Risk-based capital

Niklas Hageback gives an introduction to risk-based capital, and looks at the measurement of operational risk.

RISK-BASED CAPITAL (RBC) introduces new concepts of risk measurement and managerial decision tools for insurers. RBC is best practice in the banking industry, and serves a number of important functions that have in many ways changed the way banking business is conducted.

What is risk-based capital?

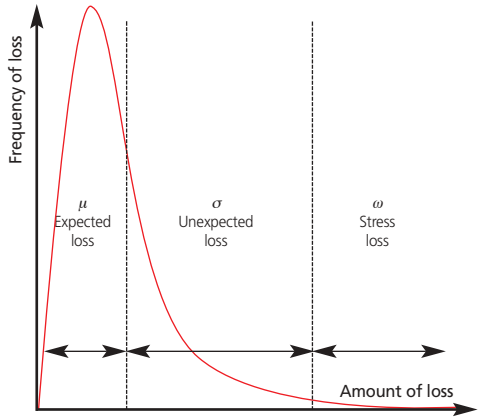
To better understand the risk a financial institution is exposed to, a consistent measuring method is needed. RBC is defined as the amount of capital that a financial institution requires in order to cover eventual unexpected losses and still remain solvent over a certain time horizon – usually one year, and with a specified probability, such as 95%, 99%, etc.

An RBC framework makes an important distinction between expected loss, unexpected loss, and stress loss (catastrophic loss).

- **Expected loss** The average expected loss, within a risk category, through time. This loss amount should be budgeted for, and can be viewed as the cost of 'doing business'.
- **Unexpected loss** The variance of expected loss over time, up to a particular confidence level. It is the amount of loss that is catered for by RBC.
- **Stress loss** As the RBC covers losses only up to a particular confidence level, potential losses beyond that cut-off point need to be estimated. These are stress losses, usually determined through predefined scenarios based on historical events.

Setting the confidence level for the cut-off point for RBC will depend on the risk appetite of the financial institution – the more cautious the company, the higher the level. This level is usually set with a view to meeting a credit rating target. A financial institution that experiences volatile revenues, expenses, or losses/claims needs to set aside significant capital even if it is quite profitable on average.

Figure 1 Distinction between expected, unexpected and stress loss



What is risk-based capital used for?

Risk-adjusted performance

Measuring a business line's return against the RBC it requires can help when comparing the returns from business lines, or from various types of product and service, and also when comparing against benchmarks such as the risk-free rate. The risk-adjusted performance can be encapsulated in the risk-adjusted return on capital (RAROC) formula, where the net return is measured against RBC.

Risk budgeting

Another key function of RBC is to enhance a financial institution's decision-making process covering the strategic direction of its activities such as retaining, growing, or shrinking business lines.

Risk-adjusted pricing

RBC can give a financial institution a relative pricing or selection advantage. Financial institutions that are using risk-based pricing methods are able to 'cherry pick' and structure the most profitable products and services by pricing accurately and providing a fair value.

Risk-adjusted capital allocation

Capital, by definition, is a scarce resource and should be allocated effectively. RBC methods allow the use of a capital allocation mechanism based on economic value added (EVA) per unit of scarce resource by assessing the risk-adjusted return against a set hurdle rate.

What constitutes risk-based capital?

RBC should address all risk types consistently across all business lines of a financial institution. Usually these risk types are:

- market risk
- credit risk
- operational risk
- underwriting risk

The measurement methods for market, credit, and underwriting risk are well established, and best practice standards have been in existence for a number of years. However, for operational risk, measurement methods are still in their infancy. Operational risk is a key risk type for both insurance and banking firms, and it is worth considering some of the emerging trends for measuring operational risk.

Operational risk

Operational risk is nothing new. It has always been around, manifested as frauds, natural disasters, process and human errors, etc, and is now widely accepted as the cause for many losses in financial institutions.

However, owing to a number of spectacular operational risk débâcles in the banking sector in recent years, regulators have become increasingly worried about the effects of operational risk.

A regulatory framework for operational risk is being developed for the financial industry. Basel 2, which is currently being drafted, dictates the implementation of an operational risk framework, including a capital charge. Basel 2 provides the inspiration for the regulatory framework for operational risk that is being

developed for the insurance industry, *Prudential Sourcebook* and Solvency 2.

What is new is that operational risk is seen as a distinct risk type. This means that it is managed through a structured framework, with tools and techniques that will try to identify, manage, monitor, and ultimately measure operational risk in a consistent way.

In addition to the regulatory driver, there are also a number of industry trends that have boosted interest in operational risk management.

