrated. In a study of loan losses 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. Thus, the study suggested that bankers should make a fairly accurate personality-morale profile assessment of prospective and current borrowers and guarantors. In addition, banks could 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 and monetary expansion, besides the *tequila* effect were reasons behind the banking fragility. Their empirical results suggested that the bank size measured by 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 in-depth 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 such as the limitations on the access to credit, macroeconomic stability, collection technology, bankruptcy code, information sharing, the judicial system, prescreening techniques, and major changes in the 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 its growth rate, the 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; 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.

In the Indian context, there is a considered view that banks' lending policy could have crucial influence on non-performing loans (Reddy, 2004). He critically examined various issues pertaining to terms of credit of Indian banks and argued 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'. 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 and 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. The Indian viewpoint alluding to the concepts of 'credit culture' owing to Reddy (2004) and 'risk pricing' owing to Mohan (2003a) confirm with several studies mentioned in the above that apart from the business cycle, banks' lending policy could play an important role in the management of loan defaults.

3. EMPIRICAL ANALYSIS

A comparative picture of the trends Gross NPA ratio and various other bank indicators including the terms of credit variables relating to maturity (share of term loans in total advances), interest cost of deposits, operating expenses to asset ratio, loan collateral (the share of unsecured loans), credit-deposit ratio deriving from the balance sheets of 26 public sector banks in India since 1995-96 is presented in Table 1 and Annex 1.

The average credit-deposit ratio of banks increased from slightly less than 50 per cent in the second half of the 1990s to 71 per cent by March 2009, reflecting the impact of financial sector reform and the changes in monetary policy such as the reduction of statutory liquidity requirement and cash reserve ratio and softening of interest rates. However, the growth of credit did not show the deterioration in asset quality as the management of NPAs showed significant improvement. The gross NPAs as percentage to advances declined from about 18 per cent in 1995-96 to 1.7 per cent in 2008-09. The declining trend in the Gross NPA ratio was accompanied by the rising trend in the loan maturity, declining loan interest rate, the improvement in managerial efficiency through the reduction in banks' operating cost, strengthening of capital to risk weighted assets and the improvement in the banks profitability (return on assets).

3.1 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 behavior. 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, it was evident that the economic

behaviour of each bank as reflected in various stylized facts about the loan portfolio, the cost structure and the performance could not be similar. This was evident from cross-section maximum and minimum values and the variability of various indicators (Annex 1). Thus, a cross section analysis assumes importance.

The basic regression equation for the NPA indicator is postulated in terms of various factors affecting the loan market from the demand side (borrowers) and supply side (banks) as follows:

Gross NPA Ratio = F (Loan Interest, Cost burden of banks, Collateral, Loan Maturity, Credit orientation, Policy rate, Regulatory Capital Requirement, Business Cycle, Lag Dependent variable)

Annex 2 provides the description of the variables. The study uses gross NPAs rather than the net NPAs because the latter affected by banks' provisions may not adequately reflect on the underlying credit risk and loan defaults faced by the banks. For robustness of the empirical findings, the regression equations were estimated with alternative measures of business cycle variable: the deviation of GDP over logarithm scale from its trend (using Hodrick-Prescott) method, the actual GDP growth rate, actual GDP growth rate less expected GDP growth rate (one period lag), actual GDP growth less the expected medium term GDP growth rate (average of last three years GDP growth rate). The key findings arising from the estimated equations as shown in Annex 3 are as follows.

First, the terms of credit variables were statistically significant with appropriate sign. Loan interest rate had positive impact on Gross NPA ratios.

Second, the maturity of loans had negative impact on gross NPA ratio; a bank providing longer term loans could benefit form lower NPAs. Longer term loan contracts could be attributable to better relationship between the banks and borrowers.

Third, the bank size variable had positive impact on gross NPA ratios. This could imply that large banks are more likely to have relatively more NPAs. This finding is in line with the literature. Due to the balance sheet constraint, small banks could show greater managerial efficiency than large banks in terms of loans screening and post loan monitoring, leading to lower defaults.

