Operational risk capital modelling

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Topics

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1. Overview

- The relevant standards for banks in Australia are APS 114 (Standardised Approach or ASA) and APS 115 (Advanced Measurement Approaches or AMA)
- The major banks in Australia use the AMA approach, which involves the use of "own models" as accredited by the regulator
- These models calculate regulatory capital (Pillar 1) and economic capital (Pillar 2 and ICAAP)
- Four majors risk weighted assets corresponding to operational risk have risen from just under 7% of total RWA in 2008 to about 9% in 2013

Source: Pillar 3 reports
2. Recent trends

- There is increasing focus on the management and measurement of operational risk in banks globally, relating principally to:
  - Significant attention from regulators
  - The sizing and adequacy of operational risk numbers, against a background of some large operational risk losses and the problems of the GFC (e.g. CROPS)
  - The use of capital models in the business to gain insight into the appetite for and management of operational risk. The risk sensitivity of the models to changes in risk profile and how this informs business decisions is key.
- Models are becoming more granular in response to this, moving from “top of house” in the first generation to lower business lines (BL) and individual event types (ET) in the second generation e.g. 8 business lines and 7 event types in Basel II (56 categories)
- Banks are exploring methods of model design and capital allocation to make the numbers more meaningful to the business
- There are also a range of new technical developments being worked on
3. Model features

- The most common approach to modelling operational risk is the Loss Distribution Approach (LDA), where Frequency and Severity distributions are convolved to produce a Loss Distribution.
- The LDA approach is a method that will be quite familiar to actuaries, as will many of the distributions involved.
- The problem of convolving the two distributions can be solved by Monte Carlo simulation or numerical methods in some cases.
- Capital is determined as a confidence interval on the loss distribution (99.90% under Basel II and APS 115).
3. Model features - data

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILD</td>
<td>Internal loss data</td>
<td>Not generally available in large quantities. Can lack extreme events. Used for frequency, severity.</td>
</tr>
<tr>
<td>ELD</td>
<td>External loss data</td>
<td>Several sources, notably ORX (consortium of around 60 banks). Used for frequency, severity.</td>
</tr>
<tr>
<td>Scenarios</td>
<td>Scenarios</td>
<td>Developed internally to counter data problem on large losses but also for risk management. Principally used for severity. More prevalent in Europe than the US (Atlantic divide).</td>
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<tr>
<td>BEICF</td>
<td>Business environment and internal control factors</td>
<td>Largely indirect input to model (say via scenarios). Quantitative measures still not widely available.</td>
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4. Business challenges

• Allocation
  - Businesses don’t always see a connection between their actions and capital changes, as the “top down” approach to Operational Risk modelling may make an understanding of the levers than can move capital more difficult.
  - It can even be that in some models the levers that are used for allocation are not actually connected to the modelling engine. This can mean that improved or deteriorating conditions result in a redistribution of capital, not an overall decrease or increase.
  - This is in contrast to say Credit, where the PD, LGD scheme is generally well connected to capital.
4. Business challenges

• **Models still evolving**
  - Models are complex and are still developing. There is no single accepted paradigm.
  - Models were at a much lower level of maturity than in Credit when Basel II accreditation happened and businesses have been subjected to a lot of experimentation!
  - The ambiguity in dealing with both regulatory and economic capital can also be problematic, as in other risk classes

• **Scenarios**
  - The scenario process is special in the crucial role that it plays in operational risk capital modelling, but the eliciting of accurate outputs is very challenging
  - There are divided views on allowing a subjective judgment to feed into the modelling process and the appropriate degree of “blending” with ELD
5. Modelling challenges

- **Severity**
  - Although much rarer than small losses, large losses occur frequently enough and are large enough to dominate the severity distributions, which are typically heavy tailed (sub exponential) e.g. Weibull, Lognormal, Generalised Pareto
  - Because of the paucity of data relating to large losses, the severity distributions are very difficult to parameterise
  - Standard fitting techniques can be very volatile under data changes and are susceptible to outliers
  - Maximum Likelihood Estimation is not always the best method and such techniques as Robust Statistics have a role to play
5. Modelling challenges

• Dependency
  – Because of the dominance of large individual losses in severity modelling with subexponential distributions, modelling dependency mostly comes down to a consideration of tail dependency. This is again a difficult area because of the paucity of data.
  – In any event, it is not clear how much difference dependency makes, given that losses are driven by individual large events:

\[ \bar{G}(x) \sim E(N) \bar{F}(x) \]

• Allocation – again!
  – There are standard techniques for allocating from the total loss distribution down to sub-distributions e.g. expected shortfall contribution, Euler allocation
  – These are not always conducive to the business use of the model e.g. low diversification benefit to the largest contributors to capital and high diversification benefit to the low contributors.
  – Need to work closely with the business on this
6. Future directions

- A new generation of models is being built
- Increasing regulator focus (e.g. SIGOR work)
- Increasing engagement from bank senior management
- Industry forums are facilitating development
- Better data is evolving internally to banks and with industry initiatives e.g. ORX
- Discussions around more simplicity rather than more complexity. Further convergence of AMA models is possible (also AMA and Standardised).
- New research
  - Severity – the old chestnut
  - Dependency
  - Allocation
  - More focus on drivers of operational risk e.g. factor based models
  - More granularity and attempts to build “bottom up” models e.g. exposure based
7. Useful reading

- Journal of Operational Risk, Risk Journals, Quarterly
- Modelling Operational Risk Using Bayesian Inference, Pavel Schevchenko (Springer, 2011)
- Operational Risk – Supervisory Guidelines for the Advanced Measurement Approaches, Basel Committee on Banking Supervision, June 2011
- ORX website, www.orx.org
- Prudential Standard s APS 114 and APS 115, APRA (latest January 2013)