"Construct of credit risk management index for commercial banks"

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Construct of credit risk management index for commercial banks

Abstract

A mature credit risk management (CRM) framework determines to a great extent the strength of banking system in general and financial performance of a bank in particular. Evaluation of maturity of CRM framework however, suffers from a lack of reliable measure for this purpose. The CRM index for commercial banks, as proposed here attempts to provide a quantitative measure of management practices based on predefined benchmark practices that CRM efforts should aim to develop and follow. Based on the computation of the CRM index scores for thirty-three commercial banks in India, an attempt has been made to validate the index by relating their CRM index scores with their non-performing advances ratios.

Keywords: Credit Risk Management (CRM) index, CRM framework, Basel II, benchmark practices, credit risk indicators, non-performing advances ratios.
JEL Classification: G21.

Introduction

Credit risk in some form exists throughout commercial banking activities, both on and off balance-sheet. However, the major part of the credit risk primarily arises from the loans and advances that constitute almost 60% of the total assets in any bank. The credit risk, which is associated with lending, is commonly understood as the possibility of the counterparty not repaying the loan. Loans and lending – from credit cards to corporate loans – is the largest and most obvious source of credit risk. "The taking of credit risk is a principle function of banks. The heart of the banking business is not necessarily taking credit risk but assessing credit risk". (Herrick, 1978, p.145). Thus, management of credit risk is the principal function of bank management. No wonder, the CRM is an organization wide function, involving decision-making at both the transaction level and at the total advances level or at the portfolio level. It essentially involves "putting in place systems and procedures enabling a bank to identify and measure the risk involved in a credit proposition: both at the individual transaction level and at the portfolio level" (Murty, 2002, p.262).

Credit risk management (CRM) involves a systematic analysis of various forms of risks that influence or are likely to influence the repayment of loan given by the bank (Mohan, 2007). This will require a framework to capture the essence of risk and risk management. A risk management framework comprises a set of elements of an organization's management system concerned with managing risk. Such management system elements primarily include strategic planning, decision-making and other strategies, processes and practices for dealing with risk (Australian Standard; Risk Management Guidelines, 2004). Thus, risk management framework is

well articulated and designed around key components, such as, strategy, policies, organization, processes together with methods and models.

Though Basel II norms and guidelines issued by various central banks in different countries provide a fairly comprehensive regulatory framework for this purpose, the CRM frameworks in commercial banks continue to differ widely. The CRM framework also evolves and new practices are adopted over a period of time to replace the old in a given bank. Both the management of banks and the regulator would like to watch the level of maturity of CRM framework in a bank and also monitor the changes in it over a period of time. Since the CRM framework is not one discrete policy, strategy or document, the number of practices involved is fairly large, making the assessment of level of maturity of CRM framework a difficult task. Thus, one single value that can represent the level of maturity of CRM framework would perhaps be more useful to both, the bank management and the regulator. The present paper makes a modest attempt in this direction. It proposes and validates a design for CRM index based on benchmark practices for commercial banks. The purpose is to provide a single representative quantitative value for level of maturity of CRM framework. It also presents an analysis of CRM index scores of thirty-three commercial banks in India.

1. Review of literature

Credit risk perhaps is the oldest risk in banking and thus a number of studies are available on various aspects of credit risk management. However, most of the available studies have focused on CRM policy and practices. Some studies have also focused on credit risk assessment. Further, some studies have focused on measurement of performance of risk management framework in a business organization in general. The earlier studies on CRM include the scholarly work of Stulz (1984), Smith, Smithson

and Walford (1990), and Froot, Sharfstein and Stein (1993), Santomero (1995). These studies have emphasized the need for an active risk management policy because of managerial self-interest, the non-linearity of the tax structure, the cost of financial distress and the existence of capital market imperfections.

Treacy and Carey (1998) study examined the credit rating mechanism at US banks. The study focused on the architecture of bank's internal rating system and made a comparison of rating system used in banks and those by the credit rating agency system. The study listed various administrative and analytical uses of credit risk ratings. It was observed that internal rating system in banks had helped them in managing credit risk, profitability analysis and product pricing.

