CHAPTER 2
Research on and Practices in Credit Risk Management

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Chapter 2

Research on and Practices in Credit Risk Management

2.1 Basel II And Practices In Credit Risk Management

Most of the countries including India is going to implement the new Basel Framework, more popularly known as Basel II, as laid down by the Basel Committee on Banking Supervision (BCBS). This is going to have severe implication on credit risk practices in Indian banking, the way banks appraise credit proposals, price loans, manage credit risk at the individual and portfolio level, and also manage their NPAs. Consequently, Indian banks have been preparing and implementing various measures for effective management of credit risk. RBI, in this regard, has initiated capacity building measures to identify the gaps and to assess as well as quantify the extent of additional capital which may be required by banks. This gap analysis exercise is scheduled to end in December 2006 (Reddy, 2005). Therefore, it will be prudent to discuss and measure the effectiveness of the credit appraisal systems, on which depends the banks' asset quality and the magnitude of credit risk a bank will carry.

2.1.1 Basel II: The New Capital Accord


Pillar I: The Basel Committee has proposed the following approaches for estimating regulatory capital for the three types of risks that banks face viz., credit risk, market risk and operational risk.

Credit Risk
- Standardised Approach
- Internal Rating Based (IRB) Approach.

Market Risk
- Standardised Approach
- Models Approach
Operational Risk

- Basic Indicator Approach
- Standardised Approach
- Advanced Measurement

Pillar II : Under the second Pillar of regulatory requirements, banks should have internal process in place to assess the adequacy of capital in relation to their Risk Profile. Supervisors are responsible to review and evaluate banks' internal capital adequacy assessments.

Pillar III: The Basel Committee has set forth two types of disclosures under the third Pillar requirements, viz., Core and Supplementary disclosures. Core disclosures are those which convey vital information for all institutions and are important to the basic operation of market discipline. However supplementary information need to be made publicly available in case of sophisticated, internationally active banks. Further, the disclosures should be semi-annually but on broader issues like risk management it could be annual and quarterly in case of information subject to rapid change.

2.1.1.1 Credit Risk

As mentioned in the earlier paragraph the Basel committee offers two approaches for calculating risk-weighted assets i.e. the standardized and the IRB approaches.

a. Standardised Approach

Under the Standardised approach, preferential risk weights in the range of 0%, 20%, 50%, 100% and 150% would be assigned on the basis of ratings given by external
credit assessment institutions (ECAIs). The key requirement under this approach are:

- External credit assessment Institution ratings to be taken for capital allocation
- Accreditation of ECAIs by national supervisors

The risk weights on various counterparties are as follows:

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<tr>
<th>Rating</th>
<th>Sovereigns</th>
<th>Banks</th>
<th>Corporates</th>
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<tr>
<td>AAA to AA-</td>
<td>0%</td>
<td>20%</td>
<td>20%</td>
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<tr>
<td>A+ to A-</td>
<td>20%</td>
<td>50%</td>
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<td>BBB+ to BBB-</td>
<td>50%</td>
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<td>BB+ to B-</td>
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<td>Below B-</td>
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<tr>
<td>Unrated</td>
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b. IRB Approach

Under the IRB approach, the Committee allows banks to use either the Foundation approach or the Advanced approach. The IRB approach is further discussed in Section 2.1.1.2.

In addition to the increased reliance on bank’s internal assessments of risk, the Committee proposes to make another important departure from the 1988 Accord. The minimum capital required for an exposure will not only depend on the risk or characteristics of that exposure, but also, on the relationship with a bank’s other exposures. Thus, a bank’s capital requirements for credit risk will also depend on the concentration of a bank’s exposures to single borrowers, or groups of closely related borrowers. Granularity (G), or rather a lack of it, is shown to be a material driver of credit risk. The Committee has proposed to incorporate this adjustment into the IRB approach by means of a standard supervisory capital adjustment applied to all non-retail exposures under IRB treatment.

2.1.1.2 The Internal Ratings- Based (IRB) Approach

With the IRB approach (Basel, 2001) the Basel Committee seeks to meet two objectives viz,

- Additional risk sensitivity
  
  Capital requirements based on internal ratings are more sensitive to the drivers of credit risk and economic loss in a bank’s portfolio
• **Incentive compatibility**
  
  An appropriately structured IRB approach provides a framework which encourages banks to continue to improve their internal risk management practices.

  The following five elements are vital for the supervisory IRB approach to work in practice.

  • A classification of exposures by broad exposure type (corporate, sovereign, banks, retail, projects);
  
  • For each exposure class, certain risk components which a bank must provide, using standardized parameters or its internal estimates;
  
  • A risk-weight function which provides risk weights (and hence capital requirements) for given sets of these components;
  
  • A set of minimum requirements that a bank must meet in order to be eligible for IRB treatment for that exposure, and
  
  • Across all exposure classes, supervisory review of compliance with the minimum requirements.

  The components PD, LGD, EAD and M form the basic inputs to the IRB approach, and consequently the capital requirements derived from it. These components are elaborated below:

  • The Probability of default (PD) of a borrower or group of borrowers is the central measurable concept on which the IRB approach is built. The PD does not, however, provide the complete picture of the potential credit loss. Banks also seek to measure how much they will lose should a borrower default on an obligation. This is contingent upon the EAD and LGD.

  • Exposure at default (EAD) is the amount to which the bank was exposed to the borrower at the time of default.

  • Loss Given Default (LGD) is the magnitude of likely loss on the exposure expressed as a percentage of the exposure. It is 100 minus the recovery rate. The net recovery, as a percentage of the actual exposure at the time of default, will give the recovery rate.

  • The IRB approach also takes into account the maturity (M) of exposures. Where there is no explicit adjustment for maturity, a standard supervisory approach is presented for linking effective contractual maturity to capital requirements.
These three components PD, LGD, EAD combine to provide a measure of expected intrinsic or economic loss. The two approaches viz., Foundation IRB approach (F-IRB) and Advanced IRB (A-IRB) approach are discussed in the following paragraphs.

a. Foundation IRB Approach

Under this approach, banks, which comply with certain minimum requirements (given below) could assign preferential risk weights, with the data on Loss Given Default (LGD) and Exposure at Default (EAD) provided by the national supervisors.

The Basel Committee (Basel, 2001) has laid down, amongst others, the following as minimum requirements for corporate exposures under the Foundation IRB Approach.

- Separate assessment of borrower and transaction characteristics. One rating scale should be oriented to the risk of the borrower defaulting on its obligation. The second should have a facility orientation that would consider both borrower and transaction specific factors.

- A minimum of 6 to 9 grades for performing borrowers and a minimum of 2 grades for non-performing borrowers. For banks having specialized rating schemes for different types of borrowers, products or market segments, smaller number of risk grades may be used. However, the minimum is set at 6 performing grades and 2 non-performing grades.

- No more than 30% of the gross exposures to fall in any single borrower grade.