Table 1: Trends in Bank Indicators				
	GNPA Ratio	Lending Rate	Loan Maturity	Collateral (secured loans to total loans)
1996	18.12	12.65	26.89	93.05
1997	18.53	13.87	29.62	92.91
1998	17.04	11.85	32.23	92.35
1999	16.35	11.45	33.88	92.40
2000	14.20	10.91	35.02	91.84
2001	12.72	10.66	35.16	89.81
2002	11.39	9.85	35.67	88.11
2003	9.87	9.37	39.20	88.62
2004	7.58	8.21	45.24	87.17
2005	5.38	7.37	49.75	84.76
2006	3.87	7.20	52.50	82.83
2007	2.55	7.77	55.65	82.83
2008	1.93	8.74	55.65	80.62
2009	1.74	9.40	54.95	81.81
	CRAR	Provisions	Return on Assets	Operating Expenses
1996	8.76	1.75	-0.43	3.04
1997	9.21	1.00	0.47	2.92
1998	11.13	0.86	0.71	2.76
1999	11.24	0.91	0.43	2.72
2000	11.42	0.96	0.54	2.59
2001	11.38	1.02	0.38	2.78
2002	11.45	1.26	0.73	2.40
2003	12.47	1.46	1.01	2.34
2004	13.13	1.63	1.22	2.24
2005	12.54	1.45	0.85	2.19
2006	12.11	1.07	0.77	2.08
2007	12.21	0.95	0.84	1.78
2008	11.93	0.74	0.86	1.55
2009	13.34	0.89	0.89	1.47
	Interest on Deposits	Net Interest Margin	Non-interest income ratio	Credit-deposit Ratio
1996	7.88	4.76	1.27	50.72
1997	8.08	5.79	1.22	47.54
1998	7.57	4.28	1.29	47.25
1999	7.57	3.87	1.19	46.35
2000	7.58	3.33	1.32	47.30
2001	7.30	3.37	1.24	48.45
2002	7.14	2.72	1.59	50.57
2003	6.40	2.97	1.79	51.41
2004	5.29	2.92	2.01	51.87
2005	4.59	2.78	1.39	56.83
2006	4.63	2.57	0.97	64.88
2007	4.98	2.79	0.94	69.15
2008	6.08	2.66	1.00	71.04
2009	6.36	3.04	1.06	71.29

Fourth, the terms of credit variables like the interest rate, loan maturity, and bank size the collateral variable (the proportion of unsecured loans) did not show invariably significant positive impact on the NPAs. It may be mentioned here that the unsecured loans included credit cards, where are treated as unfunded loans. Moreover, credit cards served the transaction needs of customers.

Fifth, the lag dependent variable, reflecting on the persistence of loan defaults, was also positive and statistically significant. But the size of this coefficient was less than 0.5; indicative of moderate legacy effect due better loan management by banks.

Sixth, banks having credit-deposit ratio greater than the industry average could have more NPAs. This could be attributable to better customer centric credit culture adopted by the banks.

Seventh, non-interest income, reflecting upon technological progress and financial innovations, had a favourable impact of moderating the NPAs.

Eighth, the coefficient of policy variable, i.e., changes in the interest rate signals, had positive impact on NPAs. This implied contractionary (expansionary) policy had positive association with the NPAs.

Finally, we come to the business cycle variable. Alternative measures of business cycle variable had differential association with the NPAs. The cyclical output and lagged GDP growth rate (expected GDP growth) had inverse relationship with the NPAs. The current GDP growth showed a positive but statistically insignificant association with the NPAs. On the other hand, unanticipated GDP growth rate (current GDP growth rate less previous GDP growth rate) showed a positive association with the NPAs. But the unanticipated GDP growth over a medium term (the deviation of current GDP growth rate from the past three-year average GDP growth) showed a positive but insignificant effect on the NPAs.