Another study by Brian Gray (1998) analyzed various elements of the credit risk management systems installed in commercial banks in Australia, such as, the quantity and quality of underlying data collected on customers and their exposures, extent of use of formal risk grading, pricing of exposures, measurement of risk-adjusted returns, use of portfolio modeling, etc. The study found that techniques were evolving rapidly, though the rigor of the methodologies used and the comprehensiveness of credit risk management processes varied among banks. The study primarily focused on operational aspects of CRM and did not take into account CRM policy and organizational structure that may be installed in bank for effective CRM. Further, the study did not attempt to quantify the level of maturity regarding various elements of CRM framework.

Basil Orisni (2002) proposed a benchmarking tool for assessments of risk management practices in the organization. The suggested diagnostic tool listed five performance indicators, namely: 1) organizational culture; 2) leadership and commitment; 3) integration; 4) risk management capability; and 5) reporting and control. This study was focused on assessment of overall business risk and thus did not offer any list of performance indicators, especially for credit risk management in a commercial bank. The benchmarking tool proposed in the study was generic and qualitative in nature. It did not offer any framework for quantitative assessment of various performance indicators.

A risk management maturity model (RMMM) offered by Risk Management Research and Development Program (2002) suggested four levels of capability and risk management maturity, namely, Adhoc, Initial, Repeatable and Managed, in this order. Each of the levels was linked to a specific set of attributes. At the Managed level, the organization

has established a risk-aware (not risk-averse) culture, a proactive approach to the management of risks in all aspects of the organization, active use of risk information to improve all organization processes. The study indicated a number of practices in each level but did not offer any model for quantitative assessment of level of maturity with regard to risk management. The study focused on management of overall risk in business and its applicability to banking sector is limited.

Another significant study was conducted by Anbar (2005) on credit risk management practices followed in Turkish banking sector. The survey observed that credit risk management was still not at desired level and identified some shortcomings and problems in credit risk management. Lack of sufficient data about credit risk measurement inputs was one of the major problems. The study was descriptive in nature and did not attempt to quantify the maturity in CRM. Also the study did not analyse the association between bank specific factors (such as, ownership, size of bank and geographical location) and the CRM practices followed.

In another study of banks' risk management practices in four Asian emerging markets (Indonesia, Malaysia, Republic of Korea and Thailand) by Parrenas (2005), it was observed that the banks followed sound practices in the areas of credit and market risk management, as well as internal control. As regards the credit risk management practices, the study observed that in general, banks demonstrated sound credit risk management environments, written credit policies, credit granting processes and credit administration, measurement and monitoring practices. The study concluded that there were slight differences among banks with different types of ownership. The study further observed that availability of data and technology were the main resource constraints faced by banks in implementing Basel II requirements. The study did not focus on related issues, such as, organizational structure, loan pricing strategy, comprehensiveness of CRM policy, credit portfolio risk modeling, etc. Further, the study did not attempt to quantify the level of maturity in the CRM practices.

Pickett (2005) also emphasized the need for defining various levels or stages of risk management maturity and then monitoring the progress through these levels. He suggested a "risk management maturity model", with four levels to gauge maturity, starting from level 1 – awareness, level 2 – design, level 3 – integration and level 4 – review. Level 1 represents risk immature organization and as its risk maturity increases, the risk management becomes more embedded in the business operations. However, the study did not provide any design for arriv-

ing at a single value representing a measure of maturity in risk management practices. In absence of such value, it is difficult to differentiate between two levels of maturity within a given level.

The issue of Risk Management Index as a measure of risk management performance was addressed by Carreno, Cardona and Barbati (2005). They suggested use of "risk management index (RMI)". It was proposed particularly to evaluate risk management performance and effectiveness of countries of Latin America and the Caribbean in the framework of the Disaster Risk Management Indicators Program in Americas. It proposed a qualitative measure of management based on predefined "targets" or "benchmarks" that risk management efforts should aim to achieve. The design of the RMI involved establishing a scale of achievement levels or determining the "distance" between current conditions and an objective threshold or conditions in a reference country, sub-national region, or city. The study covered fairly comprehensively the process of developing a disaster risk management index. However, the indicators included in the index were specific to disaster management and may not be suitable for application in the context of CRM.

Another important study on the assessment of credit risk for entire banking sector is made by Sefakli (2007). It was an aggregative study of CRM practices of banking sector (comprising 23 banks) in Northern Cyprus and also related the credit risk indicators with various macroeconomic factors for time period of 1990-2005. The research found only two statistically significant correlations. They observed negative correlation between "nonperforming loans relative to total loans" and the competitiveness of country. A negative correlation was also observed between "Total assets/gross national product" and "Export/import (%)" ratio. Above study was based on consolidated data of the banking sector and did not identify the benchmark CRM practices that may be followed by commercial banks or the indicators of maturity in CRM.

