Best practice and remaining challenges for credit economic capital

Received (in revised form): 25th January, 2008

Corinne Neale
is Head of Capital Management for Asia Pacific at Algorithmics, a Member of the Fitch Group. Ms Neale has 18 years of experience in the risk management industry at Chase Manhattan Bank, Bankers Trust Company, IQ Financial (a Deutsche Bank company) and S&P. Ms Neale has advised banks and regulators on market risk, credit risk and capital management around the world and is a frequent contributor to industry forums, conferences and publications.

Algorithmics, 33 Pekin Street, Pekin House #02-02, Far East Square, 048763, Singapore
Tel: +65 6536 7737; E-mail corinne.neale@algorithmics.com

Abstract This paper describes the current state of development of credit economic capital models among banks, particularly in Asia Pacific, and the challenges that must be addressed to meet regulatory and management expectations.

Keywords: *credit economic capital, New Basel Accord, Pillar 2, Asia Pacific credit risks*

INTRODUCTION

For more than 20 years, internationally active and sophisticated banks have been using internal calculation tools to assess and manage the impact of future changes on their capital requirements. While these internal tools were initially focused on assessing the capital-at-risk impact of financial market events, forward-looking banks were quick at adding the impact of adverse credit and other events to their capital-at-risk estimates in order to drive capital allocation and grow risk-adjusted returns.

Changes in industry practices, however, take time and require sponsorship. It was not until 1999 and the first consultative paper of the New Basel Capital Accord that the economic capital practices pioneered by Bankers Trust and other similar banks gained popularity among a larger number of banks.

This paper takes a practitioner's view of current practices in the quantification and management of credit economic capital and describes remaining challenges. While the observations made in this paper apply universally, the examples used are specifically derived from observations in the Asia Pacific region.

The first section of this paper builds on industry feedback to assess progress made in credit economic capital management practices. The second section reviews recent observations made by regulators on the current adequacy of banks' credit economic capital models. The third section describes common challenges expressed by banks and outlines important themes to be considered by banks and their regulators in the future.

CURRENT PRACTICES

As part of its ongoing industry

monitoring process, Algorithmics conducted a private interview-based survey with top-tier banks around the world in the first quarter of 2007. The purpose was to assess how, more than seven years after the publication of the first New Basel Accord consultative paper, banks measure and manage portfolio credit risk.

The banks surveyed in the Asia Pacific region were chosen from among the three largest in asset size in every country and from among those aiming to implement the Basel II Advanced Internal Rating Based Approach. Every one of these banks had implemented or was in the process of implementing either an internal or vendor solution to measure and manage credit risk in their portfolios.

A detailed description of the survey's questions and answers is outside the scope of this paper. Instead, the paper will focus on significant findings that suggest possible future evolutions of practices for credit economic capital management.

The first finding is that the term 'management of credit risk in banks' portfolios' has different meanings to different people among the survey respondents. The significance of this finding is that banks' practices are as a result not uniform.

This will come as no surprise to industry practitioners. In 2005, the International Association of Credit Portfolio Managers itself came to realise that 'credit portfolio management' referred to a range of practices among its members and required definitions.[1]

In Algorithmics' survey, North American and European respondents identified two main credit portfolio management processes in their banks:

- *A top-down economic capital management process* focusing on establishing the overall risk appetite of the bank, and then allocating the risk capital to the bank's various risk-taking activities to meet a predefined risk-return trade-off. The allocation is required to support bank activities through plausible but extreme macroeconomic conditions.[2]
- *A portfolio management process* for which the amount of risk capital available is a given and the focus is on initiating transactions that maximise the returns giving the process more of a bottom-up flavour.

Although both processes are seen to be linked, they are also clearly seen to differ in objectives and perspective. Accounting for interactions among different risk types, eg between market risk and credit risk, is deemed critical to effective economic capital management processes. However, this may not be necessary to portfolio management if the primary or only source of risk in the portfolio is, say, credit risk. As a result, methodology simplifications are also more likely in traditional portfolio management tools as they only produce relative measures of risk.

In this context, credit economic capital was defined by survey respondents as the share of total economic capital covering default and rating migration related risks, while portfolio credit risk was often defined in relation to the objectives set for the portfolio.

A second significant finding was that, while Asia Pacific banks reported having a credit portfolio management process in place, they were for the most part making limited use of it, and had overwhelmingly not yet embarked on

credit economic capital management.

Asia Pacific respondents:

- were usually at the very beginning of defining and measuring their internal capital adequacy assessment process;
- had usually not undertaken an external validation of their methodologies;
- were not remunerating their staff based on risk-adjusted return performance measures;
- had usually not implemented nor enforced limits based on credit risk; and
- at a senior management level, consistently made very limited use of the portfolio credit risk information produced.

