

Bank Credit Risk Management

by R. Boffey and G.N. Robson, Department of Economics and Finance, Edith Cowan University

1. Introduction

Bank management, from a finance theory perspective, is generally acknowledged to involve the management of four major balance sheet risks: liquidity risk, interest rate risk, capital risk and credit risk (Hempel et al, 1989). Of these, credit risk has commonly been identified as the key risk in terms of its influence on bank performance (Sinkey, 1992, p.279) and bank failure (Spadaford, 1988).

A key reason why the correct management of credit risk is so important is because banks have such a limited capacity to absorb loan losses. In broad terms, the capacity of a bank to absorb a loan loss comes, in the first instance, from income generated by other profitable loans and, in the second instance, by bank capital.

The income that a bank generates from its profitable loans is typically modest. Over the past decade in Australia, for instance, the four major banks have operated with net interest margins of approximately 3.5% (Phelps, 1991). The corresponding return on assets has been approximately 0.6%. There is a marked comparison to be made between this 0.6% return on assets for banks and the 5.6% made by non-bank financial institutions in Australia for the same period.

The low risk - low margin nature of banking business is something that has been written about for some time. For instance, the author of *The Country Banker* (a collection of writings on banking first published over a hundred years ago) identified that typically it would take twenty five pounds of high quality lending to replace a loan loss of one pound (Rae, 1885). More recently, Sheppard (1991) has discussed how the probability of default on a loan has to be less than 1% in order for a bank to be profitable given a typical net interest margin on its loan of 2%.

Capital is the second way open to a bank to absorb loan losses. Given the low levels of capital that banks can operate with under the Capital Adequacy Regulations (compared, for instance, to gearing levels typically achieved by manufacturing companies), the extent of the loan losses that capital could potentially absorb is also quite limited. Shanmugan et al (1992) quoted a major share investor in the USA on this point as follows:

"The banking business is no favourite of ours. When assets are twenty times equity - a common ratio in this industry - mistakes that involve only a small portion of assets can destroy a major portion of equity... and mistakes have been the rule rather than the exception." (p.64)

The lending "mistakes" that banks have made internationally over the past decade have been well documented (The Economist, Survey of International Banking, April

1993). Authors such as White (1992) have suggested a remedy in the form of a "return to the basics" of lending. However, as Brice (1992) has noted, the successful bank in the 1990's will build on the "basics" by developing innovative structures, systems and processes to manage its credit risk in a more pro-active way.

Given that most of these "mistakes" were generally made in the area of corporate and commercial business lending, it was not surprising that both White (1991) and Brice (1992), for instance, largely confined their discussion to this area of lending. Their emphasis will be continued in this article.

The rest of this article will review some of the innovations which are currently occurring in the management of credit risk (for corporate and commercial business lending). Risk rating systems, portfolio theory and loan management, pricing for risk, and loan loss prediction are the main areas of innovation which will be covered. Overlaying the coverage of these four topics is an emphasis on creating a credit culture. Section 2 will discuss this important concept.

2. Credit Culture

A recent report commissioned by the Australian Institute of Bankers researched the topical issue of "Improving Asset Quality" (Brice, 1992). The report dealt with a number of issues which might be described as quantitative or objective in their nature and which involved applications of the theory of finance. Among these issues were sampling techniques as part of loan management, credit scoring models, and quantitative models that can be used to predict corporate failure and measure default risk.

An interesting facet of the report was that overlaying its coverage of finance-related issues was a consistent emphasis on the importance of "credit culture". The term "credit culture" has been defined by McKinley (1990), the major author on this topic, as:

"... a combination of factors that establish a lending environment that encourages certain lending behaviour. It should include such things as management's communication of values and priorities, the indoctrination of lenders during training, and the bank's lending philosophy and policy." (p.5)

The main reason for focusing on "credit culture" here is that it has been cited in the literature (eg. Spadaford (1988) and Brice (1992)) as an important factor in explaining bank performance and in some cases bank failure.

