

Capital is key to any financial institution. Companies in other industries need capital to buy property and production equipment. For financial institutions, the primary function of capital is to cover unexpected credit and market risks losses, because risk of such losses inevitably accompanies a bank's core business of lending money and making markets. David Rowe, Dean Jovic and Richard Reeves explain why it is crucial for financial institutions to build an advanced economic capital framework and how that plays into current initiatives to implement the Basel II Capital Accord.

International banks, Risk management, Financial risk

Capital matters to most corporations in free markets, but there are differences. Companies in non-financial industries need equity capital mainly to support funding to buy property and to build or acquire production facilities and equipment to pursue new areas of business. While this is also true for financial institutions, their main focus is somewhat different. Banks actively evaluate and take risks on a daily basis as part of their core business processes. For example, the commercial lending business inherently involves weighing the credit risk of new loans and their associated mitigates. This involves analysis of the credit quality of the underlying obligor, the effectiveness of guarantees, collateral, cross-default and other forms of credit protection. Today, however, best practice does not stop there. It also is necessary to evaluate the impact of portfolio diversification (e.g. in terms of geographical or industry concentration of exposures) and the degree of correlation among exposures on the bank's balance sheet. Another example is trading activity whereby a bank benefits from high trading volumes (by earning the bid/ask spread) and hopes to gain from proprietary net positions, but must bear some degree of market risk in the process.

Given the central role of market and credit risk in its core business, a financial institution's success requires that it be able to identify, assess, monitor and manage these risks in a sound and sophisticated way. The growing emphasis on the part of banking supervisors world-wide regarding adherence to best practice risk methodology reflects a broad recognition of how important such processes have become. In order to assess and manage risks, a bank must have effective ways to determine the appropriate amount of capital that is necessary to absorb unexpected losses arising from its market, credit and operational risk exposures (expected losses will be addressed through loan pricing and/or provisions). In addition to that, profits that arise from various business activities need to be evaluated relative to the capital necessary to



cover the associated risks (so called risk adjusted performance measurement or RAPM). These two major links to capital – risks as a basis to determine capital and the measurement of profitability against risk-based capital allocations – explain the critical role of capital as a key component in the management of bank portfolios.

So if you can measure risks, shouldn't it be straightforward to determine risk-based capital (commonly referred to as economic capital or risk capital)? And why are the two terms – regulatory capital (RC) and economic capital (EC) – so sharply distinguished?