Another important study conducted by Hussein & Mohammed (2007) examined the risk management practices and techniques followed by UAE banks in dealing with different types of risk. The study observed that UAE banks were 'somewhat efficient' in assessing and analyzing risks, risk monitoring and risk identification. The study observed a significant difference between the practices of UAE national banks and foreign banks regarding risk assessment and analysis and in risk monitoring and controlling. The study made only qualitative comparison and was restricted to selected issues only. It did not identify the elements of CRM policy and organizational structures in this regard.

1.1. Research gaps. As may be observed, most of the studies discussed above have either focused on risk management practices in general or have focused only on selected CRM practices. Most of the studies focusing on CRM practices did not offer any quantitative measures for assessment of CRM framework. This provides the motivation for a more comprehensive study that integrates all elements of CRM framework and offers an appropriate quantitative measure for assessing the maturity of CRM framework in commercial banks. The present paper makes a modest attempt in this direction by offering an integrated framework for commercial banks. It offers quantitative measure for evaluation of CRM framework for commercial banks based on comparison between benchmark and actual CRM practices using an integrated framework in commercial banks.

2. Need for CRM index score

The CRM index score gives a snapshot of a given bank's CRM practices at a given moment of time enabling one to understand its level of maturity. CRM index score may serve varied purposes for both, the bank management and the regulatory authorities. From the perspective of bank management, CRM index serves as a quantitative assessment of a bank's CRM practices, systems and organization. It will also help in monitoring the improvement in CRM framework of the bank over time, on a regular basis and in identifying weak areas in it in order to decide agenda for future improvement. A CRM index may provide an early warning signal of competitive disadvantage that the bank may suffer from as against those who have better index score. CRM index score may serve as an indicator of the overall completeness, adequacy, consistency, and efficiency of a bank's risk management practices in compliance with internal policies, regulations and best industry practices. As it provides a single representative value relating to the deployment of CRM practices in a bank, it may be useful to a bank in monitoring the improvements in the CRM practices over a period of time. Such an exercise may also help bank management in monitoring changes in the level of preparedness for managing its credit risk and determining suitable capital adequacy ratio. The outcome is an insight into how a bank can synchronize its CRM organization, policy, strategy, operations and systems and thus align its overall risk management strategy to produce acceptable level of aggregate risk in balance-sheet. From the theoretical perspective, such an index can be used as CRM maturity model for research in risk management.

CRM index score may also be useful to the regulatory authorities and policy makers. The regulatory authority may use index scores in making regular assessment of the maturity of credit risk manage-

ment framework and for evaluating the compliance of a given framework by the bank with regulations. A regulator while using such an index for monitoring the CRM practice of each bank, may, if necessary impose special regulation for the banks with low CRM indices. For example, the central bank may stipulate higher capital adequacy ratio for such banks or may suggest closer monitoring and control. CRM index may be used by policy makers to establish realistic CRM goals by conducting a definitive comparison of a single bank performance against others in that country combined with a thorough internal analysis. This shall also provide insight into which practices to target, key challenges and opportunities that exist for commercial bank managers. Quantification of the CRM practices followed by different commercial banks may enable a cross-section comparison within and across countries. Such comparisons may be useful in policy making.

For the capital markets, such an index could be an important differentiator in determination of share price of each bank. As the CRM index score carries important information about the level of maturity in credit risk management in a bank or strength of CRM framework, a bank with higher CRM index may have advantage in the financial market. Thus, CRM index scores have implications for bank management, regulator and the financial markets. Moreover, the CRM index may permit a systematic and quantitative benchmarking of each bank during different periods, and also permit comparisons across banks. This index may also be used in assessing maturity in credit risk management practices of the banking system of a given country. However, the usefulness of the CRM index will depend on how the index is designed and developed.