Spadaford (1988) reported details of a study conducted in the United States by the Office of the Comptroller of Currency. In the study 162 bank failures that had occurred in the USA since 1979 were analysed. The study revealed that 98% of the failed banks had failed because of asset quality problems. The study concluded with a list of specific problems which were identified as commonly leading to the asset quality problems. Some of the specific problems which are relevant here include poorly followed loan policy, inadequate systems to ensure compliance with internal policies or laws, and inadequate controls over or supervision of key bank officers or departments.

Brice (1992) has formulated a similar list of specific problems which included ineffective audit of the credit function, poorly communicated policies, and little regard to credit policy in general.

A unifying characteristic of the specific problems identified by both Spadaford (1988) and Brice (1992) is that they were the product of a poorly developed credit culture in the banks concerned. Both authors reached similar conclusions as evidenced in the following quotes:

"Clearly in many banks the key problem is not the lack of credit policy, but rather the absence of effective enforcement that ensures compliance. (Spadaford, 1988, p.22)

"Discussions revealed a general consensus among commercial/corporate bankers and regulators that the bulk of the industry's problems were not attributable to inadequacy of bank safeguards and policies, but to selective or intermittent enforcement of existing lending standards." (Brice, 1992, p.13)

Given the importance of credit culture as a determinant of bank performance, it is appropriate to consider the four broad cultures types as defined by McKinley (1991):

- Immediate performance-driven;
- Market share/production-driven;
- Values-driven;
- Unfocused (current priority-driven).

The *Values-Driven Organisation* is seen as providing the strongest credit culture. It is a strong credit organisation with few policy exceptions; there is an appropriate balance between credit quality and revenue generation; and management are committed to maintaining strong credit values within the organisation. There is no hidden credit policy.

In an *Immediate Performance-Driven Organisation* a great deal of pressure is placed on earnings goals. This could conflict with the goal of maintaining good credit quality. In such banks, strong credit systems (and staff) need to be in place to mitigate the degree of asset quality deterioration that could occur. During periods of relatively low demand for credit there can be a conflict between written and hidden credit policy.

A *Market Share/Production-Driven Organisation* typically has the goal of being the biggest. Lenders generally understand that their primary role is to produce. This can lead to conflicts over priorities in terms of maintaining credit quality. As a result, hidden credit policy tends to dominate written policy.

An *Unfocused (Current Priority-Driven) Organisation* will often be attempting to answer the question - "What do we want to be?" As a result, lenders are often confused

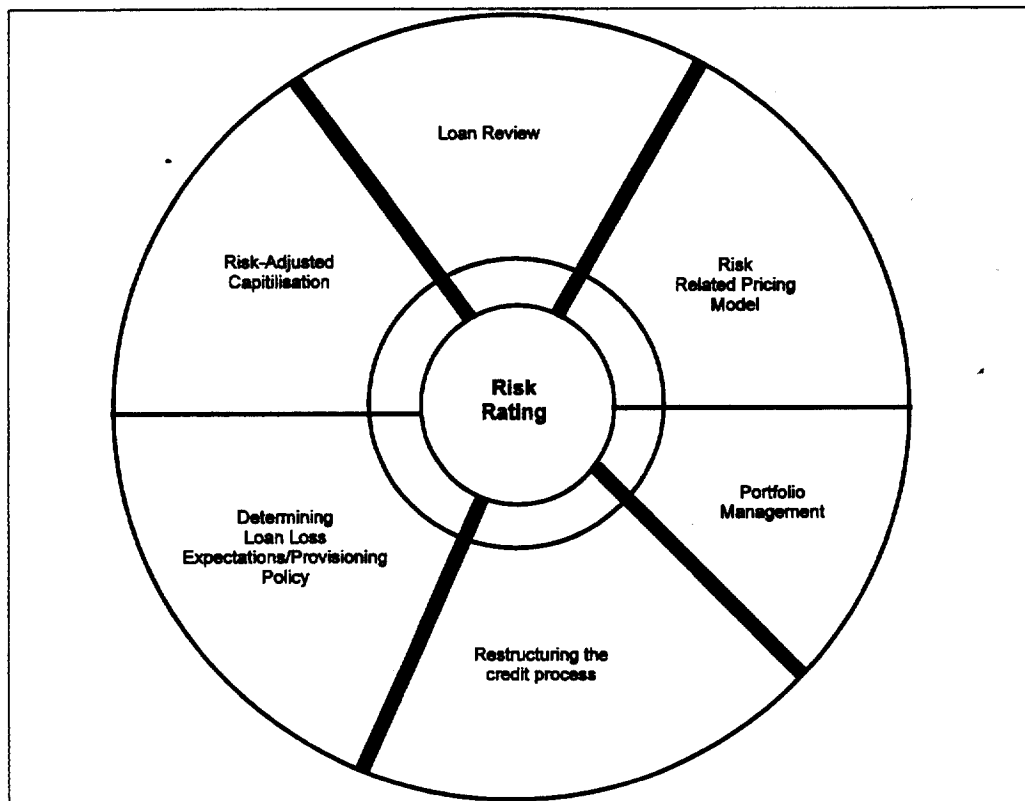
about what behaviour is required of them. An unfocused bank would not be expected to be successful.