A major constraint identified by Asia Pacific banks to explain slow progress was the lack of senior management 'buy-in', a term expressing a lack of senior management confidence in the techniques, data and assumptions commonly used, a lack of understanding in their application, as well as the absence of credible oversight.

This may be about to change. First, as the Basel Committee for Banking Supervision itself recognised in its September 2007 Quarterly Review bulletin,[3] banks have made 'remarkable advances in their economic capital framework' over the past few years, and with these come a better understanding of model limitations, applications and alternative solutions.

Secondly, regulators themselves have started paying oversight visits to banks which aim to comply with the Internal Ratings Based Approach of the New Basel Accord.[2] From these visits and from both formal and informal feedback from regulators, a picture of the current consistency, adequacy and state of development of banks' economic capital measurement and management practices is emerging, in particular in relation to credit risk.

Will these two forces be sufficient to convince banks and their senior management in the Asia Pacific region to implement or upgrade credit economic capital models? Sociologist Malcolm Gladwell suggests that they may be. In his best-selling book, *The Tipping Point*, Gladwell describes how personally involving individuals in a process via a powerful sponsor, while providing practical guidance on its execution, leads to a greater chance of the process being adopted on a wide scale.[4]

This may well work for the implementation of satisfactory credit economic capital practices across banks. Regulatory feedback on individual banks' economic capital measurement and management practices is already serving to highlight the meaning and importance of economic capital results to banks' senior management and external stakeholders.

It may also help banks to further strengthen their methods and processes, and in particular to initiate a shift beyond current limited credit portfolio management practices, towards a more holistic and credible approach to capital management.

REGULATORY LEVERAGE

So far there have been two main areas of regulatory feedback and suggested improvements on credit economic capital models in jurisdictions where banks have already implemented such models.

The first area relates to required improvements in documentation:

- *Banks are expected to align their economic capital methodology to their risk profiles.* This requires a documentation of the major risks banks are facing and a rationale for how the methodology implemented captures these risks. This will require a departure from the prevailing one-size-fits-all approach adopted by many banks. For example, a methodology adopted for portfolio credit risk management by an international bank may not be appropriate for the risk profile or capital management objectives of a domestically focused Asian bank.
- *Expectations and assumptions should be formalised.* Economic capital model assumptions, limitations and the general consistency between a model methodology and the way its results are likely to be used by senior management need to be better documented. This may prompt less sophisticated banks to recognise that the methodology they are using is ill-adapted to the purpose for which they are using it.
- *A breakdown of individual risk contributions* within the bank's total economic capital result is rarely currently available to banks. This is however necessary to facilitate communications with regulators, and to put in perspective the relative size of 'major risks'. For instance:
  - What is the capital requirement associated with rating migration risk as opposed to just default risk?
  - What is the capital requirement contribution of concentration risk?
  - What is the contribution to results of the bank's own default and risk correlation estimates, etc?

The second main area of suggested improvement from regulators relates to the need for more robust internal control mechanisms to provide confidence in the reliability of the credit economic capital estimates produced. In particular, these internal control mechanisms should embrace the implementation of a formal credit economic capital model validation process that includes:

- validation of the model's methodology, the adequacy of its assumptions based on the type of portfolios carrying credit risk, and the impact of its limitations on the model applications;
- the ability to derive from the methodology a reliable measure of key risk contributions, in particular for concentration risk, which is a major preoccupation in Asia Pacific;
- results of stress tests and benchmarking/replication tests;
- the granularity of results and sufficiency to support decision making by groups including senior management.

To appreciate the importance of a formal validation process, it needs to be noted that most of the off-the-shelf credit economic capital methodologies currently available are based on similar mathematical foundations.[5] They differ however in their modelling distributions, assumptions and limitations, particularly in relation to the modelling of exposures, default correlations, default migrations, loss given default, the impact of macroeconomic factors and the definition of risk horizons. As a result, and depending on their implementation, common off-the-shelf credit economic capital models can have different applications, may yield different results, and may over or under-represent capital at risk.

More comments and suggestions are expected as regulators are still largely in investigative mode. This was best expressed by John Laker, Chairman of the Australian Prudential Regulation Authority (APRA) in his August 2007 comments on APRA's Pillar 2 reviews:

> 'there are differences in economic capital modelling methodologies in terms of risk coverage, risk definitions, exposure measurement and risk aggregation. There are also significant differences in the relativities between modelled economic capital and equivalent Pillar 1 regulatory capital numbers.'[6]

What is starting to emerge from the combined pressure of regulatory reviews, self-imposed validation tests, senior management's feedback and ongoing methodological enhancements is a new approach for credit economic capital measurement and management:

- a more risk-aware approach, where risks definition, assumptions and their representation are tailored to an individual bank's risk profile;[7]
- a less siloed approach, where risks are not measured in isolation but in relation to co-dependent risks to avoid double counting or ignoring risks;[8]
- a more validated approach, transparent and independently controlled;
- a more complete approach with more granular risk contribution information to guide senior management decisions;
- a more flexible approach, in particular one that allows banks to change their methodology foundations and assumptions without major technology overhauls as these banks grow in sophistication.