- A conservative credit evaluation when greater uncertainty exist and a comprehensive assessment of the borrower’s financial condition over the future horizon.

- Risk factors should have the ability to differentiate risk, have predictive and discriminatory power, be both plausible and intuitive.

- A conservative view should be taken of projected information.

- Probability of Default (PD) estimates must represent a conservative view of a long-run average PD which must be estimated over an entire economic cycle.

- Three estimation techniques for PD estimation viz., a. internal default experience, b. mapping to external data, and c. statistical default models.

- Rating system should be an integral part of a bank’s current business and risk management culture. More specifically, it should be used for the following functions:
  a. Credit approval authorities and limits;
b. Evaluation of loan pricing;
c. Reporting portfolio’s risk profile to bank management and to the Board;
d. Analysis of the bank’s capital adequacy and profitability; and
e. Performing stress tests to assess capital adequacy.

b. **Advanced IRB Approach**

The IRB Advanced Approach has the following features:

- more closely aligns capital requirements to banks’ internal risk measurement and management practices, and is consistent with the philosophy of providing incentives for banks to improve these practices.

- Allows banks to estimate the probability of default, the likely loss to be incurred should the borrower default, the likely level of exposure to that borrower at the time of default, and the effect of guarantees and credit derivatives on the risk of the exposure. Thus, banks can use their own estimates of PD, LGD and EAD, which will be validated by supervisors.

### 2.1.2 Practices in Credit Risk Management

#### 2.1.2.1 International Practices

In January 2000, the Basel Committee issued a paper titled *Range of Practice in Banks’ Internal Rating Systems* (Basel, 2000), which summarized the key findings from its empirical studies and surveys in respect of the rating systems used in best-practice banks. These are discussed below.

a. **The number of grades both for performing and non-performing loans**

- Rating systems differentiate between good quality assets and exposures that show potential weaknesses.

- Across the banks surveyed, the number of grades for performing loans was on average 10, the number for impaired loans was about 3, although in both cases there was wide diversity across banks.

b. **The decision whether to focus the rating on the borrower or the facility**

- The rating systems in place at most banks include an explicit obligor dimension that is, they assign a rating that is meant to reflect primarily the risk that the borrower will default on any of its obligations.

- Many banks also utilize a two-dimensional rating system that includes both an obligor and a facility grade. In some cases, facility grades were
based on the relevant obligor grade, adjusted explicitly or implicitly by "notching" the grade higher or lower to reflect the attributes of the transaction in question.

- Only a small number of banks operate rating systems with only a facility grade, and only a small minority of the banks surveyed takes no consideration of facility characteristics in their grading processes.

- Among those banks with two-dimensional rating systems, a small number appear to assign an obligor rating and a second LGD rating grade that explicitly and separately evaluates likely recovery rates for each transaction in the event that a default were to occur.

c. **The means by which ratings are assigned**

- The survey identified a continuum of practice bounded by full reliance on quantitative techniques (such as scoring models), on the one hand, and full reliance on the personal experience and expertise of loan officers, on the other.

- In general terms, three categories of rating systems can be identified: statistical-based processes, constrained expert-judgment based processes and full expert-judgment reliant processes. In practice, banks often use a different mix of these techniques in different market segments. Each of the banks surveyed use all of these techniques in the large, medium and small corporate lending market, although to very different degrees.

- External ratings are also considered in assigning internal grades, to the extent that such an external rating is available for the borrower in question.

- In some banks a default probability model or other quantitative tool is essentially the sole basis for determining a rating for certain portfolios. Such models are either developed internally or by vendors, and typically include both quantitative (financial ratios) and some qualitative but standardized (e.g. industry, payment history/credit report) factors.

- The modeling techniques are discriminant, logit-based, or based on classic credit scoring techniques. In general, the statistical based approaches have a more prominent role in small corporate lending than for middle market or large corporate.
The survey revealed that at times, the statistical models provided a "baseline" rating that can be overridden by raters. At other times these tools are only one consideration among many in assigning grades. In all cases based on unconstrained expert judgment, however, the rater has discretion to significantly deviate from statistical model indications in assigning a grade.

Mostly, these systems do not need to specify the factors to be considered as fully as model-based systems, although raters may be required to address certain core issues or risk factors. In some cases, peculiar circumstances surrounding an individual borrower may come to dominate a risk assessment yet would be excluded from consideration in a model-oriented process.

d. The risk factors considered in the rating assignment process

- Essential in the process of assigning a rating of a borrower are balance sheet, income statement, and cash flow performance. When using statistical default models, specific types of financial data are required e.g. specific ratios that describe leverage, debt service coverage, etc.), while a more judgemental analysis may leave much discretion to the rater in respect of which economic data are used and how they are analysed. Sometimes this discretion is supported by some standardization via inclusion of exclusive guidance ratios in the documentation of the formal rating criteria. At times, formal industry and peer group analysis plays a significant role in assigning ratings. Internal economic analysis units or outside vendors provide such analysis.

- Management experience and competence are also important considerations especially when raters are allowed to override the results of statistical models. Other considerations are ownership structure, reputation, quality of financial information, the purpose of the loan, and in some instances the presence of environmental or other liability claims against the borrower.

- Country risk is almost universally considered for cross-border lending.

- All banks take into account ‘facility’ characteristics such as third-party guarantees, collateral, and senior/subordination of the obligation in
making lending decisions and more generally in their credit risk mitigation processes. Collateral is generally also considered as an input in reducing the severity of the loss and thus in improving facility ratings.

- The survey revealed that banks take account a wide range of both financial (e.g. marketable securities) and physical (e.g. real estate) forms of security.
- Banks providing facility grades generally did not consider the liquidity of the instrument being rated in assigning that grade, although in some cases the liquidity of collateral (and implication for its value) was considered explicitly.
- Other risk factors, like the variability of loss, or the correlation of risk factors, are generally not taken into account in assigning ratings.
- Although maturity is often considered in the process of allocating of economic capital for credit risk, it is not explicitly cited as consideration in the assignment of ratings.

2.1.2.2 Risk Rating Practices in Indian Public Sector Banks

During the late eighties, signal started emerging that the directed system of lending was gradually giving way to discretion based lending by the commercial banks. This led to the emergence of a simplified form of credit rating in the Indian Banking system, specially the public sector banks. In a sense, the health code system introduced by RBI may be said to be the precursor of the credit rating system. In reality, however, the data collected through the health code classification system did not have any significant bearing on the decision-making and pricing credit facilities. The credit rating system, on the other hand, was introduced by the banks to measure the suitability of the loan accounts against a standard scale for the purpose of fixing a proper price. SBI was one amongst the first public sector banks to have introduced the system during that period.