3. Policy Implications

In India, macroeconomic stabilization in terms of monetary and fiscal policies appropriate for sustained economic progress is the hallmark of India's policy approach to a sound and stable banking sector. The operating procedures of monetary policy witnessed a shift in emphasis from direct instruments to indirect instruments of monetary management during the reform period. During the reform period, the reduction in the cash reserve requirement (CRR) from 15 per cent to 5 per cent and the SLR from 38 per cent to 25 per cent was aimed at reducing statutory pre-emption of banks' funds so that they could lend more to productive sectors. The monetary policy increasingly relied on short-term policy interest rate, the repo and reverse rates, for signaling to financial markets apart from using

the open market operations to manage liquidity conditions. As part of the banking sector reform, the policy approach to sound and stable banking sector banking focused on instituting an appropriate credit culture encompassing effective terms of credit, efficient asset-liability management (ALM) and strict adherence to prudential norms in line with Basel Accord. As part of the ALM, Reserve Bank had issued guidelines on Asset Liability Management in February 1999, which covered, among others, interest rate risk and liquidity risk measurement, reporting frameworks and prudential limit. Further in April 2006, the Reserve Bank issued guidelines on ALM to the banks to follow Duration Gap Analysis (DGA) along with the traditional gap analysis for some banks. In line with the policy approach, banks are managing the maturity structure of deposits and loans and investments. They are increasingly mobilizing term deposits in order to provide long-term loans for productive sectors such as infrastructure. Recently, the Reserve Bank of India constituted a Committee (Chairman: Mr. Deepak Mohanty) to look into the prime lending rates of banks and suggest recommendations for further strengthening of the credit culture. The Committee submitted its report in October 2009, with a host of recommendations for enhancing transparency in the pricing of loans and determinations of lending rates. According to the Committee, the existing benchmark prime lending rate (BPLR) system should be replaced with a new Base Rate System (BRS). The constituents of the Base Rate would include (a) the card interest rate on retail deposit (deposits below Rs.15 lakh) with 1-year maturity adjusted for current account and savings account (CASA) deposits; (b) adjustment on account of negative carry in respect of CRR and SLR; (c) unallocatable overhead cost for banks; and (d) average return on net worth. The final lending rates would include the Base Rate plus variable or product specific operating expenses, credit risk premium and tenor premium. In order to make the lending rates responsive to the Reserve Bank's policy rates, the Group recommends that banks may review and announce their Base Rate at least once in a calendar quarter with the approval of their Boards. The Base Rate alongside actual minimum and maximum lending rates may be placed in public domain. It is possible that some banks charge unduly high product specific operating expenditure, credit risk and term premium from some borrowers. In order to avoid such unhealthy practices, the banks should continue to provide the information on lending rates to the Reserve Bank and disseminate information on the Base Rate. In addition, banks should also provide information on the actual minimum and maximum interest rates charged to borrowers. This would give both existing and prospective borrowers an idea of variable operating cost, credit risk and term premium charged by different banks.

The empirical findings of the study broadly support the policy approach to the banking sector in India. While the credit risk as reflected in non-performing loans could be influenced by the business cycle, it could be managed by appropriate terms of credit variable such as

loan interest rate and maturity and capital buffers, which have significant influence on non-performing loans. From this perspective, the proposed new system of lending rate is expected to enable banks to better manage credit risk.

4. Conclusion

This study analyzed the non-performing loans of public sector banks in India in terms of the response of NPLs to terms of credit, bank size and macroeconomic condition variables. Using the pooled regression analysis, the study found that the terms of credit variables had significant effect on the banks' non-performing loans in the presence of bank size and macroeconomic shocks. Moreover, alternative measures of business cycle could give rise to differential impact on bank's non-performing loans. The results of the study provide important insights for banks' lending behavior. From policy perspective, these findings are in line with the policy approach to banking sector in India, which emphasizes on the appropriate credit culture and lending policy designed with relevant economic and financial factors. The business cycle impact on non-performing loans could be managed with appropriate terms of lending in terms of maturity, loan interest rate and capital requirement.