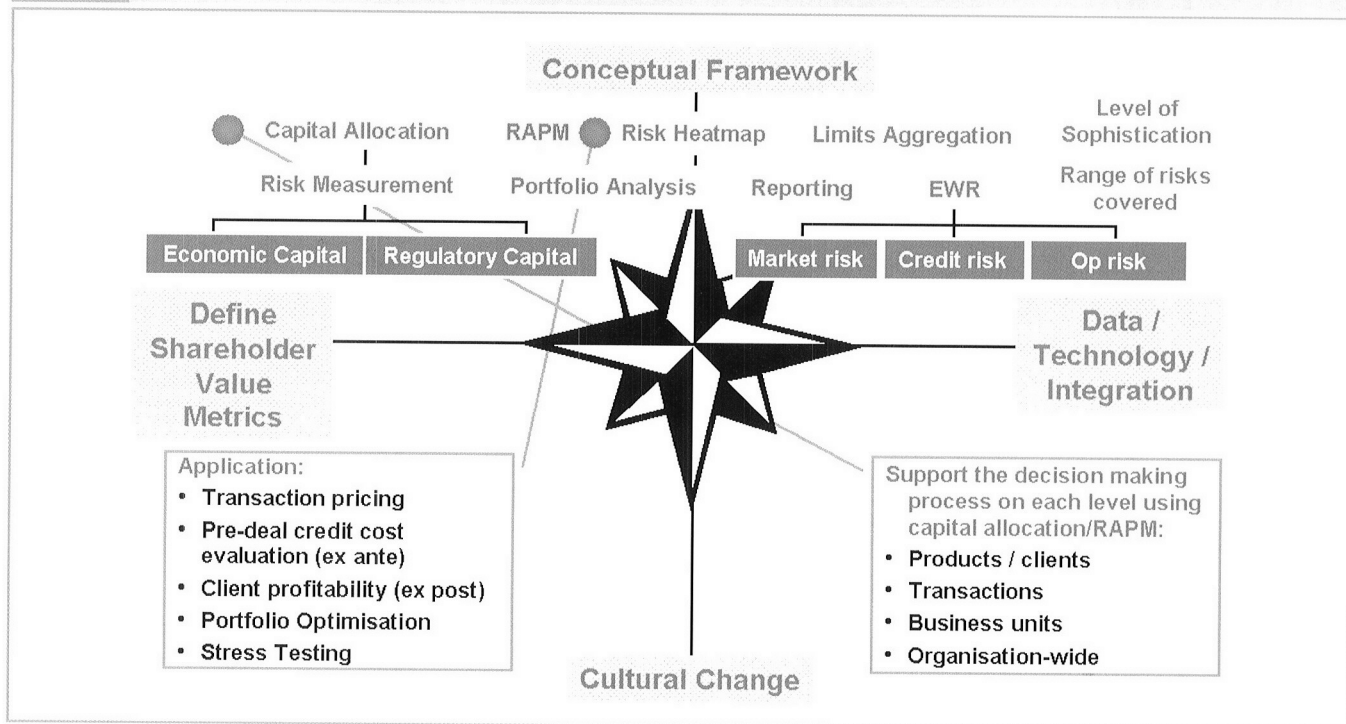
The challenge of determining EC lies in the fact that all the various risks that banks are facing (market risks, credit risks, operational risks) have a very different nature, are measured by specific metrics (if they can be quantified at all) and are difficult to capture by one common metric or method (the best candidate for a common metric is the value-at-risk approach). Given perfect circumstances, such a common risk metric would not only be able to capture and quantify all relevant risk exposures of the bank, it would also have to be able to account for all the correlations between different risk categories and exposures. In reality, economic capital frameworks within financial institutions are often very fragmented. On one hand they feature sophisticated capital and risk measurement methods for specific parts of the overall risk books. On the other hand, these frameworks often suffer serious deficiencies with respect to calculating EC from an integrated risk point of view.

The reason for the existing gap between RC and EC is two-fold: one is that banks are free to choose which methods they want to apply in order to calculate EC in a way that they believe accurately reflects the riskiness of a specific position or portfolio. This leads to various levels of sophistication regarding EC frameworks, making it difficult for outsiders to compare the capital management practice of different financial institutions. In comparison to that, methods to calculate RC will be prescribed to a far greater extent by regulators. This is designed to assure greater comparability among banks provided the rules do not distort risk of one type of activity relative to others (a continuing subject of dispute among banks and regulators). Also, regulatory capital rules naturally tend to have a time lag in terms of incorporating state-of-the-art risk measurement methods and models because they are driven by a consensus seeking process both among regulators and within the banking industry. Both elements, the freedom to apply the most appropriate economic capital methods (as opposed to having to follow prescribed regulatory approaches) and the time lag in the evolution of RC versus EC methods, result in a gap between the two approaches. The question is not whether this gap is likely to disappear but rather: is it too big? If it is, what can be observed in the financial industry are "capital arbitrage" activities leading to paradoxical incentives whereby banks try to restructure those risk positions that they believe generate unrealistically high levels of regulatory capital. The risk of such positions will be transferred to the capital markets through securitization. This results in regulatory capital being released and used for other businesses or risk positions that do not require that much RC relative to its associated EC levels (the latter reflecting the bank's best estimate of the true risk of the respective exposures or portfolios).

As Figure 1 shows, building an advanced economic capital framework assumes that banks find conceptual solutions to measure risks, define shareholder value metrics and determine capital based on risk measures and correlations. From an implementation point of view, economic capital frameworks imply key challenges in building comprehensive data structures and the supporting technology as well as mastering a significant cultural change. In practice, the cultural challenge and its implications for staff incentives and compensation is often one of the main causes for the failure of capital management projects.