The credit rating system then, used a simple framework wherein two broad parameters were considered (i) the financial parameters and (ii) the compliance parameters. The financial parameters were generally confined to two or three most important ratios viz., Current Ratio and TOL/TNW or Debt Equity Ratio. The compliance parameters, on the other hand, contained some general queries viz., whether
the enterprise submits stock statements in time, whether the account has been running satisfactorily. However, this framework was not found suitable for providing answers to the pressing questions that started emerging in course of the fast changing economic scenario during the nineties. It became necessary to evolve models that would capture the risks inherent in the credit proposals (Murty, 2002). Subsequently, in view of Basel II requirements, most of the banks have modified their work practices and are evolving new methodologies for assessing credit risk.

A brief outline of the new risk rating systems (refer to chapter 4 for details) and the credit risk management practices of Indian banks is given below.

- The risk categories identified by the banks can broadly be categorized as three viz., Financial Risk, Business/Industry Risk and Management Risk. Critical parameters are assessed under these broad categories.

- The risk categories are allotted weights based on their relative importance. Individual parameters are assigned scores, which are then summed to get the aggregate score for the particular type of risk. These risk scores are added to get the final score and based on the final score the credit proposal would be given a gradation.

- The nomenclature for grades varies from bank to bank. The Reserve Bank of India has suggested that a scale consisting of eight or nine risk levels may be used by the commercial banks in India.

- Banks have been found to use different credit risk assessment models depending on whether the proposal relates to an existing unit or a new unit, whether the intended credit exposure is short term or long term, whether the activity is manufacturing or trading or service. The practice amongst banks varies with regard to the number of models used. A brief account of the credit risk management practices of Indian banks are given in the following paragraphs.

- Banks’ Credit Risk Management is covered in the Loan Policy Document of the banks, which details the strategy the bank has, in addressing its target markets, risk tolerance, risk acceptance/avoidance, risk diversification/concentration, besides credit risk measurement, monitoring and controlling mechanisms.
• Banks have Credit Risk Management Committee comprising of senior executives who oversees all aspects of credit risk and the Credit Risk Cell does the day-to-day functions of managing.

• Standardized Credit Approval Process with well established methods of appraisal and rating is the pivot of the credit management system of the banks.

• Various credit rating / scoring models are used in the spheres of retail and non-retail portfolios of the bank.

• The pricing of the loans has been linked to credit risk rating.

• The portfolio of all the rated accounts is monitored regularly to decide policy initiatives to improve the quality of the loan portfolio.

• Banks have implemented Preventive Monitoring System (PMS) for all large corporate borrowers., which is a scientific monitoring tool comprising of signals/indicators for evaluating the health of a borrowal account on a continuous basis. PMS is basically a branch/micro-level monitoring tool, which is effective in nature and pro-active in approach as it gives early warning signals in respect of a borrowal account.

• Banks have also initiated the Loan Review Mechanism with setting up of Credit Audit and Review Division for post sanction review of accounts.

• Pro-active credit risk management practices in the form of studies on future probability of defaults of borrowers, portfolio analysis of retail lending assets, periodic industry review, review of country, currency, counter-party and group exposures are some of the prudent measures that banks engage in for mitigating risk exposures.

Thus, the current focus of banks is on augmenting their abilities to quantify risk in a consistent, reliable and valid fashion. This will ensure advanced level of sophistication in the credit risk measurement so as to enable them to upgrade to the level of the IRB Approach from the Standardised Approach. This upgradation is crucial in the years ahead in light of the policy developments of the Reserve Bank of India. RBI has announced on February 15, 2005, that banks have to adopt the Standardised Approach for credit risk with effect from March 31, 2007. Banks will be allowed to migrate to Internal Rating Based (IRB) approach only after they develop adequate skills.
The features of the internal rating systems of the surveyed banks are analysed in chapter 4.

2.2 Literature Review

While there is a growing empirical literature on validity and reliability of credit risk models, in general, and external ratings in particular, there is still very little published work on the methodology and empirics on internal ratings.

The literatures can be clubbed into the following categories-

a. Literature on internal ratings
b. Literature on corporate failure prediction
c. Literature on NPA

2.2.1 Literature on Internal Ratings

Most research on internal ratings has focused on examining the general design of banks' internal rating systems and suggesting how specific design choices are likely to affect the eventual functioning of Basel II (Crouchy, Galai & Mark, 2001; Treacy & Carey, 2000). However, some recent studies (Hayden, 2003; Jacobson, Lindé & Roszbach, 2003) has focused on evaluation of internal ratings of banks in two countries. A survey of the literature in this area is given in the following paragraphs:

1. The study by Hayden (2003) tries to answer the question: Is the structure and the performance of credit scoring models sensitive to the default definition that were used to derive them? The study has been done in the light of the New Capital Adequacy Framework proposed by the Basel Committee on Banking Supervision (2001a). According to the current proposal for the New Capital Accord, default is any credit loss event associated with any obligation of the obligor, including distressed restructuring involving the forgiveness or postponement of principal, interest, or fees and delay in payment of the obligor of more than 90 days. The author seeks to find out whether ‘old’ rating models (using only bankruptcy as default criterion) are outdated, or whether they can compete with models derived for the tighter Basel II default definitions in predicting those more complex default events.

If the answer to the question raised by the researcher is ‘no’, banks would not have to re-calibrate their existing rating models but could stick to their traditional ones by just adjusting the default probability upwards to reflect that the Basel II default event occurs more frequently than bankruptcies. The research would be valuable for small
banks as they typically face severe problems when trying to collect enough data to update their credit rating models within a reasonable time period. The research findings conforms this.

65 accounting variables have been used as the main input for developing the credit risk rating models for the three default definitions. The data set consists of accounting data of 56000 companies provided by three major commercial Austrian banks. Logistic regression has been used for developing the models for the three default definitions. Backward elimination method has been used for step-wise variable election with a 10% significance level. Cumulative Accuracy Profile (CAP) and Accuracy Ratio (AR) are used for evaluating the quality of the forecast done on the validation samples.

The limitation of the study is that it is based exclusively on accounting information. One central requirement of internal ratings developed by banks is that it should be based not only on traditional quantitative, financial factors but also on qualitative, non-financial information (Mählmann, 2004). Other empirical works have also supported this (Grunert/Norden/Weber, 2004; Becchetti/Sierra, 2003; and Treacy/Carey, 2000). Moreover, only one scoring technique viz., logistic regression has been used.

Therefore, further research can test whether scoring models based on other than exclusively accounting information and derived with different methodologies (e.g., neural networks) are also insensitive with respect to the default definitions.

2. Crouchy, Galai and Mark (2001) suggest how a prototype internal rating system could be organized in order to rate creditors systematically. The paper explores the traditional and prevalent approach to credit risk assessment – the rating system. The rating systems of the two main credit rating agencies, Standard & Poor’s and Moody’s are also described in the paper. They have mentioned that most rating systems are based on both quantitative and qualitative evaluation. The final decision is based on many different attributes, but is usually not calculated using a formal model that would show how to weight all these attributes in a normative way. Crouchy, et al suggests the consideration of financial as well as managerial, quantititative as well as qualitative attributes of a firm. The analyst must ascertain the financial health of the firm, and determine if earnings and cashflows are sufficient to cover debt obligations, as well as analyse the quality of assets and liquidity position of the firm. They further suggest that
the features of the industry to which the potential client belongs, and status of the client within its industry should be analysed.