- 'What gets measured gets managed' – operational risk management means improved and consistent management information is available.
- Industry would like to reduce the risk of having a real show-stopping operational risk loss.
- There is a trend towards better understanding of operational risk exposures.
- Companies wish to ensure a realistic and risk-sensitive RBC result.
- There is a move towards cost control and reduction of earnings volatility.
- Rating agencies and equity/bond analysts have started to show an increased interest in how operational risk is managed at financial institutions.

In the early days, operational risk was given a negative definition. However, that did not support the establishment of operational risk as a separate risk type, and it has now been replaced by an industry accepted definition of operational risk (as is adopted by Basel). Operational risk is defined as:

> the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events.

To facilitate the understanding and management of operational risk, categorisation is often used. There are three main ways of categorising the risk:

- **by cause**: what was the root cause behind the loss?
- **by event**: impact-based categorisation – the basis of data collation for operational risk; and
- **by effect**: how the loss affects the profit and loss account and possibly also reputational and regulatory effects.

As operational risk is such a heterogeneous risk type, the categorisation is extremely important, and will have a major effect when modelling operational risk.

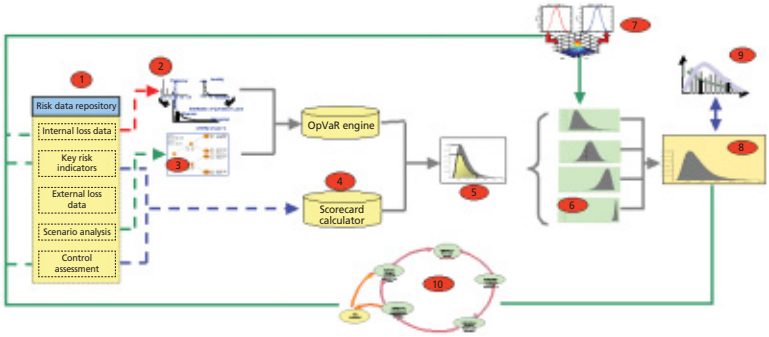
The category structure as proposed by Basel has been broken down to seven loss event types (level 1):

- internal fraud;
- external fraud;
- employment practices, and workplace safety;
- clients, products and business practices;
- damage to physical assets;
- business disruption and systems failure; and
- execution, delivery and process management.

Under Basel 2, the following methods have been presented for calculating operational risk in a continuum of increasing sophistication and risk sensitivity.

- **The basic indicator approach**
  Operational risk = average gross income * 15%.
- **The standardised approach**
  Operational risk = average gross income * 12% – 18%, depending on business line (for the main method).

Figure 2 AMA modelling – graphical overview of measurement methodology



1 Extraction of valid data from the risk data repository
2 Loss distribution modelling using internal loss data (and possibly external loss data), forming part of the OpVaR engine
3 Scenario analysis, based on workshops and external loss data, forming part of the OpVaR engine
4 Optimising scorecard factors using Baysian belief networks and fuzzy logic, calibrated from backtesting
5 Adjustment of historical loss distributions with forward-looking scorecards using Baysian belief networks
6 Aggregation of event type and business line distributions to a firm-wide capital charge
7 Copulas are used for aggregation of loss distributions
8 Firm-wide OpRisk Capital charge
9 Extreme value theory as applicable tool for capturing of tail events
10 Backtesting and validation through regression analysis of loss data to calibrate the measurement methodology

- **The advanced measurement approach (AMA)**
  Free modelling, given a few key constraints.

The first two methods are based on the assumption that operational risk is correlated with the size of the financial institution. The only way to lower the capital charge is through lowering the size of gross income. This is a perverse incentive for managing the risk–reward relationship. The size of capital should be linked with the existing control and risk environment, as that will better reflect the true risk exposures and give incentives to line management to optimise controls and mitigants.

The AMA is hence the only meaningful way of measuring operational risk. It takes into consideration quantitative factors, such as historical internal loss data, external loss data and scenario analysis, and qualitative factors, such as key risk indicators and control assessment questions that can capture the institution's current risk and control environment. The blend of this different type of information will require the use of various statistical modelling techniques, such as fuzzy logic and Bayesian belief networks for the translation of qualitative data into loss distributions, copulas for aggregating loss distributions, and extreme value theory for capturing tail events. Figure 2 provides an overview of what the framework could look like.

Changing the way we work

RBC has, in a profound way, changed the way banking business is conducted, by introducing concepts of expected and unexpected loss. It has also formed the foundation for risk-adjusted performance measurement. RBC considers a number of risk types, and the measurement methods for credit, market, and underwriting risk are well established, whereas those for operational risk are still emerging. Ensuring a realistic measurement method for operational risk is crucial, as otherwise the overall capital number will not reflect the financial institution's true risk exposures – and hence any decision-making based on this number will be inaccurate. ❑

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