3. Methodology for developing CRM index

The process of developing an index number involves constructing a continuum in which objects are located according to the magnitude of measured characteristic possessed. Design of index would thus, require identifying the elements that need to be included in the construct and relative weight-age to be given to each element. Each element must be measured in quantitative terms for this purpose. The CRM index for commercial banks, as proposed here attempts to provide a quantitative measure of management practices based on predefined benchmark practices that credit risk management efforts should aim to develop and follow. These practices represent the elements of CRM index. The benchmark practices regarding credit risk management were identified and compiled after reviewing the guidance note issued by Reserve Bank of India (RBI) on October 12, 2002 entitled, "Guidance note on credit risk management", BIS principles for management of

credit risk (1999) and other relevant recommendations by Basle Committee on Banking Supervision (BCBS). The list of benchmark practices was further enriched with the help of relevant regulatory guidelines in select countries. These regulatory guidelines included credit risk management guidelines in the USA (2000), relevant standards issued by Australian Prudential Regulatory Authority (such as, Prudential Standard APS 221, "Large Exposures", Prudential Standard APS 113, "Capital Adequacy: Internal Ratings-based Approach to Credit Risk", Standard APS 220, "Credit Quality", etc.), credit approval process and credit risk management guidelines (2004) by Oesterreichische Nationalbank (OeNB) and Austrian Financial Market Authority (FMA), Vienna, Austria. The available literature on the subject was also used, wherever appropriate while compiling the list of benchmark practices.

3.1. Elements of CRM index. As proposed CRM index is expected to measure the maturity of CRM framework, the benchmark CRM practices constituted the elements of CRM index. Based on three building blocks of CRM, suggested by RBI in its Guidance note on CRM, these elements were classified into three broad categories, namely, those relating to: (1) CRM organization; (2) policy and strategy; and (3) CRM operations and systems. The elements relating to operations and systems were further classified under two broad heads, namely, operations and systems at the transaction level and secondly, operations and systems at the portfolio level. Each of the elements under these categories was a benchmark practice and therefore was uniquely related to effective management of credit risk in a bank. This means that, ceteris paribus, the larger the number of practices being followed by a bank, the higher is the level of maturity of CRM framework of that bank. The practices included in the three categories of elements are discussed in the following Sections.

3.1.1. CRM organization. The CRM organization has an important role to play in defining and reviewing processes for credit risk management and also in ensuring coordination among the various functional activities, including offering advice on risk management issues within the bank. The practices regarding CRM organization relate to formation of various committees and departments, setting up super-specialised cell, segregation of CRM and credit administration, unit responsible for managing problem credit accounts, delegation of credit approving authority, loan review mechanism, etc. The practices regarding delegation of credit approving authority primarily relate to determining the basis of delegation, such as, size of proposal, credit risk rating, organizational position, term of facility, profes-

sional qualification of officer, etc. Regarding the unit responsible for managing problem credit accounts, it is usually more prudent and indeed preferable to segregate the workout activity from the area that originated the credit in order to achieve a more detached review of problem credits (Bank of Mauritius, 2003).

3.1.2. CRM policy and strategy. A commercial bank must establish a comprehensive credit risk management policy and strategy that includes a statement of principles and objectives governing the extent to which the institution is willing to accept credit risk. A well defined CRM policy promotes stability, clarity and consistency in lending philosophy and this reflects more mature CRM framework. The practices relating to CRM policy and strategy would include detailed plans regarding the organizational issues and defines the broad framework in which decisions regarding CRM would be taken. "The scope of CRM policies should be appropriate to the bank's size and loan activities and consistent with prudent banking practices and regulatory requirements" (Glantz, 2003a, p. 22). CRM policy in general defines broad guidelines relating to core credit business, risk targets, exposure limits, cost of funds, preferred level of diversification ratio and the factors to be considered for pricing the credit risk. The basic principle underlying the exposure limit is to diversify and broad base the commitments across various dimensions, such as, customers, industries, etc. A CRM policy may specify target parameters, such as, size of advances portfolio, market share in advances, total acceptable risk, risk premium, etc. The various objectives that may be listed by a commercial bank in CRM policy are: (1) to strive for a balanced, diversified and healthier credit portfolio; (2) to ensure healthy growth of loan portfolio; and (3) to achieve an optimal credit-deposit ratio (FRB manual, 1997).

3.1.3. CRM operations and systems. For the effective implementation of CRM strategies and policies, it is necessary to establish practices for credit risk management operations and systems. These operations and systems will put in place specific tools of CRM at both the transaction level and at the portfolio level. At the transaction level, these would involve practices relating to credit risk rating framework, operating design of credit risk rating framework, monitoring and control of individual accounts and finally estimation of credit risk for each transaction. Various practices relating to credit risk rating framework encompass issues such as, choice of rating model, length of experience of new model, regular revisions made in model, testing the accuracy of model, etc. The principles underlying a credit risk rating framework listed by (Glantz, 2003b, p. 620), suggest the management to take

actions in such a manner that a credit risk rating model is able to forecast a credit risk based on all available information.