Regulatory capital arbitrage activities and its tendency to undermine formal capital adequacy regulations has been one of the key drivers behind the BIS initiative (led by the Basel Committee on Banking Supervision) popularly known as Basel II. Starting in 1999, this effort has produced

Figure 1



three increasingly comprehensive consultative papers and a wide debate on various issues surrounding risk management and capital adequacy approaches. One of the main goals has been to align regulatory capital more closely to EC, thus reflecting a higher risk-sensitivity of regulatory capital numbers. This should ultimately leads to less capital arbitrage and implies less paradoxical incentives by decreasing the differences between RC and EC for specific positions or portfolios.

The current Basel II Capital Accord builds on three pillars to assess a financial institution's capital adequacy:

- (1) minimum regulatory capital standards that are more risk-sensitive than those in the original Basel Accord of 1988 (Basel I);
- (2) an effective supervisory review process; and
- (3) more effective use of market discipline through enhanced public disclosure.

Pillar 1 defines the minimum regulatory capital for three different risk categories. Apart from credit risk, which will be treated in a more sophisticated way than under Basel I, and market risk whose treatment remains unchanged, the new Accord proposes a capital requirement for operational risk. For these three risk categories, the existing definition of capital and the minimum requirement of 8 percent of capital to risk-weighted assets will be applied. The major changes relate to the measurement of the underlying risk itself. Under the 1988 Accord, uniform risk weights are assigned according to the obligor's institutional type and country of domicile. This includes a distinction between corporates, sovereigns and banks. Within these categories, some risk weights vary according to whether the obligor resides in a country that is a member of the Organization for Economic Cooperation and Development (OECD) and on the maturity of the claim. Under the new framework, the treatment of the various sources of risk is more sophisticated and allows banks to use one of three alternate approaches.

For credit risk, the standardized approach is a modified version of the existing requirement under Basel I. As in Basel I, the risk weights for individual claims are determined by the category of the borrower (sovereign, bank or corporate). However, the determination of sovereign risk

weights based on membership in the OECD has been abandoned. Instead, the risk weights are based on external credit ratings. The second and more sophisticated approach for the treatment of credit risk is the internal ratings-based (IRB) approach. For credit risk, it represents a fundamental shift in regulators' thinking on regulatory capital. On the other hand, it is a logical extension of the earlier precedent allowing the use of internal models for determining market risk capital requirements subject to supervisory review and approval. In order to qualify for the IRB approach, several minimum requirements need to be met. Depending on the methods used to evaluate credit quality, banks may choose between two proposed IRB approaches (foundation IRB or advanced IRB). In both cases the following input figures are needed for risk assessment and capital determination:

the probability of default (PD) of a borrower or group of borrowers (the key concept on which the IRB approach is built);

the exposure at default (EAD), which may be a result of borrower decisions or external conditions in the case of market-driven exposures;

the loss given default (LGD) (expressed as a percentage of the exposure) is an estimate of the proportion of any exposure that will be lost given the borrower's default; and

the maturity (M) of exposures.

What is a practical way to build and implement an integrated capital framework that not only meets Basel II capital rules but also has the potential to add significant value to a financial institution by allowing it effectively and efficiently to allocate economic capital to its risky portfolios and measure profitability against those allocations?

From a regulatory point of view, implementing a Basel II compliant RC framework means being able to perform the capital calculations and generate reports in a flexible, transparent, auditable way to meet the requirements arising from Basel's three pillars:

Pillar 1 – regulatory capital calculations to comply with the standardized approach, the foundation IRB or the advanced IRB approach (banks which apply one of the two IRB approaches are required to be able to run the standardized approach in parallel for comparison and consistency checking purposes).

Pillar 2 – stress testing analysis, validation reports (in order to support the supervisory model approval process for banks applying the IRB approach to credit risk or the advanced measurement approach (AMA) to operational risk). Pillar 2 also requires banks to build an advanced economic capital allocation process. An advanced economic capital framework will allow the bank to perform risk-adjusted performance measurement (RAPM).

Pillar 3 – reporting featuring a comprehensive range of information on capital and risk numbers as well as the bank's risk management practice.