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Annex 1: Indicators of Indian Banks' Performance					
	Summary Statistics (Cross section)				
Year ending March	Average	Median	Maximum	Minimum	Standard deviation
	Capital to Risk Weighted Assets Ratio (CRAR)				
1996	8.76	8.81	16.99	2.63	3.07
1997	9.21	10.26	17.53	-18.81	6.06
1998	11.13	10.86	18.14	1.41	3.07
1999	11.24	10.87	14.35	9.57	1.41
2000	11.42	11.50	14.48	9.15	1.26
2001	11.38	11.50	23.11	0.00	3.48
2002	11.45	11.81	17.90	1.70	2.67
2003	12.47	12.41	18.50	9.33	1.89
2004	13.13	12.82	20.12	9.48	1.99
2005	12.54	12.15	18.16	9.21	1.87
2006	12.11	11.94	14.00	10.62	1.04
2007	12.21	12.29	14.14	10.40	0.80
2008	11.93	12.04	13.25	10.09	0.83
2009	13.34	13.21	18.41	11.37	1.31
	Gross NPA Ratio				
1996	18.12	16.16	38.00	5.68	7.41
1997	18.53	16.31	39.12	7.36	7.75
1998	17.04	15.06	38.96	6.16	7.34
1999	16.35	15.56	38.70	5.66	6.91
2000	14.20	13.71	32.77	5.39	5.86
2001	12.72	11.81	25.31	5.21	4.96
2002	11.39	9.96	26.53	4.21	5.31
2003	9.87	8.92	21.16	3.45	4.15
2004	7.58	7.40	18.16	3.44	3.38
2005	5.38	5.01	10.85	2.46	2.23
2006	3.87	3.43	9.61	1.94	1.74
2007	2.55	2.42	4.81	1.15	0.87
2008	1.93	1.73	3.16	0.74	0.68
2009	1.74	1.68	2.88	0.65	0.60

Contd.

Year ending March	Average	Median	Maximum	Minimum	Standard deviation
	Provisions Ratio				
1996	1.75	1.52	6.94	0.11	1.54
1997	1.00	1.04	1.88	0.14	0.51
1998	0.86	0.79	1.78	0.19	0.41
1999	0.91	0.78	2.87	0.12	0.57
2000	0.96	0.93	1.92	0.24	0.43
2001	1.02	1.02	1.86	0.22	0.38
2002	1.26	1.25	2.16	0.33	0.41
2003	1.46	1.43	2.09	0.80	0.37
2004	1.63	1.72	2.35	0.94	0.40
2005	1.45	1.34	2.30	0.79	0.41
2006	1.07	1.02	1.99	0.53	0.31
2007	0.95	0.90	1.38	0.52	0.18
2008	0.74	0.75	0.98	0.27	0.17
2009	0.89	0.91	1.17	0.62	0.18
	Profitability per 100 Employee				
obs					
1996	-0.22	0.17	1.32	-4.91	1.26
1997	0.32	0.31	1.33	-1.43	0.53
1998	0.54	0.53	1.74	-1.12	0.53
1999	0.41	0.43	1.89	-2.91	0.79
2000	0.59	0.51	2.19	-1.62	0.66
2001	0.50	0.57	2.54	-2.43	0.87
2002	1.13	1.10	3.01	0.10	0.67
2003	1.75	1.58	3.88	0.04	0.88
2004	2.48	2.31	5.05	0.09	1.02
2005	2.06	2.06	4.99	-0.74	1.18
2006	2.11	2.22	3.92	0.36	1.04
2007	2.83	2.81	4.51	1.22	0.90
2008	3.57	3.66	6.12	0.74	1.23
2009	4.56	4.71	7.64	1.22	1.64
	Return (Profitability) on Assets Ratio				
1996	-0.43	0.38	1.64	-7.51	2.03
1997	0.47	0.55	1.56	-2.28	0.79
1998	0.71	0.81	1.50	-1.55	0.64
1999	0.43	0.51	1.28	-3.63	0.88
2000	0.54	0.58	1.38	-1.81	0.57
2001	0.38	0.43	1.33	-1.49	0.57
2002	0.73	0.73	1.34	0.06	0.34
2003	1.01	1.01	1.76	0.03	0.38
2004	1.22	1.22	1.73	0.06	0.36
2005	0.85	0.91	1.59	-0.45	0.42
2006	0.77	0.76	1.32	0.16	0.33
2007	0.84	0.80	1.35	0.42	0.22
2008	0.86	0.88	1.43	0.24	0.28
2009	0.89	0.87	1.48	0.30	0.29

Contd.

