
Towards better financial risk learning

Received (in revised form): 5th June, 2008

Anna Waldvogel*

is a training consultant specialising in custom and proprietary learning problems related to software use and business process. She applies best practices in learning, design and information management theory on behalf of organisations and learners. Anna offers a unique combination of technical and learning acumen with business experience managing the training function and working in both training and consulting roles. In two decades in IT, she has served clients in financial services, cable and telecom, military and internet commerce. She has led hundreds of successful training implementations in the classroom, through the internet and using on-demand rapid e-learning.

Niall Whelan

joined Scotiabank in 2000 and has had various roles since then. He is currently Director of Research and Model Risk with responsibilities for counterparty credit risk measures and the vetting of pricing and risk models. Prior to 2000 he was a theoretical physicist with appointments in Copenhagen, Paris and Hamilton, Ontario. He speaks on the topic of quantitative risk management at conferences and other forums and has authored several quantitative finance research papers.

*The Learning Enterprise, 72 Springdale Boulevard, Toronto, ON, Canada M4J 1W7
Tel: +1 416 800 1817; E-mail: anna@thelearningenterprise.com

Abstract As recent events have shown, finance professionals need to be as comfortable with risk concepts like liquidity and capital as they currently are with business concepts like compound interest and variable annuities. The firm that succeeds in integrating risk awareness into its business activities has a decided advantage over its competition. Attaining this degree of risk knowledge requires innovative learning approaches drawn from technical communication, presentation, knowledge management and training, as this paper explores. Although external risk training is available within the finance industry, this paper proposes that the interpretation and application of risk concepts are unique to the organisation and will necessarily require customised in-house training. Such a complex effort demands executive sponsorship, and partners within risk management and multiple business units. This paper highlights two financial risk concepts — economic capital and potential future exposure — and proposes practical learning recommendations for each.

Keywords: *financial risk management, financial institutions, credit risk, learning strategy, training, economic capital, potential future exposure, technical communication*

INTRODUCTION

‘If you don’t know where you are going, any road will take you there.’ (Lewis Carroll)

Substantial hurdles remain before risk

management claims its place as a core function at modern financial institutions. The first of these is technological: large sophisticated financial institutions have many inconsistent and legacy systems as well as vast warehouses of data whose

integration into risk management processes remains an enormous difficulty. Without downplaying the first challenge, an even larger one is the necessary learning shift. For risk management to become truly central to the operation of a large financial institution, its people need to be as comfortable with risk concepts like economic capital and potential future exposure as they currently are with business concepts like compound interest and variable annuities (please see the appendix for a discussion of these concepts and this paper's working definition of 'risk').

Herein lies the central learning opportunity and challenge: to motivate, educate and measure all risk learning efforts. The benefits of a risk-intelligent organisation are enormous; however, the simplicity of this learning mandate belies the complexity of the task. Learning cannot be developed and sustained without integrated tools and processes at both enterprise and local levels.

This paper identifies a set of risk management learning challenges. Since the authors are aware of little literature on this issue, the goal of this paper is to seed discussion about risk management learning, including frameworks and approaches. The paper visits several disciplines and the perspectives they offer for addressing financial risk threats, including training and communication. To assist the necessary organisational change, there are relevant strategic practices such as enterprise risk management (ERM) and process improvement methodologies. To provide more depth, the paper describes two specific financial risk concepts suited for increased understanding. For both of these examples, it suggests both strategic

and tactical approaches to embed sound financial risk understanding across the enterprise.

It pays to think about the questions of knowledge management, communication and training as they are understood more generally in the wider business community. This paper presents suggestions about how those ideas might be applied in financial institutions to communicate institutional knowledge about risk management. In the first section, on the challenges of risk learning, the paper identifies current and specific challenges for risk learning. It then discusses how risk learning must anticipate and serve rapidly changing knowledge and practice in the section on learning in the service of risk. In the section on partners in learning, the paper discusses approaches in related disciplines, specifically concepts from knowledge management, communications and training. Then, in the section on learning in practice, it highlights two financial risk concepts — economic capital and potential future exposure (described in the appendix), and proposes learning approaches.