In order to calculate regulatory capital, compare and benchmark against economic capital amounts and perform credit risk analysis, financial institutions need sophisticated modeling and analysis capabilities. In addition to that, an appropriate system has to be able to handle stress testing (including multi-dimensional 'what if' analysis) and reporting for market disclosure whilst offering a high degree of flexibility to model different rules and rule sets according to different national jurisdictions.

Following Pillar 1 requirements banks will most probably use a flexible calculation engine, working across multiple dimensions. Flexibility means particularly that the system's front-end facilitates the application of multiple variants of the same basic formulae in a context-sensitive

manner for the purpose of handling different regulations in local jurisdictions. In addition to that, the user should have the ability to modify formulae components at will (e.g. to model proposed changes in regulation), yet keep a "locked-down" version for external reporting.

A further requirement of a system for the calculation of regulatory capital is the ability to perform stress testing based on Pillar 2 requirements relative to the IRB Approach. The system should support not only the simulation of a variety of credit-risk sensitive conditions over time (e.g. simulating PD or LGD scenarios) but it should also facilitate the integration of credit portfolio models (Credit VaR model) and other internal economic capital models. A strong competence will be the ability to compare and contrast regulatory and economic capital in all relevant dimensions (at the enterprise-wide level and broken down into portfolios, borrower groups, single names and transactions) in a consistent and reconcilable way on a single platform. Pillar 2 requires that the user must be able to demonstrate that credit risk calculations are being used as an integral part of the credit risk process and to manage the portfolio in a responsible, "risk-aware" manner; this includes the use of stress testing (regulatory and *ad-hoc* what-if analysis). The system should facilitate drill down functionalities to document fully the origin and contents of credit risk calculations.

Pillar 3 requirements mandate the regular publication of detailed disclosures covering all relevant portfolios within the bank, broken down in multiple ways and including qualitative information and quantitative data, (e.g. Pillar 1 and Pillar 2 output). An appropriate system will have to provide a full audit trail for disclosure publication.

To satisfy Basel II regulations, banks must be able to produce enterprise risk information to facilitate corporate transparency. A truly comprehensive picture of risk should allow for advanced regulatory capital allocation and more effective management of economic capital.

In addition to providing RC calculations, the system should also provide the functionality to support internal EC approaches and/or integrate standard Credit VaR models. This functionality includes the generation of Monte Carlo simulations based on a variety of distributions (Poisson, Beta, Gamma, Weibull etc.), the calculation of "extreme loss" estimates with any user-defined confidence interval, the ability, through "extenders", to access external models and calculations. Ideally in-house PD/LGD/EAD models can also be integrated and built on the same technology and platform.

Ad-hoc stress testing, in addition to regulatory mandated stress testing, against any of multiple dimensions should be supported given that this is a key Basel II requirement. As the exact regulatory requirements for stress testing are not yet defined, flexibility is essential. Figure 2 shows capital requirement and expected loss for a portfolio over time against a combination of PD and LGD shifts. As with Pillar 2 stress tests, the requirements for Pillar 3 disclosures are yet to be finalized by the regulators, so again, flexibility is essential. The nature of the Basel II regulations is that there are a relatively small set of base calculations, but the way they are applied and modified depends on the particular combination of approaches, segments, capital classes, collateral etc.

Finally, in order to satisfy internal reporting needs and disclosure requirements, the system should allow defined users to publish common reports, alerts and scenarios. These features facilitate "risk-awareness" in the day-to-day running of the business and address key requirements in Basel II Pillar 2 (internal) and Pillar 3 (external).

Essentially, we believe that the final form of the Capital Accord is not the core implementation issue but rather the ability to have an institution's data well organized and centrally accessible to perform and document the necessary calculations. We also believe that addressing the data issue properly will allow banks to leverage their Basel II efforts to improve their fundamental risk management processes and not just pour money into regulatory compliance alone.