A major difference between a values-driven bank, which has consistency in performance as its top priority, and the others is the volatility in earnings and the level of non-performing loans. The values driven bank will exhibit a much lower level of non-performing loans and a lower variability in earnings, share price, and consequently a lower systematic risk.

3. Risk Rating Systems

Brice (1992) has surveyed the international use of risk rating systems in the context of the management of credit risk. He noted that banks initially developed risk rating systems as a response to increasing pressure from external parties. This included regulators, rating agencies and stockbroking analysts who wanted more information on the composition and risks inherent in individual banks' commercial loan portfolios.

According to Brice (1992) the use of these systems has now entered a new phase where they are widely considered as a key part of any credit risk management framework. For instance, the risk rating system can be used as a basis for such activities as loan pricing, loan loss provisioning and loan reviews. This key role is depicted visually in the following diagram from Brice (1992).



Most of the development of risk rating systems has occurred in the United States through the Office of the Comptroller of Currency; rating agencies such as Standard and Poor and Moody's; and adaptations by major United States banks. Earlier systems used between four and five risk categories. However, current practice is to use either a 1 to 9 or 1 to 10 grade rating system. In a survey conducted by Brice (1992), the percentage of banks using ten and nine category risk grading systems respectively was 44% and 22%.

Once the risk grades are defined (eg. 1 "Minimal Risk" to 10 "Loss") the criteria to be used in determining risk grades must be established. Credit criteria used would typically include the following:

- industry and environment factors such as demand for client's product, competitive pressures, barriers to entry, impact of economic downturn on industry, customer and labour relations, competitive advantage of client, quality of plant and equipment, impact of technological change etc.;
- management and control factors such as age of company, management's experience, qualifications, integrity, succession plans, information systems etc.;
- financial condition of the client including gearing, liquidity, profitability, working capital management etc.;
- debt servicing capacity including interest cover and cash flow cover;
- security cover in terms of loanable value of securities to facility limits;
- security type including first registered charges, control of security, marketability of security, preferential claims etc.;
- conditions prescribed in loan documentation such as regular financial reports by client, audited accounts, operating covenants, letters of comfort from parent etc.

The next step is to "score" each criterion (or risk factor). The maximum possible score for each risk factor will depend upon its perceived relative importance in assessing credit risk. A hypothetical risk rating schedule is as follows:(see next page)

Note that this hypothetical risk rating schedule weights financial aspects 40% and security factors 30%. The total score of 100 would then be linked to the risk rating categories such that a score between 91 and 100 would be assigned a risk rating of 1 and a score between 81 and 90 would be risk rated 2 and so on.

Integrating a risk rating system into the credit risk management process requires careful planning and should incorporate the following considerations (some of which have been identified by Brice (1992)):

Risk Rating Loss Provision (as a % of the total loans held)		
	RISK FACTOR	MAX SCORE
1.	Industry and Environment	10
2.	Management and Control	15
3.	Financial Condition	20
4.	Servicing Capacity	20
5.	Security Cover	20
6.	Security Type	10
7.	Loan Conditions and Support	5
		100

- clear and precise definition and explanation of the rating factors and criteria;
- a balance between subjective and objective criteria;
- the use of rating factors which are based on credit criteria appropriate to the business mix;
- the flexibility to handle a diversity of loans including secured and unsecured, as well as small and large clients;
- extensive training of staff to ensure credit ratings are consistent between all involved in the risk rating process;
- the use of current information which is regularly updated and audited; and
- an integration of risk rating scores into loan officer performance measures.