THE CHALLENGES OF RISK LEARNING

Where to seek risk learning? There is no shortage of providers of training on general risk concepts, including the rating agencies, major consulting firms, professional organisations such as Professional Risk Managers International Association (PRMIA), Global Association of Risk Professionals (GARP), Institute of Risk Managers (IRM), Risk Management Association (RMA) and Society for Risk Analysis (SRA), and boutique firms organising short courses on specific topics. These

providers are important contributors to the general dissemination of new concepts and best practices in risk management.

However, there are limitations to the efficacy of this training:

- training may not be economical for large groups of employees;
- the duration (2–3 days) and location of training may remove employees from their work for too long;
- external firms may not track the results;
- increasingly, banks see their particular risk practices as differentiating them from their competition, so there is a need for institution-specific training.

Thus, while this sort of training constitutes an important part of an institution's education process, it is not sufficient to address questions about corporate strategy around integrating risk awareness into business activities.

Attaining a large degree of institutional awareness of risk requires addressing the following realities:

- many distinct audiences exist;
- the domain includes a myriad of diverse topics, many of which have only limited audiences;
- risk management topics are inherently dynamic;
- often, the personnel who develop the risk processes initiate efforts to communicate them internally¹ — these efforts are generally not integrated into a sustainable corporate strategy;
- technical experts have limited communication and training expertise and as a result typically focus on information over insight;
- increasingly, financial risk training moves beyond pure knowledge or skills to the

more challenging goal of understanding principles — this is necessary for consistent application of those principles to new businesses as well as for consistent treatment of risk across disparate business lines;

- opportunities exist for effective financial risk mitigation where the above audiences are aligned and armed with financial risk intelligence; where everyone is actively engaged in financial risk learning in a systematic and coordinated effort, a coherent enterprise-wide vision of risk is attainable.

LEARNING IN THE SERVICE OF RISK

‘It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.’ (Charles Darwin)

What is our destination? Better decisions and execution as a result of better risk intelligence throughout the organisation. But this goal necessarily shifts and risk learning must be resilient and self-monitoring. This goal demands progress on several fronts: knowledge management, communication and training.²

These efforts have much in common with what is often termed ‘organisational change’, the success of which relies upon the engagement and alignment of a firm's people.

Financial risk learning is a component of an organisation's ERM efforts and shares the property of being more easily defined by what it is *not*. Specifically, it ‘differs from traditional approaches that manage risk on silos and typically focus on risk only as it affects existing assets’.³ The vision is to foster broader communication across business units and

encourage thinking about potential risks in addition to current ones. Like ERM, risk learning initiatives demand executive sponsorship to coordinate and measure strategic initiatives and to foster consistent tactical approaches.

In addition, analogies can be made to the process management models of Capability Maturity Model Integration[®]. This model's emphasis is on a progression of stages of organisational change which is often described as initial or chaotic, managed, defined, systematic and optimising.

Similarly, risk management communication and learning comprise the ongoing adoption of new risk habits, leading to a higher level of maturity and requiring business measurement. This is an arena for useful application of management approaches such as balanced scorecard systems, as they canonically emphasise learning as an important activity, although that lies beyond the scope of this paper.

Based on the above context of organisational change, process management and performance measurement, the following are identified as actions for successful risk learning:

- encourage inter-business unit collaboration;
- support effective communication, both formal and informal;
- consider risk learning for internal and external learners, such as clients, partners and shareholders;
- leverage external industry knowledge, and develop and share proprietary risk expertise;
- embed risk management learning in organisational change and everyday business practice;

- commit to risk management learning throughout the organisation.

PARTNERS IN LEARNING

The following subsections sample relevant theory and practice in other disciplines, and discuss applications to risk management learning.