At the portfolio level, managers of credit portfolios must follow such practices which are based on the principles of Modern Portfolio Management, the principles that have formed the basis of asset management for forty years (Smithson and Hayt, 2001). The practices at credit portfolio level should focus on portfolio risk modeling, monitoring credit portfolio risk and credit portfolio risk analysis. For the purpose of monitoring credit portfolio, bank may follow the practice of classifying its exposure on the basis of risk rating categories, economic sectors, size of advances, geographical regions, etc. Regarding portfolio risk analysis, a bank may estimate aggregate credit portfolio risk at branch level/regional office level/head-office level or at all of these levels and may also use stress testing and scenario analysis tools (Caouette, Altman & Narayanan, 1998).

All efforts were made to identify the whole range of practices that are considered to be "state of art" or benchmark practices. Though no list of benchmark practices can be comprehensive to cover all possible practices in CRM, the list prepared constitutes a fairly representative set of practices that are currently in vogue in industry. In total ninety-two such practices could be identified. For the purpose of convenience, the total maximum CRM index score that could be assigned to a given bank was fixed at 100. On a scale of 0 to 100 for CRM index, we have an attainable target for banks to aspire to. The score of each bank indicates the relative position of each bank on the CRM index.

3.2. Data collection. Developing a CRM index score would require data of actual CRM practices followed by banks with regard to each of the broad categories: (1) credit risk management organization; (2) credit risk management policy and strategy; (3) CRM operations and systems. The necessary data regarding such actual practices of banks was collected with the help of survey of commercial banks in India. The instrument of data collection contained many structured questions relating to CRM practices and the perceptions of credit risk managers regarding various issues relating to CRM framework. The questionnaire was pre-tested on 5 banks and used for data collection after necessary changes were made in original questionnaire. The data used for analysis in this paper relate to only some of the questions in the questionnaire.

3.3. Relative weights of elements. CRM practices were not considered equally important. Different weights were assigned to different practices depending upon the importance and the alternatives avail-

able under each practice. Each practice option was assigned scores ranging from 0.5 to 2 in such a manner that highest score was assigned to the best considered option or the benchmark practice in banking industry. Further, relatively more important practices were assigned higher weights as compared to those that were considered less important in CRM framework. Most of the benchmark practices were assigned weight of 1. The relative weights for various categories of elements of CRM framework are shown in Table 1. As may be observed from Table 1, operations and systems were assigned almost two-third of total weight and the organization, policy and strategy got the remaining one-third weight-age. There is a theoretical justification for giving greater weights to CRM operations and system because of the greater role they play in making CRM framework effective. However, the weights assigned in the present paper to various elements are based on the inputs received from the respondents to the survey.

Table 1. Weights for various categories of elements

Element of CRM index	Weight	
A. CRM organization		14
B.CRM policy and strategy		20
C. Operations and systems		66
C.1 At the transaction level	36	
C.2 At the portfolio level	30	
D. Total CRM index score		100

Based on mix of practices followed by a given commercial bank, CRM index score could be calculated for that bank. The scores obtained for each element reflects the maturity of CRM framework with respect to that category. Higher scores indicate that the bank has reached higher maturity level in that element. In other words, the CRM index produces a positive index of maturity of CRM framework; the higher is the index score for a given bank, the better is the quality of CRM practices that bank is currently following. As is generally the case with com-

posite indicators, it is possible to achieve comparable scores on CRM index for quite different reasons. However, since CRM index consists of three broad elements that are conceptually distinct from one another yet integrated, analyzing the differences between commercial banks is both relatively straight forward and extremely informative from a policy perspective.

For investigating the level of maturity of CRM frameworks in Indian commercial banks and also testing the validity of the proposed CRM index, CRM index scores were calculated for selected commercial banks in India. The necessary data regarding actual practices followed by these banks was collected through a survey (carried out in year 2006-2007), using a structured questionnaire. The survey questionnaire was more comprehensive and contained many questions that are beyond the scope of this paper. All the domestic commercial banks (public sector banks and private sector banks) in India (50 as on March 31, 2007) were invited to participate in the survey. Foreign banks were excluded from the sample as adequate information was either not available in the local offices in India or they were not willing to share the relevant details regarding CRM practices. The responses were received from thirty-three banks. The data regarding their CRM practices have been used for calculating CRM index score for each of the sample bank, after assigning the weights as discussed earlier.