IMPLEMENTATION CHALLENGES

There are obviously many challenges facing banks in the process of implementing or upgrading such credit economic capital infrastructures under the scrutiny of their regulators. One of the most demanding ones however may be the need for banks to tailor their methodologies and processes to their own risk profile and to their shareholders' main objective, namely stable growth that makes optimal use of capital resources.

Achieving this goal will require an open evaluation of the adequacy of assumptions made in the methodology that banks intend to use, as these methodologies may have initially been designed for different purposes, portfolios or regions. As Peter Drucker wrote in *Management Challenges for the 21st Century*, common assumptions have a tendency to be confused with realities, but are sometimes in fact so detached from reality that they become obstacles to the successful execution of management's objectives.[9] Three real-life illustrations are given below.

Model correlation foundations

A commonly-made assumption in off-the-shelf credit economic capital models is that a limited number of equity index credit drivers accurately account for future default correlations in *any* bank portfolio. This assumption was adopted and taken to extremes in the New Basel Accord regulatory capital formula, which uses a single credit driver.

In a study published in 2006, Cespedes *et al.* put this assumption to the test.[10] While acknowledging the known

limitations of using equity indices as the sole explanatory factor for default events, the authors conducted a principal component analysis of individual stock market index returns in developed economies and in emerging economies. The purpose of this analysis was to identify the number of factors required to explain 90 per cent of the variability within a region. The study showed that, in developed economies, three factors are required to explain more than 90 per cent of deviations, whereas in emerging economies, seven factors are required to achieve the same level of variability, and these factors differ by portfolio and region.

It derives from this that even for credit portfolios closely related to listed equities, multifactor models are necessary to accurately measure default correlations in credit economic capital. It also follows that there is no single list of factors universally applicable to all portfolios. Furthermore, and most particularly for credit portfolios that are not directly related to listed equities, a number of other correlation drivers may need to be calibrated in a bank's credit economic capital model. These may most particularly include market risk factors (such as interest rate, foreign exchange rate and real estate prices) and other significant macroeconomic indicators (such as gross domestic product and sectorial growth).

Such multifactor models not only will allow for more accurate credit economic capital estimates across the bank's portfolios, but they will also support the consistent application of macroeconomic stress tests, for instance in the quantification of interest rate risk in the banking book.

Model loss distribution foundations

A second example of assumption that needs questioning is the common use of a single method to assess the future loss distribution for all portfolios containing credit risk within a bank.

Historically, banks have tended to measure risk in areas where it was easier to measure, as opposed to aiming for comprehensive and tailored risk assessments. As a result, banks have used either Monte Carlo type analysis or parametric measures of credit economic capital that are respectively better adapted to large corporate portfolios and to retail portfolios.

The challenge to banks truly aiming at quantifying their total credit economic capital is the concurrent and consistent use of methodologies tailored to the many forms and locations of credit risk in their risk profile. Credit risk occurs in retail portfolios, in semi-diversified small and medium-sized companies' portfolios, in undiversified large corporate portfolios, in the trading book and in the banking book. Credit risk may be on or off balance sheet. Whatever its form and location, credit risk needs to capture consistently and concurrently across all exposures.

Hideaki Higo of the Bank of Japan presented a solution to this implementation challenge in a recent working paper. The approach consists of segmenting portfolios as a function of their level of diversification, and in running in parallel different loss distribution estimation techniques for each portfolio segment.[11]

This solution not only more accurately assesses credit economic capital for the entire portfolio, it also allows banks to:

- quantify the impact of concentration risk on credit economic capital requirements, as the difference between the credit economic capital of the entire bank where individual portfolios have a loss distribution adapted to their level of granularity and the credit economic capital of the entire bank where individual portfolios make use of a uniform law of large number distribution;
- quantify more accurately marginal risk contribution, for instance the contribution of the trading book in the total credit economic capital, or the contribution of retail risk in the total credit economic capital, as each risk makes use of tailored distribution functions and risk parameters that can be switched on and off to assess their impact;
- 'reconcile' regulatory and credit economic capital estimates, most particularly in discussions with regulators, by assessing the impact on credit economic capital of switching 'on and off' computation assumptions prescribed by regulators.

The challenge for banks is to implement a credit economic capital framework where not only individual obligors or groups of obligors can be associated to tailored default drivers, but also where individual portfolio segments can be associated to tailored and adapted loss distributions. These are basic foundations to capture all credit risks incurred across all business activities and assess their impact over time across varied adverse economic conditions.