Year ending March	Average	Median	Maximum	Minimum	Stdev
	Loan Maturity (Term Loans to Total Loans)				
1996	26.89	25.55	44.59	11.86	8.98
1997	29.62	27.49	57.27	13.87	10.72
1998	32.23	30.13	75.52	14.68	12.71
1999	33.88	34.76	61.43	17.78	10.28
2000	35.02	34.54	64.29	18.79	10.19
2001	35.16	34.55	54.83	22.63	8.18
2002	35.67	37.01	45.01	23.38	5.95
2003	39.20	40.05	47.30	27.38	5.43
2004	45.24	45.03	57.39	31.97	6.40
2005	49.75	50.34	61.80	38.16	6.46
2006	52.50	53.90	62.97	37.74	6.97
2007	55.65	59.03	72.44	39.01	7.59
2008	55.65	56.29	71.87	38.73	8.83
2009	54.95	55.56	72.88	40.65	9.32
	Collateral Indicator (Unsecured Loans to Total Loans)				
1996	6.95	4.94	27.23	1.22	5.91
1997	7.09	5.55	28.14	1.01	6.05
1998	7.65	6.72	25.04	0.82	6.08
1999	7.60	6.29	27.97	1.25	6.27
2000	8.16	6.23	36.86	0.59	7.50
2001	10.19	8.67	24.60	2.68	5.80
2002	11.89	10.52	33.05	3.71	6.21
2003	11.38	10.73	24.84	3.00	5.19
2004	12.83	12.46	34.04	3.15	6.31
2005	15.24	15.08	25.39	4.86	5.82
2006	17.17	17.53	26.84	7.09	5.13
2007	17.17	17.67	28.79	6.85	5.70
2008	19.38	20.75	28.32	8.58	5.74
2009	18.19	19.71	29.20	6.96	5.90

Contd.

Year ending March	Average	Median	Maximum	Minimum	Stdev
	Operating Efficiency (Operating Expenditure/Assets)				
1996	3.04	3.05	3.73	2.14	0.41
1997	2.92	2.94	3.56	2.19	0.35
1998	2.76	2.75	3.43	2.04	0.38
1999	2.72	2.67	3.58	1.81	0.43
2000	2.59	2.56	3.42	1.74	0.37
2001	2.78	2.79	3.81	1.73	0.44
2002	2.40	2.40	3.33	1.63	0.42
2003	2.34	2.28	3.27	1.72	0.42
2004	2.24	2.14	4.00	1.57	0.49
2005	2.19	2.09	3.63	1.47	0.46
2006	2.08	2.08	2.76	1.48	0.31
2007	1.78	1.73	2.38	1.35	0.27
2008	1.55	1.55	1.99	1.19	0.22
2009	1.47	1.53	1.70	1.14	0.18
	Spread (Return on advances and investments less return on deposits)				
1996	4.94	5.11	7.48	1.13	1.17
1997	4.98	5.05	5.97	2.72	0.81
1998	4.65	4.82	5.75	1.50	0.80
1999	4.39	4.43	5.75	2.35	0.77
2000	3.99	3.95	5.32	2.51	0.62
2001	4.05	4.01	5.75	2.56	0.71
2002	3.57	3.60	4.54	2.50	0.54
2003	3.40	3.25	4.33	2.54	0.47
2004	3.46	3.52	4.22	2.58	0.47
2005	3.50	3.46	4.55	2.35	0.45
2006	3.27	3.31	4.18	2.53	0.42
2007	2.93	2.87	4.40	2.14	0.49
2008	2.32	2.38	3.17	1.16	0.49
2009	2.32	2.32	3.38	1.46	0.40

Annex 2: Definition of the Variables

1. Gross NPA Ratio: Gross NPA to Gross Advances Ratio

2. Loan Interest rate for a bank is defined as actual interest income to loans ratio (RL,j). In order to account for competitive pricing effect on credit risk, the cross-section loan interest rate is benchmarked to industry average in terms of a spread variable: (RL,j-1/n∑j RL,j)

3. Cost Condition: Interest cost on deposits and operating expenses to asset ratio

4. Other income: non-interest income (fees and commissions etc) to asset ratio to account for financial innovation.

5. Bank size is defined as the asset of a bank as ratio to industry wide aggregate asset.

6. Collateral: the ratio of unsecured loans to total loans.

7. Maturity of loan portfolio : the ratio of a bank's term loans to its total loans

8. CRAR: the capital to risk weighted asset ratio. In order to reflect on the capital buffer approach, each banks CRAR is benchmarked to the regulatory requirement i.e., 9 per cent in the India.