The internal ratings approach has practical implications in the era of the New Capital Adequacy Framework. In the Basel II accord(2001), internal risk ratings produced by banks have been given a prominent role. Altman and Saunders(2001) advise to use a risk weighting system that more closely resembles the actual loss experience on loans and has found, among other things, relying on traditional agency ratings may produce cyclically lagging rather than leading capital requirements and that the risk based bucketing proposal lacks a sufficient degree of granularity.

The authors suggest adopting a two-tier rating system. First, an obligor rating (OR) that can be easily mapped to default probability bucket. Second, a facility rating (FR) that determines the loss parameters in case of default, such as 'loss given default' (LGD) and 'usage given default' (UGD). The prototype Risk rating System (RRS) involves nine steps and typically start with the initial OR. A series of four steps lead to the final OR. These steps include analyzing the managerial capability of the borrower, examining the borrower’s absolute and relative position within the industry, reviewing the quality of the financial information and the country risk. Additional four steps—examining third-party support, maturity of the transaction, structure and collateral assessment are needed to arrive at the final FR. The major ratios used for financial analysis are EBIT/Interest, EBDIT/Interest, funds from operations/Long Term Debt, Free Operating Cash Flow/ Total Debt, pre-tax return on capital, operating income/sales, LT debt/ capital, total debt/ capitalization. Industry related variables are competitiveness, regulatory framework, technology, long-term trends, trade environment and Vulnerability to macroeconomic environment. Management related variables include conduct of day-to-day account operations, managerial skills, track record, experience in the industry, succession planning, management initiative, contingent liabilities like litigations. Other variables that goes into the rating are financial statement quality, availability and quality of guarantee, tenor of the facility, the structure of the facility - its covenants, conditions, etc. and Collateral.

3. The research paper by Fernandes (2005) is an empirical application of credit scoring and rating techniques to a corporate historical database of one of the major Portuguese banks. Apart from a discussion on several alternative scoring methodologies
the author has developed two distinct strategies for grouping the individual scores into rating classes. Finally, the regulatory capital requirements under the New Basel Capital Accord are calculated for a simulated portfolio, and compared to the capital requirements under the current capital accord.

Although the credit portfolios of commercial banks mostly consist of privately-held firms, literature on corporate credit risk modeling for such borrowers is scarce. Unavailability of public data has impeded the path of research in the area. This paper contributes to the literature on credit risk modeling for privately held corporate firms.

The study uses the binary logistic regression for model development and is based on the financial information of 4567 firms supplied by a Portuguese bank covering the period 1996 to 2000. Twenty-three ratios were initially included in the study. The model has been validated on a hold-out sample of 301 firms, of which 50% are from the main sample. The study had tested two hypotheses, both of which are rejected. These are – (a) A system of unrelated equations, by industry group yields better results than a single-equation model for all industries; and (b) A model where the observations are weighted in order to increase the proportion of defaults to regulars in the estimation sample performs better than a model with unweighted observations. The other findings of the study are:

- The three models considered viz., two-equation model, single equation unweighted model and the single-equation weighted model have small number of selected variables ranging from 5 to 6.
- For both estimation and hold-out sample, the three models have similar discriminating power, and all the three perform significantly better than the Z-score model.
- The transition matrices of the three models based on historical methodology shows higher discriminatory power and are more stable than those arrived with the cluster methodology. However, none of the models produce a clearly more attractive matrix. Further, amongst the models developed, the weighted model provides best results under the cluster methodology whereas the two equation model provides best results under the historical methodology.
- Comparison of the two methodologies used for grouping individual scores into rating classes shows that the historical methodology yields more discriminating power while the cluster methodology provides more granular rating distributions.
The scoring model suggested by the author considers only a subset of all the variables (financial and non-financial) that can potentially help to discriminate the defaulting and non-defaulting populations.

4. Mählman (2004) studies the effect of common data sample characteristics on the accuracy of 2-group classification and rating of firms on the basis of their credit scores. The study used both financial and non-financial information for deriving the credit scoring function which classifies firms into two groups: good and bad. The main focus of the study is on bias in scoring function estimation that may arise when financial and non-financial information is combined into an overall rating. This involves the issue of transforming nominal or ordinal-scaled data to a metric scale which the author has dealt with in detail. The Fisher-Lancaster (FL) scaling procedure is judged against the use of dummy variables for handling the qualitative data in discriminant analysis. The techniques used for deriving credit scores are linear discriminant analysis (LDA) with dummy variables, discriminant analysis with scaled qualitative variables (FL/LDA) and logistic regression (LR).

The findings of the study are: i) consistent estimation of credit scoring function coefficients is a necessary condition for obtaining rating grade assignments of high accuracy for defaulted and non-defaulted firms, ii) two-group classification are not generally affected by biased coefficient estimates and the difference between LR and LDA is not large enough to favour one technique over the other if the task of classification of firms is into only a few groups, iii) qualitative information can be incorporated into a scoring function using dummy variables, and iv) there is no advantage to scaling qualitative factors with the FL method instead of using dummy variables in LDA.

This study leaves ample scope for comparing the rating accuracy of the techniques used in the study with other scoring techniques such as neural network.

5. Frerichs and Wahrenburg (2003) investigates whether it is possible to identify low-quality internal credit rating systems based on quantitative measures. Further they probe whether banks should 1) abandon the practice of aggregating credit scores into rating classes and 2) use rating model derived estimates of default probabilities instead of using historical default rates for estimating default probabilities.
The study uses data on medium-sized and large German companies from the Deutsche Bundesbank's annual accounts database for the period 1994-1999. Forty eight financial variables have been used for testing six rating systems of different quality defined by the authors. They evaluate the performance of three statistical measures viz., the area-under-curve (AUC), the Brier score and the grouped Brier score in terms of how well these measures discriminate between high-quality systems and low-quality systems.

The study found that both the AUC and Brier score are valuable measures in identifying low-quality systems. Further, they found that the Brier score measures more closely those errors which are important for regulatory capital requirements. Other results of the study are that banks do not significantly improve system quality if they do not aggregate credit scores into rating classes, or if they use rating model derived default probability estimates instead of historical default rates for estimating default probabilities.

Though the study has contributed to the literature on quality assessment of alternative rating systems, its findings cannot be generalised considering the fact that most rating systems also include non-financial variables (Treacy & Carey, 1998) which the authors excluded in their study.

6. In their paper, Jacobson, Lindé and Roszbach (2003) presents new advance quantitative evidence on how internal rating systems affect bank's perception of credit risk using data of two Swedish banks. They have studied rating class distributions, transitions, default behaviour and credit loss distributions that each rating system implies.