It is key for financial institutions to take an integrated view on risk measurement and capital determination given that the various elements – risk-adjusted pricing of products, assessing the risk exposures on different aggregation levels (enterprise-wide level, business unit level, product



Figure 2 A flexible system will allow the user to drill down behind any number in a report to the see components of that calculation, and from these components, down to the source data behind them. The bottom part of the screen shows the formulae being applied to the selected value

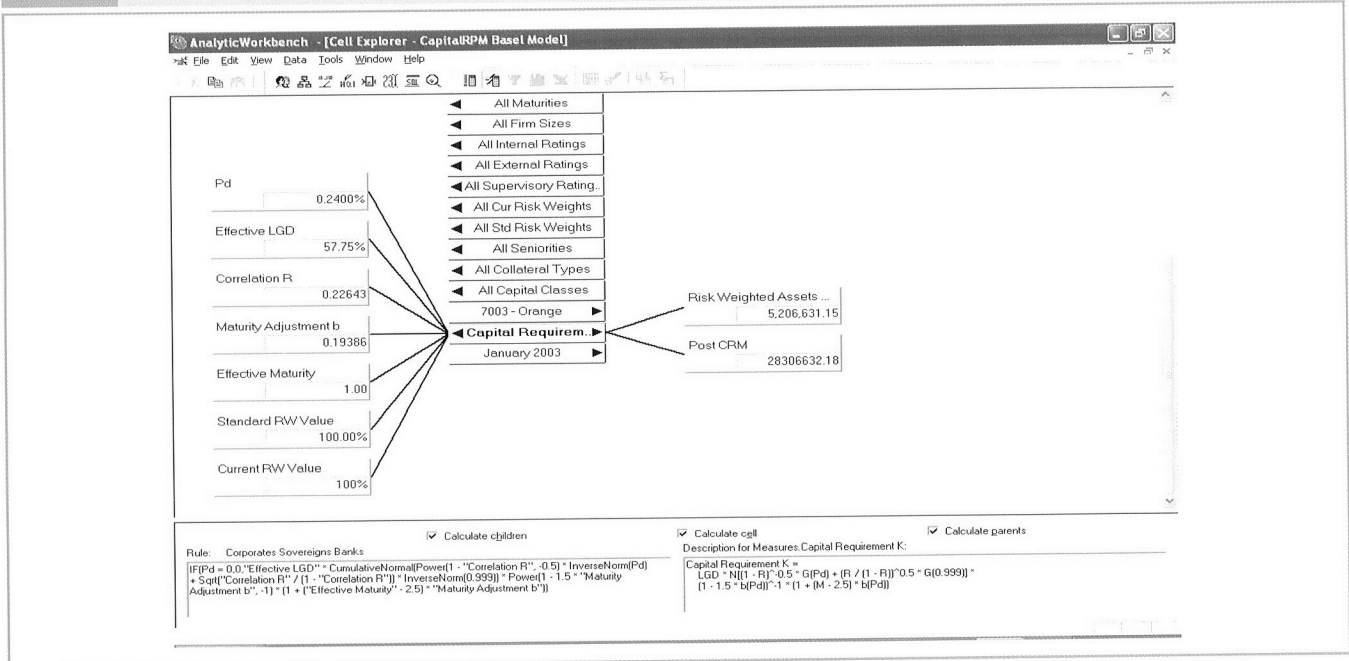
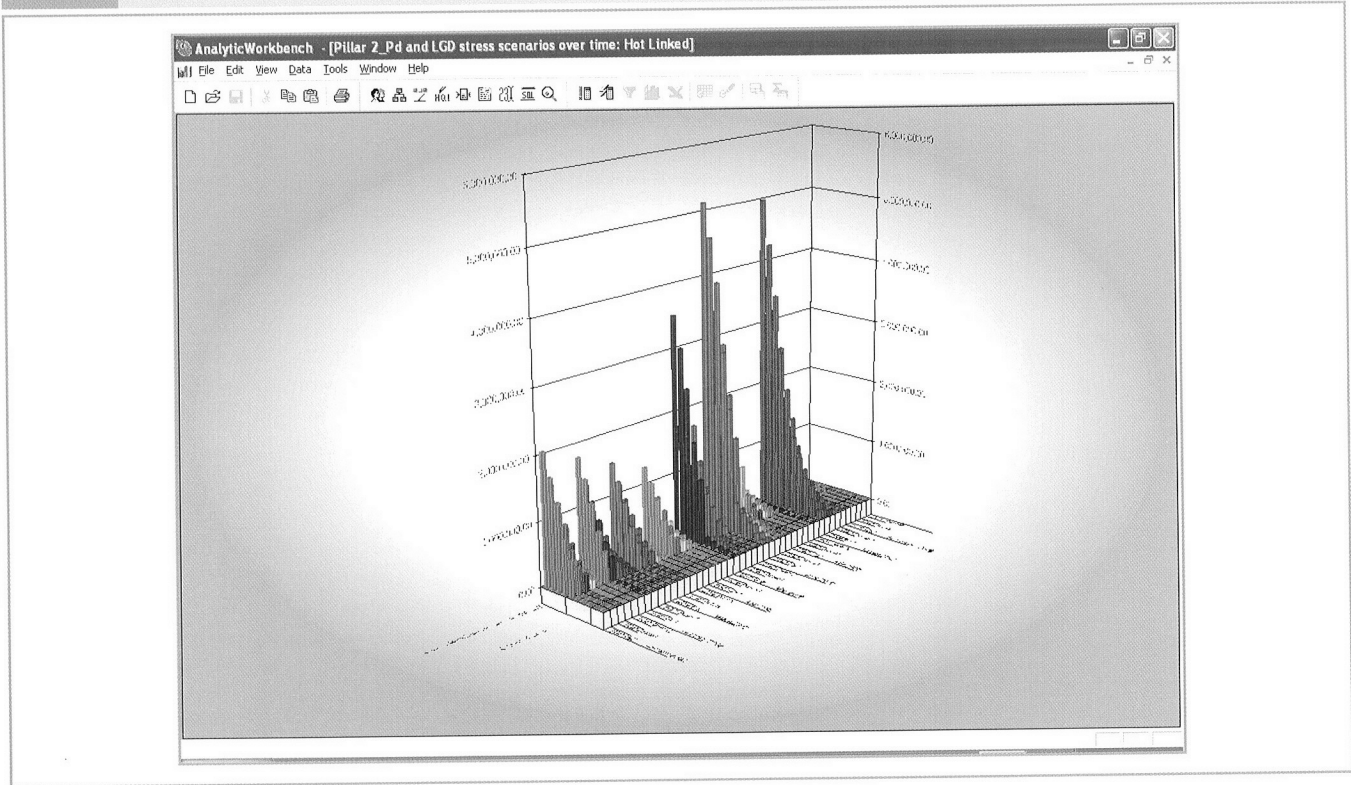