4. Calculation of CRM index scores

The scores so obtained have been used to classify banks into three broad categories, as presented in Table 2. Table 2 also relates CRM index scores with the profile of sample banks. For understanding the profile of banks, banks were classified on the basis of ownership, size (measured in terms of value of advances) and geographical spread (measured in terms of number of branches).

Table 2. CRM index scores and profile of sample banks

CRM index score class	Ownership wise distribution		Size wise distribution			Geographical spread wise distribution			Number of banks (overall)
	Public sector	Private sector	Small	Medium	large	low	Medium	Wide	
50%-60%	5 (20.84)	4 (44.44)	3 (60.0)	5 (31.25)	1 (8.33)	4 (50.00)	4 (26.67)	1 (10.0)	9 (27.27)
60%-70%	11 (45.83)	3 (33.33)	2 (40.00)	6 (37.5)	6 (50.0)	3 (37.50)	7 (46.67)	4 (40.00)	14 (39.40)
70% and above	8 (33.33)	2 (22.22)	0 (0)	5 (31.25)	5 (41.67)	1 (12.50)	4 (26.66)	5 (50.00)	10 (33.33)
Total	24	9	5	16	12	8	15	10	33

Note: Figures in parentheses represent percentage of column totals.

As regards the association between ownership and maturity in CRM framework, it was observed that around 80% of public sector banks scored more than 60% whereas, this proportion was only 55.55% in case of private sector banks. Thus, it may be concluded that level of maturity in CRM practices of the public sector banks was relatively higher than that in private sector banks. This may perhaps be due to the relatively earlier and greater compliance by public sector banks with RBI guidelines in this regard.

As regards the association between size of bank and CRM index scores, it was observed that all of the large sized banks except one had gone beyond the score of 60%. However, none of the small size banks had scored more than 70% and they were largely in the initial stages of the path of evolution in CRM practices.

As regards the association between geographical spread of banks and maturity in CRM practices, it was observed that all the banks with wide geographical spread except one scored more than 60%. Whereas, around three-fourth of the banks with medium geographical spread scored more than 60%. This percentage was 50% in case of the banks with low geographical spread.

It was further observed that the banks which had CRM index scores in the range of 50%-60% were primarily small and medium-sized banks which had low or average geographical spread of operations. As regards the banks with scores in the range of 60%-70%, they were primarily large and medium sized banks which also had medium or wide geographical spread of operations. The relationship of CRM index score with ownership, size and geographical spread looks apparent from Table 2, though its significance could not be statistically tested due to smaller size of sample. However, it can be concluded that there is adequate scope for further improvement in CRM practices of commercial banks in India as the CRM index score has been less than 70% in most of the cases.

4.1. Testing the validity of the proposed CRM index. The index scores calculated for Indian banks were also used to test the validity of proposed CRM index. Establishing the validity of this index will help to demonstrate its utility in assessing CRM framework and hence its potential use in assessing overall risks management. The aim is to show that the proposed design of CRM index has good internal consistency, reproducibility and also construct validity.

The CRM index scores in each category of elements of CRM index varied in a fairly wide range, implying internal consistency in the methodology of CRM index. The overall CRM index scores ranged between 52%-87% among the sample banks. Further, such variation in scores was observed for each category of elements of CRM index. Thus, it may be inferred that design of CRM index is capturing variation in practices followed by commercial banks in India. This finding is particularly important that though RBI has issued a detailed Guidance note on CRM in October 2002, commercial banks in India were following different CRM practices. Based on this early analysis, the CRM index meets the tests of reasonableness in relation to the range of CRM practices currently followed. The validity of the

index was further tested by examining the relationship between CRM index scores and credit risk indicators of the sample banks.

4.2. Relationship between CRM index score and credit risk indicators. Theoretically, a strong and negative relationship is expected between maturity of CRM framework and the credit risk in a bank. This would imply that any measure of maturity of CRM framework would also find similar relationship with credit risk indicators and this relationship could provide a clue regarding validity of such measure. In the absence of any 'gold standard' for testing the validity of such an index or measure, an examination of relationship between CRM index score and credit risk indicators could be used for this purpose. Though the level of credit risk in a commercial banking would depend on number of factors (external and internal factors), the relationship between changes in CRM practices and level of credit risk is quite expected, other things remaining equal.