The study uses panel data from the banks' complete business loan portfolios covering the period 1997-2000 and also uses data provided by the leading credit bureau in Sweden. For comparison of the two rating systems, a subset of overlapping counterparts i.e., those businesses (2880 in number) which had loans from both the banks, were selected and mapped the ratings of all counterparts in one bank into those of the other. Spearman rank correlation has been used to measure the degree of co variation between the ratings of the two banks. The authors found that the choice of the number of rating classes may be a non-trivial feature of the rating system design because the study revealed that both the degree of concentration in and the distribution of counterparts over classes differ clearly between the banks. Secondly, the large concentrations of counterparts in a small number of rating classes make it quite likely that default risk will
not be homogeneous within a single grade. Therefore, they conclude that applying a single probability of default may not be as appropriate as envisioned in Basel II. This will lead banks to implement differing rating systems. The second part of the study deals with the estimation of portfolio loss distributions and their sensitivity to changes in portfolio characteristics. The sampling method used for deriving the implied loss distributions for each of the banks is a non-parametric Monte-Carlo method. The findings reveal significant differences in the perceived riskiness of the overlapping portfolio between the two banks: both expected losses and the credit loss rates vary considerably between banks. This will lead to variation in the economic capital requirement of the two banks. The results suggest that some optimal properties of an internal rating system, such as the number of grades and the dispersion over classes may constitute strategic choice parameters for a bank. The simulation outcomes demonstrate that not only the design of the rating systems but also the rating composition and, especially the size of the banks (or their portfolios) are of great importance for credit loss distributions and thus for banks required capital structure.

This paper attempts to fill the gap in the literature on the actual functioning of internal rating systems and issues like the credit risk distribution implied a bank’s rating system, the match with the required capital allocation, the sources of rating differences and sensitivity to changes in lending policies.

7. In their paper, Krahnen and Weber (2001) develops a comprehensive framework for evaluating the quality of standard rating systems. Their pioneering work in the area of ‘criteria for good rating practice’ suggests fourteen “best practice rules”. These principles or best practices are applicable to internal ratings only. The applicability of these principles to external ratings has not been addressed.

The empirical basis of their paper has been derived from internal rating systems of major German bank. As opposed to ratings by external agencies, internal ratings are not made public. He further points out that although the two types of ratings rely on similar set of explanatory variables they differ substantially with regard to the number of rating classes. Of the fourteen principles (refer section 4.2 in chapter 4), some are derived formally, some are empirically founded, some are inspired by the BCBS publications and some are based on opinions of practitioners.
Although this paper elaborates on the requirements of a good rating system, it does not throw light on how a good rating system should be constructed.

8. GRK Murthy (2002) in his paper traces the significance of developing credit rating model in the Indian perspective thereby identifying and analyzing the important parameters of credit rating relevant in the Indian context. He has designed a scoring model that attempts to capture the likely impact of all internal and external factors on the ultimate risk-component of a credit proposition considered by a bank. Murthy considers the five financial parameters viz., Current Ratio, Total Liabilities to Tangible Net Worth, Interest Service Coverage Ratio, PAT/Net Sales and Return on Capital Employed (ROCE). For the financial parameters, he proposes a trend analysis i.e., all the five ratios should be examined for consistency in the last 3-5 years. The second parameter is Market Risk under which he has considered Competition, Industry Cycles, Regulatory Aspects and Technology. Managerial Risk, the third parameter considered consists of Expertise, Track Record, Rate of Expansion / Diversification, Management Culture, Integrity, Strategic Intent of the Management. Apart from these, he considers aspects relating to Security Value, Balance Sheet Practices, Nature of Facility and Customers’ Dealings with the Bank. Each of these are scored, the scores are then added up and based on the final score the account would be classified in different grades as AAA, AA,A, BB and B signifying the different risk classes.

The limitation of this paper is that the model has not been back tested with the historical experience of individual banks so as to enhance its predictability rate. Back testing is of course difficult, more so in the Indian context, where availability of reliable historical data on credit defaults is doubtful.

9. The paper by Kraft, Kroisandt and Müller (2004) addresses a particular problem of credit scoring- use of censored data for designing of rating systems. They point out that the available database of banks contains only the accepted credit applicants and this censoring (non-representative data-base), if not properly handled, leads to biased estimates for any kind of performance measure for rating systems. The authors instead of specifying a model for the rejected cases, derive upper and lower bounds for criteria used to evaluate rating systems. Further they discuss how to evaluate the discriminatory power of credit scores given that only a part of the defaults and non-defaults is observed.
Their approach is drawn from Horowitz and Manski (1998) who considers the problem of censoring in survey non-response. The authors use two criteria for estimating the discriminatory power of a credit score viz., the maximal difference of the cumulative score distribution functions for non-defaults and defaults and the Accuracy Ratio (AR). They found empirically, using publicly available data of 1000 observations of private loans, that a censored sample can lead to considerable bias when using the criteria to evaluate the score with respect to discriminatory power.

10. Treacy and Carey (1998) describes internal rating systems at large U.S Banks; their conceptualization, design and use in credit risk management. They found that the specifics of internal rating system architecture and operation differ substantially across banks. The article is based on information from internal reports and credit policy documents for the fifty largest U.S. bank holding companies, from interviews with senior bankers and Federal Reserve bank examiners.

The study reveals the following:

a. Most large banks use ratings in one or more key areas of risk management involving credit.

b. Banks produce ratings for all commercial or institutional loans, and in some cases for large loans to households or individuals where the underwriting process are similar to those for commercial loans.

c. The rating process almost always involves human judgement.

d. Banks fall into two categories with regard to the loss concept. About 60 per cent of the banks have one-dimensional rating systems, in which ratings are assigned to facilities and ratings approximate EL. The other 40 per cent have two-dimensional systems, in which the borrower’s general creditworthiness (approximately PD) is appraised on one scale while the risk posed by individual exposures (approximately EL) is appraised by another.

e. The number of grades on internal scales varies considerably across banks. The number of Pass/ investment grades varied from two to low twenties. Vast majority of the large banks also included three or four regulatory problem-asset (Special Mention, Substandard, Doubtful and Loss) grades on their internal scales.

f. Ratings are typically assigned at the time of each underwriting or credit approval action.
Risk factors are similar to those considered by rating agencies. Risk factors include the borrower's financial condition, size, industry, and position within the industry; reliability of the borrower's financial statements and the quality of its management; elements of transaction structure.

11. McAllister, Patrick and Mingo (1994) have observed that a simple credit scoring model of risk rating still serves best in majority of cases even today. They have observed that credit rating of individual borrowers can be worked out on the basis of a simple scoring system that involves allotting numbers on a scale from 0 to 5 in the ascending order of importance of performance. After specifying the parameters of performance for rating, different scores are ascribed to different levels of parameter values. On the basis of the total score obtained by a borrower over all the parameters, the borrower can be classified into various "risk grades" for assessing its acceptability or otherwise and if acceptable, to quote the right premium.