Figure 3 As the exact regulatory requirements for stress testing are not yet defined within Basel II, flexibility is essential: any number of stress tests can be performed on any factor in the model. The graph shows capital requirement and expected loss for a portfolio over time against a combination of PD and LGD shifts



and/or transaction level) and the measurement of profitability against risk or the allocation of economic capital – are different sides of the same coin and should not be viewed separately from each other.

What this means in practice can be explained by a quote of the former CRO of Canadian Bank CIBC, Dr Robert Mark: "What was my most important task as CRO of CIBC? The answer is risk transparency: when front managers wanted to do a transaction that made no sense from a risk point of view then my task would be to show them what this meant in terms of economic capital. They could then make the transaction if they wanted to but they had to bear the EC on their books and measure profitability against it".

Solving the integrated risk and capital management puzzle inevitably will be linked to the unique core competence of bank to manage its risk portfolios more effectively than competitors. Thus, developing an advanced risk management practice and an economic capital framework is key to gaining competitive advantage from Basel II compliance efforts.

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Richard Reeves heads BancWare Whitelight, responsible for the Basel II Capital Manager. Richard has over 20 years of experience in financial services and risk management. Richard's primary focus is on developing sophisticated risk management and regulatory compliance models based on the WhiteLight Analytic Server, the flagship of which is the Basel II Capital Manager suite of models. Whitelight was acquired by SunGard Trading and Risk Systems in December 2003. Prior to joining WhiteLight, Richard held senior product and project management roles in the risk management area at Reuters, Telekurs, and Algorithmics. Most recently, Richard worked with KPMG /Atos KPMG Consulting, specializing in IAS and Basel II. He has a BA in French & German from Durham University, England.