Model granularity of output

A third assumption that needs questioning is the usefulness of a model's output to manage the banks' capital. Capital management implies that the methodology produces granular risk contribution results that support senior management decisions. Failing this, a credit economic capital model would not pass the most basic 'use test'. What 'granular' means of course depends on the portfolios to be analysed and may evolve through time. As a result, the credit economic capital methodology needs to be flexible enough to user-define the appropriate level of output granularity, and robust enough to process the required information rapidly.

At the Spring 2007 General Meeting of the International Association of Credit Portfolio Managers, Ben De Prisco proposed an elegant solution to this challenge.[12] His technique, termed 'additive risk contribution', is an enhancement of traditional time-consuming sampling techniques to quantify risk contribution. It consists of conditional expectation computation routines calculated from a sample distribution at all risk quantiles simultaneously across as many time steps as required by end users. The risk measures employed are additive, thereby allowing a simultaneous and much more intuitive view of the risk in the overall enterprise portfolio as well as its breakdown at the various subportfolio levels.

The application of this technique allows the rapid assessment of marginal risk contribution in discussions with regulators and in support of the 'what-if' analysis that may be required at short notice by senior management. Once accompanied by user-friendly risk visualisation tools, this technique serves to support 'slide and dice' views of the

bank's credit portfolios across all asset classes, any relevant time horizon and any confidence level simultaneously.

There are many more implementation challenges of immediate relevance to credit economic capital managers. Some of them are reflected in current initiatives by Basel-based committees and groups, for instance on the treatment of liquidity risks and the extent to which this affects credit risk; others are longstanding issues such as the definition of macroeconomic and other scenarios of relevance to credit portfolios, or the aggregation of credit with other risks.

First and foremost, however, is the issue of whether banks and their regulators will, in Peter Drucker's words, be able to 'think past yesterday's logic'[8] to embrace more comprehensive and validated credit economic capital frameworks.

Acknowledgment

The author is grateful to Savita Verma for her comments and valuable suggestions for this paper.

References

1 International Association of Credit Portfolio Managers (2005) 'Sound Practices in Credit Portfolio Management', available at: http://www.iacpm.org (accessed 30th October, 2007).

2 Banks must have adequate capital to support their activities under unfavourable economic scenarios; see (2006) 'International Convergence of Capital Measurement and Capital Standards: A Revised Framework, comprehensive version. Basel Committee as Banking Supervision, June, available at: http://www.bis.org (accessed 30th October, 2007).

3 Gadanecz, B. (2007) 'Recent initiatives by the Basel-based committees and groups', *BIS Quarterly Review*, September, available at: http://www.bis.org (accessed 30th October, 2007).

4 Gladwell, M. (2001) 'The Tipping Point' (international edition), Back Bay, Boston.

5 Iscoe, I., Kreinin, A. and Rosen, D. (1999) 'An integrated market and credit risk portfolio model', *Algo Research Quarterly*, Vol. 2, No. 3, p. 22.

6 Laker, J. F. (2007) 'The evolution of risk and risk management. A prudential regulator's perspective', paper presented at the Reserve Bank of Australia Conference on the Structure and Resilience of the Financial System, 20–21 August, at Kirribilli.

7 Basel Committee on Banking Supervision (2003) 'Trends in Risk Integration and Aggregation', BIS, Basel. Annex 2 provides an overview of a range of approaches indicative of banks increasingly adapting their approach to their portfolio and circumstances.

8 Rosenberg, J. V. and Schuermann, T. (2004) 'A General Approach to Integrated Risk Management with Skewed, Fat-Tailed Risks for the Capital Reduction Incentive of Adopting a Risk Integration Approach', Federal Reserve Bank of New York Staff Report No. 185, available at: http://ny.frb.org (accessed 30th October, 2007). The authors found that on average simply adding up marginal risks resulted in a 40 per cent total economic capital over-estimation.

9 Drucker, P. F. (2001) 'Management Challenges for the 21st Century', Harper Collins.

10 Cespedes, J. C. G., Herrero, J. A. de J., Kreinin, A. and Rosen, D. (2006) 'A single multi-factor "factor adjustment" for the treatment of credit capital

diversification', available at: http://www.fields.utoronto.ca/~drosen/ (accessed 30th October, 2007).
11 Higo, H. (2006) 'An efficient Monte Carlo method for a large and non granular credit portfolio', Bank of Japan Working Paper Series No 06-E-19, available at: http://www.boj.or.jp/en/type/ronbun/ron/wps/wp06e19.htm (accessed 30th October, 2007).
12 Presentations delivered to General Meetings of the International Association of Credit Portfolio Managers are available to members. To register and access presentation material, log on to http:///www.iacpm.org.