Knowledge management

The theory of process management or business engineering renews itself frequently, and although knowledge management may not have the buzz it once had, it clearly refers to the ongoing challenge of getting the right information to the right people at the right time.

IT and accounting organisations were at the forefront of appointing chief knowledge officers to spearhead these initiatives, although it may also fall to a chief information officer or chief learning officer if such a position has been defined. Whatever the title, this function will best succeed when led by someone with a business background,⁴ possessing credibility when insisting on the strategic importance of learning.

Historically, investment in knowledge management has had a mixed record, with some sectors (eg pharmaceuticals) benefiting more than others. Advocates have pointed to a lack of committed resources for failures, while critics see limited progress as the reason for limited resource backing. Some pundits have indicated that knowledge management, largely successful in its mission for early adopters, is now embedded in other business activities, under other service names. Whatever the progress, legacy or nomenclature, the challenges are tremendous for a large organisation to collect, organise, share information and continually optimise these efforts.

Knowledge management activities within most corporations are fuelled by the pursuit of increased productivity and a competitive edge. Good knowledge management serves financial risk training by marshalling information and developing understanding and insight. Knowledge management experience also shows the need for exceptional individuals to lead these initiatives — leaders with the authority and combination of business, strategic and technical understanding to deliver effective organisational change.

Risk learning that has identified and developed base knowledge can benefit from the enterprise experiences of successful knowledge management initiatives.

Communication

Initiatives are only as strong as their communication, particularly as that is understood by the audience. Subject matter experts must respect the assessment of colleagues from other business units when told that explanations are not sufficiently clear. This does not imply an oversimplification of communication — but an acknowledgment that the audience is the arbiter of communication.

As in many disciplines, it is easy to focus on tools over content. Boredom by PowerPoint is a familiar phenomenon; the same can be said for knowledge managers focusing on technology at the expense of knowledge captured and shared. Popular communication and design best practices can, in contrast, deliver exceptional results.⁵ Good graphic and user experience theory informs choices in visual communication and dashboards

that reinforce or clarify large-scale risk management initiatives.⁶

Jargon is appropriate as an enabler within a team, but broader messages are compromised by excessively specialised language. This is a particular risk in enterprise (multi-audience) or expert-initiated communication. To communicate effectively across the silo or division walls, specialists need to employ concrete and transparent language and images.⁷

The ‘curse of knowledge’⁸ illustrates another hurdle: because of the way in which the subject matter expert’s knowledge has been filtered over time, their valuable expertise becomes no longer suitable for new audiences and is thus a barrier to communication. Technical communicators can often draw from subject matter experts information better suited to learners.

Communicating messages in ways that the audience will retain is perhaps most important. One approach is to employ stories to reinforce key risk management strategies within the organisation. Collecting corporate anecdotes of how risk intelligence saved the day, or ignoring it led to disaster, will do more to open people’s minds to a concept than any traditional presentation. The audience of these stories will relay them to colleagues, thereby reinforcing risk messages. The history of disasters in the financial world constitutes a fabulously rich repository of stories which can be crafted as corporate case studies or scenarios. There are also stories of successful risk management. For instance, Goldman Sachs recently beat analyst estimates and has suffered no significant write-downs in the current turbulent credit environment, even as its peers write

down many billions of dollars. What did it do better? It was disciplined in its adherence to its risk approach.

Training and development

Trainers are painfully aware of the adage that ‘everything is a training problem’. In addition, trainers contend with financial and resource challenges implicit in corporate training and development structures. Prioritisation is increasingly a corporate and business unit exercise instead of exclusively a training and HR domain, and trainers offer substantial experience evaluating and prioritising the individual learning objectives in order to employ resources effectively.

Within both corporate and business unit training, the three main training spheres exist with their relevant actors: design (instructional designers, technical communicators, etc), delivery (trainers and subject matter experts) and executive (chief learning officers, vice presidents of HR, etc). This section considers relevant design considerations for financial risk learning.