If the preceding issues are managed properly, the risk rating system can become a pivotal factor in a bank's credit management process.

4. Pricing for Risk

The obvious extension of the risk rating system is to link it with the pricing of loans. Pricing models linked to risk have been developed by many banks. The models incorporate the expected profitability of a loan (or banking relationship), capital adequacy requirements, return on assets and return on equity objectives plus an adjustment for risk.

There are any number of models for assessing client profitability to determine the best pricing structure relative to the perceived risk in the facilities. Some of the variables that need to be estimated include:

- Equity capital allocated to support the loan. This requires identification of the type of facilities advanced (eg. cash, bills, letters of credit, standby lines etc.).

The relevant capital adequacy risk weightings are applied to determine the capital adequacy 'value' of the facility (relationship).

- The bank's normal margin over its cost of funds is then estimated (eg. 1% margin). This margin is applied to the "total capital value" to derive a base income amount.
- A risk adjustment percentage is then determined and this risk income added to the base income. The risk adjustment margin could be linked to the risk rating level (1 to 10) or the score (0 to 100) for finer calibration of pricing margins. For example, a risk rating of 2 could have 0.50% as a risk margin. Or this could be spread over the range of 81 to 90.
- To these two margins may be added a charge for the operating costs to the bank in providing the asset and/or liability products. This percentage would be a function of asset and liability balances and the expected consumption of the bank's personnel and processing resources.
- The sum of these three margins provides an estimate of the total income required from the relationship.
- This "required income" would then be compared with an estimate of the expected income from the relationship. That is, from any of the following sources:
 - loan facilities such as cash, bills, letters of credit, guarantees;
 - fee income such as establishment fees, unused facility fees, banking services, foreign exchange fees and margins plus fees from other products such as options, swaps, forward rate contracts etc.;
 - income from deposits such as non-interest bearing current accounts etc.
- From these income and cost estimates, return on equity and return on assets for each relationship can be determined and compared with the bank's objectives.

The final stage would then be to ensure that the suggested margins and fees are competitive. The total "package" of pricing, security to be taken, loan covenants and reporting requirements must, at the end of the day, be competitive, suitable to the client and within bank guidelines (both income and credit risk).

Casey (1990), has commented on the pricing spread achieved by banks in the US using models like the one outlined in the preceding paragraphs. The figures indicate that these banks are very commonly achieving only a 100 basis point spread (after inclusion of fee income and required balances) between their highest quality loans and their lowest quality loans.

In comparison, the bond market typically has a 500 point spread between the highest and lowest quality bonds. Casey (1990) went on to suggest that banks were not getting paid for the credit risk that they were bearing: they "...routinely misprice corporate loans, charging too much to their best customers and far too little to their riskiest ones" (p.13).

Casey (1990) concludes that while each bank needs to develop and implement a pricing model, the process should not stop there. There is an ongoing need to analyse the pricing patterns which the model produces to ensure that the bank is being adequately rewarded for the credit risks that it is taking.

5. Loan Loss Expectations and Prediction

Expected loss should be considered as a normal cost of providing credit and, as discussed above, can be incorporated into pricing models. The use of a risk rating system implies there is a range of risky assets in the portfolio, all with a different probability of default. Work done by Brice (1992) has identified that a number of banks identify default risk as being comprised of two components:

- Expected loss which involves an actuarial calculation of the anticipated average loss on loans within a particular asset class over a given time period.
- Unexpected loss which is the change (volatility) of those expected losses from one year to the next.