In absence of adequate information regarding credit risk indicators for banks, Non-Performing Advances (NPA) ratios have been used by earlier researchers as credit risk indicators (Sefakli, 2007). The use of ratios as indicators is an accepted procedure in business research (Timari, 1966). Use of ratios instead of absolute values also helps in making comparison. In view of this, the validity of CRM index was tested by examining the correlation between CRM index score and NPA ratios, namely: (1) gross NPA as percentage of gross advances; (2) net NPA as percentage of net advances; (3) gross NPA as percentage of total assets; (4) net NPA as percentage of total assets. Impact of any improvement in CRM framework is usually felt over a period of time, so such ratios for a particular year may not be useful. Therefore, it may not be appropriate to relate such a ratio for a particular year with CRM index score for that year. For the purpose of present study, three year and five year's average ratios were used as indicators of credit risk. Since the CRM index scores were calculated on the basis of practices followed on or before 2006-2007, three time periods, 2003-2006, 2005-2008 and 2003-2008 were selected for computing correlation coefficients. It was hypothesized that a bank with higher CRM index score shall have relatively lower NPA ratio or the correlation between these two variables would normally be negative. Absence of significant correlation coefficient in this regard may raise doubts about the reliability of proposed CRM index.

By relating the CRM index score of a sample bank with its NPA ratio, the correlation coefficients were calculated using the data in respect of all the thirty-three sample banks. The Karl Pearson correlation coefficients are indicated in Table 3.

Table 3. Correlation analysis between CRM index scores and NPA ratios (number of observations – 33)

Correlation analysis	Karl Pearson correlation coefficient	p-value
CRM index and average gross NPA to gross advances ratio (2003-2006)	-0.364**	0.040
CRM index and average net NPA to net advances ratio (2003-2006)	-0.432**	0.012
CRM index and average gross NPA to gross advances ratio (2005-2008)	-0.297***	0.093
CRM index and average net NPA to net advances ratio (2005-2008)	-0.233	0.192
CRM index and average gross NPA to gross advances ratio (2003-2008)	-0.421**	0.015
CRM index and average net NPA to net advances ratio (2003-2008)	-0.432**	0.012
CRM index and average gross NPA to total assets ratio (2003-2006)	-0.355**	0.042
CRM index and average net NPA to total assets ratio (2003-2006)	-0.368**	0.035
CRM index and average gross NPA to total assets ratio (2005-2008)	-0.393**	0.024
CRM index and average net NPA to total assets ratio (2005-2008)	-0.320***	0.069
CRM index and average gross NPA to total assets ratio (2003-2008)	-0.398**	0.022
CRM index and average net NPA to total assets ratio (2003-2008)	-0.368**	0.035

Notes: *** significant at 0.10 level (2-tailed), ** significant at 0.05 level (2-tailed), * significant at 0.01 level (2-tailed).

As expected, the correlation coefficients were negative. They were also significant for all the cases, except in one of the case. The correlation coefficient values ranged from 30% to 44%, indicating a fairly close association between CRM index scores and credit risk exposure. This supports our hypothesis that the higher the CRM index score (better CRM practices) is, the lower is the level of credit risk exposure in a bank. Thereby, it also offers evidence in support of contention that the CRM index proposed in this study was valid, robust, consistent and fairly reliable. A good measure should not only be reliable for a given year but also be useful for prediction.

In order to test the reliability of the index as an antecedent for NPA ratios, simple regression analysis was carried out taking each NPA ratio as the dependent variable and the CRM index score as an independent variable. In this manner six regression models were formulated for NPA to advances ratios and the results of regression analysis are presented in Table 4. Theoretically, it is expected that there may be a time lag between a good CRM practice and its impact on NPA ratio. As data regarding CRM practices for different years were not available, the lag relationship could not be examined. As an alternative average NPA ratios were taken for different time periods (2003-2006, 2005-2008, 2003-2008) and also averaging has been made for both three and five years so as to take into account time lag effect.

As may be observed from Table 4, the intercept value is positive for all cases and the intercept value is fairly significant. The value of slope/beta is negative in all cases, indicating that an increase in CRM index score would lead to a fall (decrease) in level of NPA ratio. This supports the earlier assumption that higher values of CRM index score mean lower credit risk of the bank. The "F" stat values indicated fairly high level of significance for each of the regression models.