In order to develop training with impact, training designers have been substantially influenced by instructional system design. This has been accompanied by performance consulting, needs analysis, content development, implementation and delivery via methods such as the classroom, webcasts, and downloaded electronic materials. All these learning products are marketed and managed within the organisation, often using learning management systems. Another major training activity revolves around internal certification programmes (used frequently for teams which are driven by regulation or competition) to develop and maintain certification for specific roles.

While the above approaches are well suited to mature and stable content, for new and controversial material more agile or rapid design approaches should be considered. Approaches such as rapid prototyping design (RPD) complement traditional instructional design. RPD is less commonly used, but like its software engineering counterparts, it values prototypes, iteration and frequent user evaluation over high-level planning. One cannot ignore agile approaches when dealing with rapidly changing material such as risk management — especially when partnered with ongoing business evaluation.

Within the design process, trainers have an interest in supporting their audience’s learning styles.⁹ Successful learning experiences consider at a minimum the learner’s motivation, perceived self-efficacy, and existing knowledge. These factors can enhance the material’s accessibility. Other learning professionals put effort into helping learners make the most out of material by employing generic learning skills.

If we know where we are going — assuming expert collaborators are aligned on the goals of the training development and subject matter — then how do we know if we have got there? Trainers consider evaluation throughout the design process. Kirkpatrick describes how to do this (and why it is difficult to do well).¹⁰ Ultimately, learning is validated by users, stakeholders and experts; if training strategies are sufficiently flexible, it is possible to respond to changing business needs. For the designer of risk training, challenges exist if the business goals are not clear or concrete enough or continually evolving. It is also worth considering

timely refresher training for key groups — both for the learners and for keeping core materials current.

Another training consideration goes beyond formally designed learning, or informal learning — sometimes described as anything you do not learn in a formal training setting and which forms a large part of the corporate experience. Related to earlier themes, investment in communication and stories to support informal learning will considerably enhance risk learning in the organisation, as these will seed and reinforce informal learning. Beyond a series of training events, learning is then seen as an embedded business process.

LEARNING IN PRACTICE

The paper now focuses on two examples of risk measures: economic capital¹¹ and potential future exposure (PFE)¹² of derivatives. Extended definitions are provided in the appendix. From a learning perspective, the examples represent distinct communication challenges. The widespread use of economic capital requires building general enterprise-wide concepts across the firm, while PFE relates to business-specific concepts relevant to a relatively small set of stakeholders.

Despite this difference they share a number of features including:

- there is an industry-wide consensus on the generalities but important details will be specific to the firm;
- they have relatively simple high-level definitions but very technical implementations in practice;
- there is a broad spectrum of potential users with varying needs and varying degrees of technical expertise;
- the subject matter experts typically do

not have a background in technical training or communication;

- there are key controls which are communicated to the highest levels in the firm and into other bank-wide systems and processes — changes can therefore have many ramifications;
- these concepts are predominantly conceptual, and are difficult for the learner to reinforce by practice.

There are many applicable technical communication techniques. The following examples require some combination of subject matter experts, documentation, communication and learning professionals:

- experiential learning allowing learning through practice, where practice may include discussion of case studies;
- developing and distributing videos and podcasts of eloquent subject matter experts describing concepts;
- reference materials and job aids; and
- collaborations between subject matter experts and graphically minded professionals on broadly used key concepts, resulting in reusable and on-demand graphics or videos.

Some other techniques include mentoring and internal online interactive communities.