Expected loss can be calculated using the risk rating system to determine default probability within each risk grade and multiplying it by the historical experience of percentage principal written off. Loss provisions can then be calculated in terms of basis points and assigned to each risk grade. An example might be as shown below:

RISK RATING	LOSS PROVISION (as a % of the total loans held)
1	0.1%
2	0.2%
3	0.5%
4	1.0%
5	4.0%
6	8.0%
7	20.0%
8	50.0%
9-10	100.0%

Unexpected loss, the variability of losses from year to year, is that part of default risk which requires an allocation of equity capital. Banks lending at the lower end of the risk scale or exposed through high concentration in one or two industries will tend to have more unexpected loan losses and a greater need for a capital buffer. Loan portfolio management and tracing risk rating migration (downwards) will keep the bank informed and lessen the number of "surprises".

A key to understanding and improving credit risk management is the linking of a robust risk rating system (which serves as an accurate predictor of default) to the process of estimating expected and unexpected losses. Prudent forecasts of loan loss provisions can be made and logically based pricing models can be developed.

A bank's internal loan portfolio management system and its risk rating system should provide early warning of default and corporate failure. A bank can supplement its internal prediction with external quantitative models used to predict corporate failure. The most well known have been the Beaver (1966) univariate models and the Altman (1968) Z score, multivariate approach. In Australia Lincoln (1984) refined the approach by recognising that there were systematic differences between industries. A discriminant equation was derived for each industry with better prediction ability than an all-companies equation.

Houghton and Smith (1991) developed similar models in conjunction with the Western Australian Department of Corporate Affairs. The sample was 432 companies and 31 financial institutions listed on the stock exchange. The sample was split into different categories and industries to improve prediction ability. The conclusion from most of these studies was that the models are most effective one year before actual failure.

Use of quantitative models to predict corporate defaults are not extensively used by banks. The reasons for this include:

- cost to acquire the information/score;
- accounting-based models that are not directly transferable to other business structures (eg. partnerships, trusts);
- banks prefer their own loan staff to perform the analytical review to obtain a "feel" for the client's business.

The final decision of whether to use these models as part of the credit risk management system will be dependent upon the perceived costs and benefits from such models. Obviously these predictive models would not replace the credit assessment function but could serve as a good cross-check.

6. Loan Portfolio Management

Fund managers and professional investors are generally acknowledged (see Elton and Gruber, 1991) to have accepted modern portfolio theory (MPT) and developed sophisticated models based on MPT. In contrast, banks have been identified by Brice (1992) and Carmichael and Davis (1991) as being slow in applying MPT. Despite this slowness, Brice (1992) has argued that some banks are currently in the process of developing portfolio measurement and management systems which monitor a range of variables including:

- industry concentrations;
- geographic exposure;

- duration and tenor of facilities;
- product clustering;
- over exposure to one borrower and group;
- cross directorships and interrelationships between companies;
- secured versus unsecured mix;
- risk rating.

All the above suggest that banks are at least embracing the main thrust of MPT that diversification can reduce the risk of a portfolio.

Carmichael and Davis (1991) have suggested that MPT has limitations in the application to a bank's loan portfolio because the assumption of normally distributed returns does not hold. This is because the upside of the return is limited to the amount of the loan plus interest. Whereas, on the downside, the bank's return is limited to the extent that it has collateral. In the extreme, the bank can lose the total amount of the loan.

Carmichael and Davis (1991) have nevertheless suggested that the principles of MPT can still be applied to build a risk management system for a bank. The approach is to model the bank's profitability as a function of the external environment (economic variables) and the bank's balance sheet. The output of the models is a time path of profitability conditional on a given set of inputs (or scenarios).

Using this approach, risk is measured by the combination of means and standard deviations of entire paths of profitability and by the sensitivity of these dynamic distributions to various external factors. Using simulation, distributions can be generated for returns on the loan portfolio, return on other financial assets and the distribution of deposit cost and finally the profit distribution. The approach allows some measure of the risk-return trade-off through numeric rather than analytical methods.

Carmichael and Davis (1991) have acknowledged that their model was only a starting point to building a risk management system appropriate to banking. The main benefit of their framework was that it would force a bank to review the linkages between profit, deposits, loans, other assets and external variables. That review would, no doubt, provide useful insights into the interrelationships existing within a bank's total portfolio.

Other loan portfolio management trends identified by Brice (1992) include:

- - setting concentration limits on exposure to industries based on an analysis of covariance of returns;

- reviewing the impact of macroeconomic events on industries to improve portfolio construction;
- tracing risk rating movements of borrowers over time;
- establishment of asset allocation committees (similar to fund managers) and developing efficient portfolios based on optimisation models.