2.2.2 Literature on Corporate Failure Prediction

Bankruptcy prediction has been one of the most challenging tasks in accounting. Two main approaches can be distinguished: the first and most often used approach has been the empirical search for predictors (financial ratios) that lead to lower misclassification rates. The second approach has concentrated on the search for statistical methods that would lead to improved predictive accuracy. Few prominent literatures relating to the first approach is presented in the following paragraphs.

2.2.2.1 First Approach in Failure Prediction Literature
1. Frydman, Altman & Kao (1985) uses the Regression Partition Analysis (RPA) for classification of firms as distressed and non-distressed. RPA is a non-parametric, computerized technique based on pattern recognition that has attributes of both the classical univariate classification approach and multivariate procedures. This study uses both financial and non-financial indicators. The sample used in the study consisted of 58 bankrupt industrial companies that failed during 1971-81. 142 non-bankrupt manufacturing and retailing companies were selected randomly. The financial years investigated were also randomly chosen from the period 1971-1981 and not matched to the exact years of the bankrupt firms. 20 financial variables were used viz., Cash/Total...
Assets, Cash/Total sales, Cash Flow/ Total Debt, CA/CL, CA/Total Assets, CA/ Total Sales, EBIT/Total Assets, log(Total Assets), log(Interest coverage+15), Market value of Equity/Total Capitalisation, Net Income/Total Assets, Quick Assets/CL, Quick Assets/Total Assets, Quick Assets/Total Sales, Retained Earnings/Total assets, Standard Deviation of EBIT/TA, Total Debt/Total assets, Total Sales/Total Assets, WC/Total assets and WC/Total Sales.

The researchers found that the classification accuracy using RPA to be superior to that obtained under MDA, though they did not claim that RPA was always superior to MDA.

2. Bhattacharya (1995) surveys the literature on corporate failure and comes out with a single comprehensive ratio to help predict failures. He analyses 25 ratios from the literature to first understand the relationship, if any, between the two variables which produces the ratio and tries to find out its contribution towards understanding the health of a firm. He classifies the ratios into two broad classes: Flow Ratios and Stock Ratios. The ratios included under the first class are Sales to Total Assets, Sales to Fixed Assets, Sales to Inventory, Sales to Accounts Receivables, Cash Flow to Total Debt, Cash Flow to Long-term Debt, Sales to Current Assets, Profit before Interest and Tax to Total Assets, Sales to Quick Assets, Sales to Cash, Net Profit Ratio, Retained Earnings to Sales, Sales to Net Working Capital, Gross Profit Margin, Earnings per Share. The Stock Ratios considered are Current Assets to Total Assets, Quick Assets to Total Assets, Cash to Total Assets, Current Ratio, Quick Assets to Current Liabilities, Cash to Current Liability, Total Liability to Tangible Net Worth, Long-Term Liability to Total Assets and Market Value of Equity to Book Value of Debt.

The author finally suggest a single fund ratio called the health ratio to analyse the financial health of a firm.

3. Ramakrishnan (2005) examines the applicability of Multiple Discriminant Analysis and Logistic Regression in the Indian context. He uses eleven financial ratios to test the two models on a sample of 298 firms- distressed and non-distressed. The sample consists of manufacturing companies, which are listed companies. Further, for validation purpose, a holdout sample of 281 firms has been taken.
The author found that the overall significance of the MDA model improves as one moves close to the event of distress. Cash Flow dominated most of the models followed by Current Assets to Total Assets. The classification accuracy went up from 80% to 95% as one moved from four years to one year prior to the event. The logistic regression show similar results although there is marginal improvement in the predictive power. The significant ratios were found to be cash flow from operations/total assets, sales to total assets, and working capital to total assets. The comparative analysis of the two models shows that there is no major difference between the two models in terms of predictive ability of financially distressed and non-distressed companies. Also the two models fail to show any superior predictive ability beyond one year in advance.

2.2.2.2 Second Approach

The question of "which modeling method produces the best performing failure prediction model(s)?" has been discussed in several papers. Table 2.1 gives a summary of their conclusions. For each study, the methods that are compared are indicated with an X. This symbol X remains, if the corresponding method shows no superior results, when compared to the other methods. An 'X+' indicates that the corresponding method appears to be slightly better than the other methods, while an 'X+°' means that, only in some situations, the method is slightly better than the other methods. A method that is generally or clearly the best is marked with an 'X*', while a method that is clearly the best method in certain situations, is indicated with an 'X*°'.

Table 2.1: Overview of the conclusions of comparative studies on modeling methods for corporate Failure

<table>
<thead>
<tr>
<th>Method</th>
<th>MDA</th>
<th>LA</th>
<th>PA</th>
<th>LPM</th>
<th>MGH</th>
<th>DIS</th>
<th>CUSUM</th>
<th>Decision Tree</th>
<th>SA</th>
<th>RPA</th>
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MDA = multivariate discriminant analysis; LR = logistic regression; PA = probit analysis; LPM = linear probability model; SA = survival analysis; MGHDIS = multigroup hierarchical discrimination; RPA = recursive partitioning analysis.