Economic capital

Economic capital is a general enterprise-wide risk measure which applies to all business activities. It is a long-term 'strategic' concept, the function of which is to align the business activities of the bank with the corporate objectives of the risk–return profile. It is not considered by most stakeholders on a daily basis. However,

due to its importance, it calls for familiarity on the part of virtually all bank employees. One of its important functions is to reflect risk taken when comparing performance of business lines and the corresponding compensation. This is done through the principle of risk-adjusted return on capital (RAROC),¹³ an important concept which is more commonly discussed than implemented. In a recently distributed document on UBS's multibillion-dollar write-downs, this was identified as a contributing cause: 'Asymmetric risk/reward compensation: The compensation structure generally made little recognition of risk issues or adjustment for risk/other qualitative indicators'.¹⁴

The learning perspective on economic capital offers the following recommendations when formulating a learning strategy:

- For all parties, acceptance of the validity of this model is a precondition for risk learning and informed decision making about the merit of business initiatives.
- Develop and employ language that is meaningful and does not mislead. Redefine concepts through test audiences prior to rolling out larger learning initiatives. Otherwise a learning programme may work against set metaphors and language.
- Use concrete metaphors. One standard approach considers actual capital as a dam and economic capital as an estimate of how high the flood waters might rise. Test these metaphors and modify or completely replace them when necessary.
- Present examples where economic capital concepts were used either to enter a business which otherwise seemed

questionable or to stay out of a business which otherwise seemed lucrative.

- Develop modular materials and create variations specific to each audience/business: elaboration of models occurs here.
- Although e-learning delivery mechanisms support the challenges of multiple distributed audiences, live approaches can be included, especially for learners to find context and assimilate concepts, and for them to contribute to shared knowledge and stories. Learner-driven training can help align risk knowledge within the organisation.
- Consider tools that will be suitable for learning concepts that may only be in their initial phase of maturity. Develop agile learning processes that will respond to quick and ongoing feedback. Successful conceptual training could benefit from an RPD approach to develop both enterprise messages and local scenarios or case studies.

Potential future exposure

PFE is specific to one business type (over-the-counter derivatives) and is extensively considered on a daily basis by a relatively small subset of bank employees, namely traders and the corresponding risk managers and credit officers. In contrast to RAROC, it can be thought of as a short-term 'tactical' concept, the function of which is to monitor the credit risk in trading positions on a daily basis.

The learning perspective on PFE offers the following recommendations when formulating a learning strategy:

- As with the economic capital example, use meaningful language for formulas that will have wide usage.
- Address potential misconceptions, such as

the distinction between PFE and loans, and the non-dependence on the credit quality of the counterparty.

- Consider at least seven groups which work with PFE, all with significantly different contexts.¹⁵
- Realise that the definition of PFE may not be retained by learners who work with it infrequently. PFE training may therefore need particularly powerful metaphors to embed concepts, and training designers may need to identify these critical concepts and use the most effective approaches for them.

CONCLUSION

'I forget what I was taught; I only remember what I've learnt.' (Patrick White)

As in many spheres of human endeavour, the simplest goals are frequently the hardest to address. The present view of financial risk management training could be phrased as the activities necessary to get contextual information to the right people, inspiring and empowering them to make decisions in accord with the organisation's stated risk profile.

The firm that succeeds in embedding financial risk management throughout its organisation, nurturing it and feeding it, will have an advantage over its competition. While the parameters of the problem can be discussed industry-wide, the individual approaches, systems, tools and initiative will be part of the corporate DNA of the successful financial risk management learning organisation.

ACKNOWLEDGMENT

The authors thank David Koenig and Robin Machanda for fruitful discussions.

APPENDIX

Risk

For the purposes of this paper, risk is defined as any event which could lead to a material financial loss to the financial institution. Canonically, these are classified as credit, market or operational risk, the latter acting as a sort of catch-all for anything which is not credit or market risk. This is how Basel II has enumerated risks for capital purposes, for instance.

Economic capital

Economic capital is defined as the maximum loss, in excess of expected losses, which might accrue over a specified time interval at a specified confidence level. Generally, the confidence level is tied to the desired credit rating that the institution wishes to maintain, which in turn is tied to its desired cost of funds. A confidence level of 99.95 per cent is typical (although by no means universal) for major financial institutions. The time interval is almost universally selected as one year. The definition is in terms of losses in excess of expected losses as those are assumed to have already been provisioned for in loan loss provisions or other accounting adjustments such as credit valuation adjustments for trading books.