It may not be possible to implement MPT for bank's in a similar way to fund managers because of the return distribution properties and illiquidity of bank loans. Loan portfolio management then becomes one of risk measurement and risk strategies and policies to ensure a well diversified portfolio is maintained which is consistent with the bank's objectives.

7. Conclusion

Bank credit risk management has come under close scrutiny in recent times due to the abnormal loan losses which flowed from profligate lending practices in the late 1980s. As a result of this scrutiny there has recently been a rapid development of sophisticated systems to manage credit quality at both the micro and macro level. A number of these systems - such as risk rating systems, risk pricing systems, loan loss prediction systems, and loan portfolio management systems - have been identified and discussed in this article. Two major points have been made about these various systems. The first is that their use must be integrated in order to achieve maximum improvements in asset quality. The second is that while these systems are necessary, they are not sufficient to guarantee the integrity of credit risk management within a bank. The success of bank credit management in the 1990s will depend upon the development and nurturing of a strong credit culture that permeates the entire bank from the board of directors down to the loan officer managing a portfolio of loans.

References

- Altman, E.I., "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy", *Journal of Finance* (Sept 1968), pp.589-609.
- Beaver, W.H., "Financial Ratios as Predictors of Failure", *Empirical Research in Accounting: Selected Studies*, Supplement to the *Journal of Accounting Research*, (1966), (1966) pp.71-111.
- Beaver, W.H., "Market Prices, Financial Ratios and the Prediction of Failure", *Journal of Accounting Research*, (Autumn 1968), pp.179-192.
- Brice, R., "Improving Credit Quality", Australian Institute of Bankers Scholarship Report (1992), pp.1-102.
- Carmichael, J. and Davis, P., "The Relevance of Portfolio Theory to Risk Management in Financial Institutions", in *Risk Management in Financial Institutions*, Davis, K. and Harper, I. (eds) Allen & Unwin (1991).
- Casey, R., Mispricing Loans, *US Banker*, (1990), pp.13-15.
- Elton, J.E. and Gruber, J.M., *Modern Portfolio Theory and Investment Analysis*, John Wiley and Sons, New York, (1991).
- Freeman, A., A Survey of International Banking, *The Economist*, (April 1992), pp.3-38.
- Hempel, G.H., Coleman, A.B., and Simonson, D.G., *Bank Management: Text and Cases*, John Wiley and Sons, New York (1990).
- Houghton, K. and Smith, M., "Loan Risk and the Anticipation of Corporate Distress: West Australian Evidence", in *Risk Management in Financial Institutions*, Davis, K. and Harper, I. (eds), Allen & Unwin (1991).
- Lincoln, M., "An Empirical Study of the Usefulness of Accounting Ratios to Describe Levels of Insolvency Risk", *Journal of Banking and Finance*, (1984) pp.321-340.
- McKinley, J.E., "Analysing Your Credit Culture", *The Journal of Commercial Bank Lending*, (1990), pp.4-10.
- McKinley, J.E., "Linking Credit Culture and Risk Management Strategy", *The Journal of Commercial Bank Lending*, (1992), pp.1-102.
- Phelps, L., Competition: profitability and margins, in *The Deregulation of Financial Intermediaries*, Macfarlane, I. (ed), Reserve Bank of Australia, (1991), pp.87-110.
- Rae, G., *The Country Banker*, John Murray, Albemarle Street, London, (1885).

Shanmugam, G., Turton, C., and Hempel, G.H., *Bank Management*, John Wiley and Sons, Sydney, (1992).

Sheppard, R., Approaches to loan management issues for Australian banks - the practice, *The Australian Banker*, (August 1991), pp.178-181.

Sinkey, J.C., *Commercial Bank Financial Management*, Macmillan Publishing Company, New York, (1992).

Spadaford, J.F., Credit quality: CEO's set the tone, *Magazine of Bank Administration*, (June 1988), pp.20-22.

White, R., Banking in the 1990's - back to basics, *The Australian Banker*, (October 1991), pp.236-241.