Some studies conclude that the different modeling techniques lead to similar results. In this context, Yang, Platt & Platt (1990) point out that the within-sample
Classification results of corporate failure models one year prior to failure seem to be fairly invariant with respect to methodology, which can be partly explained by the close mathematical relationships between the various methods (Neophytou & Mar-Molinero, 2001). Laitinen & Kankaanpaa (1999) conduct a very comprehensive comparative study, involving MDA, logit analysis, RPA, survival analysis and NNs and conclude that, generally, there is no superior method of classification. Dependent on whether the ex-post classification results or the ex-ante prediction results are used, the ranking of the methods differs. Moreover, the differences in prediction accuracy that appear at first sight seem to be not statistically significant. The only difference in predictive performances that is found to be significant is the difference between the logit model and survival analysis, one year prior to failure. Here, the logit method seems to be better than the survival analysis model. Similarly, Neophytou et al. (2001) compare the performances of NNs and logit models and find that NNs and logit models are both reliable alternatives for company failure prediction. On the other hand, the large majority of comparative studies show varying conclusions, which point in different directions. Doumpos & Zopoudinis (1999) conduct a comparative study on the techniques of linear MDA, logit analysis and multi-group hierarchical discrimination (MGHDIS), using the same variables for the three methods (i.e. an equal comparative basis). They find (1) an inferior performance of the MDA model, when compared to MGHDIS, and (2) an equal performance of the logit model and the MGHDIS model. Theodossiou (1993) provides evidence for the CUSUM model being clearly superior in performance, when compared to an MDA model. In a study of Joos et al. (1998b), logit models seem to have an overall better accuracy than machine learning decision trees. Nevertheless, the decision trees method appears superior for qualitative variables and companies with an abbreviated form of the annual accounts. Shumway (1999) compares two pairs of models. Firstly, the MDA model of Altman (1968) is compared with a hazard model containing the same variables and, secondly, the logit model of Zmijwski (1984) is compared with a similarly constructed hazard model. The survival analysis technique reports equal or better out-of-sample predictions than MDA. Luoma & Laitinen (1991), on the contrary, find that MDA and logit analysis outperform survival analysis. Frydman et al. (1985) compare the technique of RPA to MDA and conclude that, dependent on the choice of misclassification costs, the RPA model does not always outperform the MDA model. Spanos (1999) compares the accuracy of a fuzzy rule-based classification model with the accuracy of MDA, logit
analysis and probit analysis and concludes that that the fuzzy rule-based classification model overall provides the best results. Especially in the studies comparing the NN method to the classical statistical techniques and other methods, the conclusions are widely divergent. In most studies, the NNs have proven their superior performance. More in particular, the studies of Odom & Sharda (1990), Cadden (1991), Coats & Fant (1992) and Coats & Fant (1993) suggest that the NN technique is clearly superior to the MDA method. Coats & Fant (1993) find that NNs are particularly more effective for “early detection” of financial distress and hence for minimizing the type I errors. Wilson & Sharda (1994) also compare MDA with NNs and show that NNs, using the back-propagation algorithm, perform slightly better than MDA in predicting failure one year prior to failure. Fletcher & Goss (1993) and Udo (1993) show that NNs are better than logit models in extracting information from attributes for forecasting bankruptcy. Chung & Tam (1993) perform a comparative analysis of a back-propagation NN and two types of decision tree algorithms. They conclude that the NN method is the best, both in a 1 and a 2 year prior to failure predictive context. In a study of Back et al. (1996b) a genetic algorithm-based NN is compared with the techniques of MDA and logit analysis. One and three years prior to failure, the NN seems to perform better than the other methods, while two years prior to failure, MDA shows the best results. Based on a sample of Belgian data, Weymaere & Martens (1993) find that NNs generally perform slightly better than MDA and logit analysis, especially for the medium term (3 years) analysis. Only for short-term failure prediction, the logistic regression model seems to perform equally. In addition, when the data are first subjected to a principal component analysis, the NN technique significantly outperforms the traditional models. Bardos & Zhu (1997) compare both logit analysis and NNs with the linear MDA method and conclude that the logit model does not perform better than the MDA model, while a simple NN with eight input variables performs slightly better than MDA, especially for the non-failing firms. Zain (1994) compares a NN with a logit model and finds that, 3 years prior to failure, the NN has the best classification results, while, one year prior to failure, the logit model performs best. When comparing the stability of the models, the NN technique appears to be the best method. In contradiction to the above-mentioned studies attributing superior qualities to the NN technique, Trigueiros and Taffler (1996) point out that there is little evidence that the artificial intelligence NN approach dominates the conventional multivariate models, particularly in the case of out-of-sample prediction. They argue that
the relative performance of NNs, as compared to traditional statistical models, depends on the sample size used. NNs have increased prediction accuracy when small samples are used. In this respect, they stress that the superiority of the NNs found in many studies may be the result of the use of a small sample as a basis for comparison. In the case of a small sample, the NNs are likely to show a very high number of fitted coefficients, in some cases even higher than the number of cases in the model fitting, and hence this over-fitting may result in an overstated accuracy for the NN in comparison to the other techniques. In this context, Altman et al. (1994), using a large sample, find little or no differences in classification performance between neural networks and conventional multivariate statistical techniques. They find that complex NNs perform equally or better than the MDA in the original estimation sample, while their performance in a validation context is even poorer than MDA, due to illogical weights and over-fitting. Similarly, in a study of Pompe & Bilderbeek (2000), it is shown that in the case of large samples, NNs and linear MDA models perform equally, while in the case of small estimation and training samples, NNs deliver better results than linear MDA. Finally, when comparing different modeling techniques on a large sample of 570 companies, also Hekanaho (1998) finds that the differences between the various induction methods, especially between rule-based learning and NNs, are quite small and inconsistent. Depending on the sample size, NNs and rule-based learning may perform better than logit analysis. On the contrary, Back et al. (1997) show that NNs (and machine learning models) perform better than MDA and logit models when the sample size is large (400 cases), while there is no best performing method when the sample size is smaller (200 or 100). Finally, some studies indicate that NNs have poorer performances than other methods. Boritz et al. (1995) find that NNs have no superior classification abilities as compared to MDA, logit and probit analysis. Only for particular combinations of proportions of failing and non-failing firms in the training and validation samples and for particular misclassification costs for type I and type II errors, the NN shows superior results. Furthermore, the results of a comparative study of Yang et al. (1999) indicate that logit models perform better than models based on NNs. Thus, the above studies indicate that, although the alternative methods are computationally more complex and sophisticated than the classical cross-sectional statistical methods, it is not clear whether they produce better performing corporate failure prediction models.
2.2.3 Literature on NPA

Literature on NPA can be categorized into four - i) factors responsible for NPA and suggestive measures to overcome it (Bhattacharya, 2002; RBI, 1999; Shivpuje, 1997; Taori, 1996; Kaveri, 1994; Ramchandran, 1993), (ii) impact of NPAs on bank performance/profitability (Das, 1999; Gupta, 1997; Kaveri, 1995; Sharma, 2005), c) effectiveness of NPA recovery measures (RBI, 1999) d) suitability of asset reconstruction companies to solve the problem of NPAs as in (Mukherjee, 2003; Saha, 2003). The following paragraphs briefly discusses some of the above literature.

1. Sharma (2005) examines the impact of NPAs on the performance of public sector banks by looking at such variables as profitability, productivity, achievement of capital adequacy level, funds mobilization and deployment policy. It also examines the effect on macro and micro economic variables. Further the paper suggests different preventive and curative measures.

The study has been carried out in 27 public sector banks. Time series data for the period 1993-2002 of these banks has been taken for the purpose of analysis. Both univariate and multiple regressions has been used for data analysis. In particular, multiple regression has been used to study the impact of NPAs on bank profitability. 6 independent variables viz., gross NPA as a percentage of total advances, difference between spread and burden, priority-sector advance as a percentage of total advances, credit-deposit ratio, establishment expenses as a percentage of total expenses and, fixed deposits as percentage of total deposits. Simple regression has been used for studying the impact of NPAs on productivity. Business per employee and operating profit per employee were taken as dependent variables and non performing assets as independent variables.

The results of the study showed that impact of NPAs on the profitability of the banks was significant at one percent in all the step-wise regression equations, other variables like establishment expenses, proportion of fixed deposits in total deposits and priority sector lending also had a priori signs but were not significant in explaining the relationship. The study also found that NPAs had a negative impact on the productivity, achievement of capital adequacy level, funds deployment and mobilization policy, credibility of the banking system and overall economy.

2. Mukherjee (2003) takes a curative approach to NPA management in her paper and discusses on the set of appropriate policies to remove NPAs from the balance sheets of
Indian banks. The paper attempts to draw some policy conclusions from the international experiences regarding the resolution of the problems of old bad debts. It studies the applicability of International practices in the Indian context.