9. Credit orientation: credit-deposit ratio of bank as compared with industry average.

10. Business Cycle: Actual GDP (in logarithm scale) less its trend component (using Hodrick-Prescott trend)

11. Expected Growth : One period lag of GDP growth rate

12. Unexpected GDP Growth: Actual GDP growth less expected GDP growth (the variation GDP growth rate)

Annex 3: Estimated Equations

Dependent Variable: Gross NPA Ratio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.590818	2.719720	3.158714	0.0018
Interest on loans	0.318377	0.114563	2.779050	0.0058
Cost	0.384232	0.101435	3.787962	0.0002
Credit orientation	0.117971	0.016390	7.197576	0.0000
Other Income	-0.757433	0.225154	-3.364066	0.0009
Bank Size	0.035649	0.006841	5.211106	0.0000
Lag Dependent	0.765200	0.027623	27.70204	0.0000
Business Cycle	-0.116898	0.062033	-1.884455	0.0605
Policy rate	0.567774	0.079296	7.160189	0.0000
Collateral	0.034227	0.017156	1.995060	0.0470
Maturity	-0.048915	0.017052	-2.868520	0.0044

R-squared	0.967452	Mean dependent var	12.94944
Adjusted R-squared	0.963369	S.D. dependent var	9.576993
S.E. of regression	1.724587	Sum squared resid	853.5952
F-statistic	236.9646	Durbin-Watson stat	1.829217
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests: F Statistic (Significance): 2.09 (0.002) . The F statistic has degrees of freedom (26,285).

Dependent Variable: Gross NPAs

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.039986	2.649374	3.412122	0.0007
Interest on loans	0.261298	0.109959	2.376318	0.0181
Cost	0.478968	0.103408	4.631828	0.0000
Credit orientation	0.123436	0.015956	7.735793	0.0000
Other income	-0.790640	0.205939	-3.839204	0.0002
Bank size	0.035811	0.006734	5.317480	0.0000
Lag dependent	0.759637	0.026963	28.17377	0.0000
Policy rate	0.439878	0.054910	8.010830	0.0000
Collateral	0.039342	0.016879	2.330820	0.0205
Loan maturity	-0.056286	0.016317	-3.449492	0.0006
D(Growth rate)	0.079929	0.029353	2.723054	0.0069
	Regression Statistics			
R-squared	0.968917	Mean dependent var		13.17993
Adjusted R-squared	0.965018	S.D. dependent var		9.925581
S.E. of regression	1.728871	Sum squared resid		857.8416
F-statistic	248.5096	Durbin-Watson stat		1.744991
Prob(F-statistic)	0.000000			

Redundant Fixed Effects Tests: F Statistic (Significance): 2.28 (0.00)

Dependent Variable: Gross NPA Ratio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.33676	2.602577	3.971740	0.0001
Loan interest rate	0.294778	0.108491	2.717083	0.0070
Cost condition	0.339017	0.100042	3.388737	0.0008
Credit orientation	0.126728	0.015832	8.004379	0.0000
Other income	-0.863133	0.197735	-4.365097	0.0000
Bank size	0.034792	0.006588	5.281404	0.0000
Lagged dependent	0.761471	0.026460	28.77820	0.0000
Policy rate	0.528473	0.057062	9.261313	0.0000
Collateral	0.040872	0.016455	2.483869	0.0136
Loan Maturity	-0.047457	0.016288	-2.913639	0.0039
Expected GDP growth	-0.188934	0.047021	-4.018088	0.0001

Weighted Statistics

R-squared	0.970031	Mean dependent var	13.27579
Adjusted R-squared	0.966272	S.D. dependent var	10.09919
S.E. of regression	1.713348	Sum squared resid	842.5057
F-statistic	258.0443	Durbin-Watson stat	1.751997
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests: F Statistic (Significance): 2.47(0.00)

Dependent Variable: Gross NPAs ratio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.325787	2.765992	3.371589	0.0008
Loan interest rate	0.285677	0.116714	2.447674	0.0150
Cost condition	0.449245	0.126440	3.553020	0.0004
Credit orientation	0.120260	0.016365	7.348401	0.0000
Other Income	-0.634115	0.214549	-2.955568	0.0034
Size	0.036805	0.006953	5.293795	0.0000
Lag Dependent	0.762444	0.027809	27.41741	0.0000
Policy rate	0.436004	0.066055	6.600614	0.0000
Collateral	0.037522	0.017219	2.179043	0.0301
Loan maturity	-0.058740	0.016814	-3.493597	0.0006
GDP Growth rate	0.030682	0.058692	0.522758	0.6015