With the values mentioned above, economic capital can be interpreted as an amount of yearly loss (in excess of what has already been provisioned for) which would be experienced every 2,000 years. This is roughly consistent with a AA credit rating from the major rating agencies. Of course, estimating the distribution of possible losses is a far from trivial task and requires the technical judgment of a large number of experts in diverse areas.

The term 'economic capital' is confusing as it sounds like a capital amount whereas it is a pure risk measure.¹⁶ A useful metaphor is that of a dam. Economic capital as defined above can be thought of as an estimate of the height of floodwater that might be experienced once every 2,000 years. The actual amount of capital that the financial institution actually has on hand is then the height of the dam walls that will hold back the flood.

Basel II regulatory capital is itself a regulatorially imposed economic capital model (at a relatively low confidence level of 99.9 per cent). This risk measure is then converted to risk-weighted assets (RWA), the value of which is compared with the bank's actual capital holdings.¹⁷

Potential future exposure

Potential future exposure¹⁸ is a risk measure specific to derivatives trading and is used to measure and limit counterparty credit exposures. It provides an answer to the question: if we have struck a new derivative with a counterparty, how much credit line does it use up? Using the initial derivative value is not appropriate as transactions are often struck at or near the money so the initial derivative value is zero. Furthermore, that would not distinguish between short-dated transactions, which have little potential to generate significant exposures, and long-dated transactions, which can generate substantial exposures.

Instead, it is common to determine through the life of the contract what it might be worth at some specified percentile (typically in the range of 90–99 per cent depending on the firm, although 95 per cent is typical). So for a five-year swap, one would determine

the specified percentile at each month (or some other natural grid of future times) for the next five years. The maximum of these values is taken and defined to be the PFE. Whether the maximum is at maturity or some intermediate time depends on the nature of the derivative.

This is an accepted measure as it is reflective of important deal attributes such as term, underlying volatility and so on. It makes no reference to the credit quality of the counterparty. An identical five-year swap struck with an AAA counterparty and a BB counterparty would generate exactly the same values. The distinction is made at the level of the limit that is authorised; presumably the bank would be comfortable with a larger PFE to the AAA counterparty than to the BB counterparty. In addition, while it is commonly thought of in terms of loan-equivalence, there is nothing in its definition which specifically relates to anything to do with loans, making this more a metaphor than a precise connection. It is typically rolled out either in the form of look-up tables (per unit of notional) or simulation models.

While the concept is presented here at the level of an individual transaction, it can be equally well defined at the level of a set of counterparty transactions (with or without netting), with or without incorporation of margin agreements and so on. It can also be applied to groups of related counterparties to determine industry or geographical exposures.

The important teams working with PFE at a financial institution include:

- *Market risk quants:* They generate the values and develop the models.

- *Traders*: They manage the business lines whose credit risk is being measured and controlled. They are experts in markets and in the derivatives being simulated but less so in the simulation processes.
- *Desk quants*: Traders are typically supported by quantitative teams which have a similar skill set to the market risk quants but may not be as familiar with risk simulations.
- *Senior risk management*: They need to understand the general principles and limitations of the process at a conceptual level and be able to synthesise the information with any other risk information they are presented with. They usually have an intuitive understanding of quantitative risk measurement.
- *Credit risk officers*: They typically have little background in market risk but are knowledgeable of credit risk. Their job is to set credit line limits and they may use the model to determine those values.
- *Back office*: They monitor PFE versus the authorisations set by the credit officers and report breaches. They also typically have little to no knowledge of market risk.
- *IT*: They are responsible for supporting the various information flows required for the process to work smoothly, including systems extracts, authorisation data, report generation, and so on.

Each of these groups needs to understand PFE with varying degrees of specificity. As new trading lines ramp up, there will typically be a few iterations of the PFE determination and this will impact upon all of these players in varying ways. Important communication of relevant information is central to this happening smoothly.