The author has surveyed policies followed by different countries in times of their crises related to bad debt. Restructuring policies were undertaken almost everywhere in order to restore solvency and profitability as well as to reinstate public confidence. Bad loans played a major role in the banking crises. Non-performing loans as percentage of loans ranged from 5 to 48 per cent in South-East Asia, 1-11 percent in Latin America and 3-27 percent in Russia and Eastern Europe, while it was 8 per cent in India during 1998. The crises countries broadly followed two approaches to financial restructuring: (i) the centralized approach through AMCs (Asset Management Companies) and (ii) the decentralized creditor-led restructuring strategy. The success and failure of countries adopting these approaches to bad debt recovery are further examined in this paper. The key factors behind the success of AMCs is that (a) the assets transferred were very small (Spain, Sweden) and hence politically easier to deal with and (b) the assets disposed off where easily liquefiable or securitisable (US, Sweden). Whereas Norway, Argentina, Chile, Thailand and Poland mainly relied on creditor-led restructuring policy. For successful decentralized strategies, the pre-requisites are :i) adequately-capitalised banks, (ii) limited or no ownership links between banks and corporations, (iii) appropriate accounting norms and (iv) proper incentives for banks and borrowers through creation of a congenial legal environment for debt recovery. The author concludes that bank-based restructuring is better suited than AMCs so far as India is concerned since the pre-conditions for a successful bank-based restructuring as mentioned above are already more or less present in India.

Although the paper has drawn some policy conclusions from the international experiences regarding the resolution of the bad debt problem in India, it does not delve into the area of prevention of fresh NPA generation.

3. Saha's article (2003) examines the financing pattern of the Indian commercial sector, how an NPA is defined, classified and provided for according to banking norms, the scale of NPAs and the principal reasons for high NPA accumulation. The features of the ‘Securitisation, Reconstruction of Financial Assets and Enforcement of Security Ordinance’ and the reactions of industry associations and bankers to it are also described.
He has observed the pattern of funding on non-government non-financial public limited companies and the data analysis revealed that the present NPA problem in India's banking system stemmed from the fact that the commercial sector primarily depends on the banking system for its financing needs. As regards to the reasons for occurrence of NPA, he mentions siphoning off funds, post loan disbursal monitoring lapses, incorrect demand projections by promoters of greenfield projects in the early 90s and the emergence of macro economic factors like growth of services, stagnation in public investment, global overcapacity, slump in international markets in the latter half of the decade which made all demand and price projections go haywire. Besides this the article also discusses the implementation issues with regard to the Ordinance. At the end he mentions that what the Ordinance will actually do is to change the mindset of the creditors as well as the borrowers. It will remove from the minds of the creditors the sense of lack of control it gets as soon as the amount of credit is out of its door and from the minds of most borrowers remove the sense of total complacency which many of them have about meeting the terms of agreement under which credit has been extended.

He concludes that the Ordinance has the power to recover NPAs, provided the bankruptcy and liquidation processes are improved.

4. Kaveri (1995) carried out a study to understand the perception of both borrowers and bankers about the recovery of overdues. The study covered 55 branch managers. The main reasons responsible for NPAs included diversification of bank funds (16 nos.), problems in marketing (12), lack of supervision (5), mismanagement (7), lack of follow-up (10) amongst others.

As regards recovery measures, 36 out of 55 managers considered 'compromise' as an effective recovery measure. As regards suit-filed cases, most of the branch managers (49 out of 55), had experienced difficulties in handling such accounts: 31 branch managers mentioned about delays from 3 to 7 years in receiving court orders. Similarly, for effective execution of decree, they suggested that the bank branches operating in a local area might collectively work for seeking assistance from the police department, voluntary organizations and valued customers.
Branch managers were of the view that the staff members should also be made responsible for recovery. Most of the managers (45 out of 55) had not received any training in recovery matters.

5. Khan & Singh (2005) has studied the effectiveness of DRT in recovery of bank dues. The study evaluates the existing system and suggest suitable mechanisms for dealing with the bad loans.

The study has used CIBIL data on borrowers availing more than 25 lacs limit. The major problems found in the effective working of the DRTs are (i) shortage of staff (75% of respondents) (ii) delay in producing evidence due to transfer and retirement of bank officials (53%) (iii) execution of Recovery Certificate due to obstruction in auction, no bids in auction, price reduction due to no bids and no proper effort by recovery officers (iv) delay in submission of documents required by DRT (v) defects in filing the case (vi) stay orders of High Court and (vii) absence of defendants. Thus, even after twelve years of the setting up of DRTs in 1993, it has not achieved its goal of deciding the case within six months.

6. The study by Reserve Bank of India (1999) relates to the problems, genesis and influence of NPAs on the banking industry. Specifically this study throws light on the causes of NPAs and effectiveness of recovery measures. This study is based on the RBI inspection reports on banks, files on borrowal accounts of twenty-seven Public Sector Banks and Six Private Sector Banks and also State Financial Corporations.

The causes for sickness/ weak performance and consequently the account turning NPA in respect of 50 top NPAs of the thirty-three banks were found in the order of prominence as - a) diversion of fund mostly for expansion/ diversification/ modernization, taking up new projects and for promoting associate concerns, b) business failure, inefficient management, strained labour relations, inappropriate technology and other internal factors, c) external factors comprising of recession, inputs/ power shortage, price escalation, natural calamities, etc., and other external factors like recession/ non-payment in other countries, d) time/cost overrun during project implementation leading to liquidity strain and e) other factors in their order of prominence are government policies like changes in excise/ import duties, pollution control orders, etc.; willful defaults, fraud/ misappropriation, promoters/ directors disputes and deficiencies on the part of banks.
delay in the release of limits and delay in settlement of payments/subsidies by Govt. bodies.

In regard to recovery measures, the study found that banks file suits after exhausting other means of recovery. The recoveries made out of suit filing during 1996, 1997 and 1998 were 7.33%, 4.74% and 4.32% respectively evidencing decreasing trend of recovery through this route. In some cases, suits were pending for 15 to 20 years without any progress made in the suit. The study suggested other modes for addressing the problem of NPA recovery viz., Debt Settlement Tribunals, Lok Adalats, Asset Reconstruction Company, amendment to banking related laws.

The study concludes with the suggestion of a double-pronged approach viz., preventive and curative measures by banks at macro and micro levels. This paper provided a base for evolving suitable strategies for satisfactory resolution of the NPA problem.

2.3 Potential For Research

The available literatures are mainly on the various aspects of credit risk management with and without reference to Basel II. Though some of the papers tried to examine some of the aspects of internal rating systems none of the researchers have reported about the effectiveness of rating models adopted by banks in view of Basel II requirements.

As such, no in-depth study has been reported on the effectiveness of credit monitoring systems adopted by the banks though some of them reported the status on monitoring system.

Except one, none of the studies have considered the non-financial parameters though these parameters are found to have high discriminating and predictive power.

The present research has tried to address some of the issues mentioned above.