Weighted Statistics

R-squared	0.967722	Mean dependent var	13.08012
Adjusted R-squared	0.963673	S.D. dependent var	9.844455
S.E. of regression	1.740508	Sum squared resid	869.4286
F-statistic	239.0136	Durbin-Watson stat	1.778621
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests: F Statistic (significance: 2.17(0.001)

Dependent Variable: Gross NPA ratio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.092931	2.701503	3.365878	0.0009
Loan Interest	0.274374	0.113716	2.412806	0.0165
Cost condition	0.477806	0.112034	4.264848	0.0000
Credit orientation	0.121154	0.016159	7.497824	0.0000
Other income	-0.721623	0.218590	-3.301266	0.0011
Size (Assets)	0.036200	0.006856	5.279696	0.0000
X36?(-1)	0.761193	0.027488	27.69194	0.0000
Policy rate	0.438908	0.056950	7.706940	0.0000
Collateral	0.038078	0.017147	2.220706	0.0272
Loan Maturity	-0.056387	0.016583	-3.400367	0.0008
GDP Growth (unexpected)	0.060513	0.041701	1.451094	0.1478

Weighted Statistics

R-squared	0.968076	Mean dependent var	13.10328
Adjusted R-squared	0.964072	S.D. dependent var	9.830849
S.E. of regression	1.737417	Sum squared resid	866.3430
F-statistic	241.7548	Durbin-Watson stat	1.771419
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests: F Statistic (significance): 2.18 (0.00)

Dependent Variable: Gross NPAs

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.226848	2.818907	3.273201	0.0012
Loan interest	0.338035	0.119697	2.824097	0.0051
Cost condition	0.449538	0.105562	4.258520	0.0000
Credit orientation	0.117716	0.017009	6.920724	0.0000
Other income	-0.804929	0.230107	-3.498064	0.0005
Size	0.037338	0.007019	5.319442	0.0000
Lag Dependent	0.748177	0.029046	25.75823	0.0000
Policy rate	0.537248	0.082277	6.529749	0.0000
Collateral	0.022615	0.017484	1.293431	0.1969
Loan Maturity	-0.047240	0.017568	-2.689017	0.0076
Business Cycle	-0.113628	0.063519	-1.788868	0.0747
CRAR	-0.094435	0.039893	-2.367214	0.0186

Weighted Statistics

R-squared	0.967271	Mean dependent var	12.54349
Adjusted R-squared	0.962977	S.D. dependent var	9.410928
S.E. of regression	1.665874	Sum squared resid	782.5888
F-statistic	225.2489	Durbin-Watson stat	1.863386
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests: F Statistic (significance): 2.07 (0.002)

Dependent Variable: Gross NPA Ratio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.602098	2.801448	3.427549	0.0007
Loan interest	0.293927	0.120282	2.443655	0.0152
Cost condition	0.563679	0.118025	4.775943	0.0000
Credit orientation	0.119750	0.016867	7.099856	0.0000
Other income	-0.789818	0.225992	-3.494899	0.0006
Size	0.037996	0.007038	5.398496	0.0000
Lag dependent	0.742748	0.029138	25.49109	0.0000
Policy rate	0.407048	0.058397	6.970341	0.0000
Collateral	0.024873	0.017657	1.408665	0.1600
Maturity	-0.052157	0.017189	-3.034427	0.0026
CRAR (lag)	-0.106295	0.039664	-2.679863	0.0078
GDP Growth (unexpected)	0.064888	0.043242	1.500575	0.1346

Weighted Statistics

R-squared	0.967505	Mean dependent var	12.63016
Adjusted R-squared	0.963242	S.D. dependent var	9.497641
S.E. of regression	1.674340	Sum squared resid	790.5629
F-statistic	226.9280	Durbin-Watson stat	1.809092
Prob(F-statistic)	0.000000		

Redundant Fixed Effects Tests: F Statistic (significance): 2.07 (0.002)