References

- 1 This is of course a subjective view of practice across the industry arising from the authors' discussions with various participants. Individual financial institutions may be undertaking this communication in different ways.
- 2 One might also identify 'evangelising' or persuading the institution to think about and communicate risk effectively. It is the authors' view that most institutions have already been persuaded of the need due to recent events such as the ongoing credit/liquidity crisis in the markets and major loss events such as that of Société Générale. Furthermore, recent regulatory developments, such as Basel II and Solvency II, have led to greater acceptance of the need for firm-wide risk awareness.
- 3 Deloitte and Alliance for Enterprise Security Risk ManagementTM (2007) 'The Convergence of Physical and Information Security in the Context of Enterprise Risk Management', The Alliance for Enterprise Security Risk management (AESRM), available at: <http://www.isaca.org/ContentManagement/ContentDisplay.cfm?ContentID=43023> (accessed 4th May, 2008).
- 4 Bersin, J. (2007) 'The new chief learning officer — 2008 and beyond', available at: <http://beta.bersin.com/blog/post/The-New-Chief-Learning-Officer—2008-and-Beyond.aspx> (accessed 7th May, 2008).
- 5 Reynolds, G. (2008) 'Presentation Zen: Simple Ideas on Presentation Design and Delivery', New Riders Press, Berkeley, CA.
- 6 For a strong case against the use of pie charts due to human perceptible limitations see: Few, S. (2006) 'Information Dashboard Design', O'Reilly, Sebastapol, CA.
- 7 For many materials on jargon in communication, refer to the website of the Society for Technical

- Communication at: <http://www.stc.org>.
- 8 Heath, C. and Heath, D. (2007) 'Made to Stick: Why Some Ideas Survive and Others Die', Random House, New York, NY.
 - 9 For references to learning styles, please consult the website of the American Association of Training and Development at: www.astd.org. In contrast, psychologists consider aptitudes, see: Gardner, H. (1983), 'Frames of Mind: the Theory of Multiple Intelligences' Basic Books, New York, NY.
 - 10 Kirkpatrick, D. L. (1994) 'Evaluating Training Programs: The Four Levels', Berrett-Koehler, San Francisco, CA.
 - 11 Dev, A. (2004) 'Economic Capital: A Practitioner Guide', Risk Books, London.
 - 12 As far as the authors are aware, widespread application of the concept dates from the beginning of the modern swap market in the early 1980s. For a discussion see, for example, Canabarro, E. and Duffie, D. (2004) 'Measuring and marking counterparty risk', in Tilman, L. (ed.) (2003) 'ALM of Financial Institutions', Euromoney Institutional Investor, London, pp. 122–134, available at: http://www.stanford.edu/~duffie/Chapter_09.pdf (accessed May 2008).
 - 13 This concept was pioneered at Banker's Trust in the 1970s. For a discussion see, among others, Crouhy, M., Mark, R. and Galai, D. (2000) 'Risk Management', McGraw-Hill, New York, NY pp. 529–577.
 - 14 UBS (2008) 'Key findings relating to the causes of losses', in 'Shareholder Report on UBS's Write-Downs', available at: <http://www.ubs.com/1/e/invstors/shareholderreport/remediation.html> (accessed 27th August, 2008).
 - 15 Refer to the appendix for a full list of the audiences.
 - 16 This is a point which has been made by various people but the authors owe their own understanding of it to presentations and discussions with Dan Rosen.
 - 17 Conversion to RWA is an unnecessary artefact as it would be enough to compare the Basel II regulatory capital with the institution's actual capital. However, analysts, management and regulators are conditioned to think in terms of capital ratios and so the concept of RWA persists.
 - 18 There is not complete consensus on this term; other commonly used terms are 'potential exposure' and 'contingent exposure'.

Copyright of *Journal of Risk Management in Financial Institutions* is the property of Henry Stewart Publications LLP and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.