Table 4. Regression analysis: dependent variable (average NPA ratio), independent variable (CRM index score), number of observations – 33 banks

Average NPA ratio (%)	Constant or intercept	Beta/slope	R^2	Adjusted R^2	F change	Sig. F change
Gross NPA to Gross advances (2003-2006)	13.02 (Sig.0.000)	-0.115	0.133	0.104	4.590	0.040
Net NPA to net advances (2003-2006)	6.314 (Sig.002)	-0.065	0.147	0.119	5.334	0.028
Gross NPA to gross advances (2005-2008)	4.964 (Sig.001)	-0.034	0.088	0.059	3.004	0.093
Net NPA to net advances (2005-2008)	1.892 (Sig.010)	-0.014	0.054	0.024	1.782	0.192
Gross NPA to gross advances (2003-2008)	10.514 (Sig.000)	-0.094	0.177	0.151	6.684	0.015
Net NPA to net advances (2003-2008)	5.161 (Sig.0.000)	-0.053	0.187	0.161	7.120	0.012
Gross NPA to total assets (2003-2006)	6.327 (Sig.0.001)	-0.054	.126	.098	4.483	.042
Net NPA to total assets (2003-2006)	3.001 (Sig.0.002)	-0.030	.135	.108	4.857	.035
Gross NPA to total assets (2005-2008)	3.701 (Sig.0.000)	-.031	.154	.127	5.648	.024

Table 4 (cont.). Regression analysis: dependent variable (average NPA ratio), independent variable (CRM index score), number of observations – 33 banks

Average NPA ratio (%)	Constant or intercept	Beta/slope	R^2	Adjusted R^2	F change	Sig. F change
Net NPA to total assets (2005-2008)	1.566 (Sig.0.004)	-.014	.103	.074	3.547	.069
Gross NPA to total assets (2003-2008)	5.068 (Sig.0.000)	-.043	.159	.132	5.850	.022
Net NPA to total assets (2003-2008)	1.999 (Sig. 0.008)	-.017	.074	.044	2.490	.125

The values of R^2 varied from 7% to 18.7% for different regression models, implying that reasonably fair explanation of variation in NPA ratios was explained by CRM index. Low values of R^2 also suggest that besides the CRM practices various other factors explain the variation in NPA ratios. Numerous studies conducted in India and in other countries on causes of NPA (McGoven, 1998; Bloem & Goerter, 2001; Muniappan, 2002; Das & Ghosh, 2003; Mohan, 2003; Reddy, 2004; Chaudhuri and Sesame, 2008, etc.) have identified various contributory factors, such as, risk appetite of banks, lenient credit terms, share of priority sector advances to total advances, mix of agricultural and industrial advances, willful default by the customer, laxity in legal procedures, political interferences, such as loan melas, loan waiver, government policies, macroeconomic factors (such as, GDP growth, credit growth, real interest rate and real exchange rate appreciation), etc. The central bank of India, RBI study (1999) also gave similar findings.

Thus, in both tests of validity, the proposed CRM index performs as expected – tending to confirm it as a valid measure of maturity.

Conclusion and intended contribution

The recent global financial crisis has brought in focus the issue of effective credit risk management in banks. It is imperative for a bank in particular and for banking system in general to regularly monitor and review the CRM practices. A single value measure that represents an evaluation of credit risk management framework for a commercial bank can be useful in such monitoring. The CRM index proposed in this paper provides an initial construct that can be further

improved by incorporating more benchmark practices and realigning weights for different elements depending upon bank and country specific characteristics. It is perhaps for the first time that a construct for CRM index has been proposed, based on benchmark practices in this regard. The idea of using an index like this as CRM maturity model is unique and not widely discussed in literature. From the perspective of methodology, this paper makes a significant contribution by testing the validity of a single value quantitative measure for a list of practices. Identification of various categories of elements that constitute building blocks of a CRM framework is another unique contribution of this study.

Limitations and scope for further research

The proposed index suffers from a number of limitations which can be motivation for further research in the area. The validity of this index has been tested, based on the CRM index scores computed from the set of CRM practices followed by banks in India. So the country specific characteristics might restrict the generalization of construct for the index. Thus, a multi-country study with larger size of sample could be more useful in making better generalizations. Larger sample size will also permit analysis of CRM index scores for different categories of banks, classified on the basis of size, ownership and geographical spread. This study relies on responses of CRM officials with regard to CRM practices. Any inaccuracy that might have crept in these responses may result in over/under estimation of CRM index scores. Ideally, these responses should be verified with the help of relevant documents that could not be done due to constraints of resources.

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