Catastrophe Risk Management

Opportunities for embedding Solvency II

Capital Modelling and Risk Management Seminar
10 December 2015

Junaid Seria
Solvency II Nat Cat Actuary
Agenda / Key messages

1. The Operating Model is key to embedding Solvency II – we share a few examples

2. Post Internal Model Approval, Reverse Stress testing is arguably the most important validation tool.

3. In the context of significant regulatory reporting requirements, Cat Models provide a quick and easy method for identifying extreme loss scenarios. We typically think, “Job done!” – this is a problem!

4. We outline a few ways to extract greater value from the reverse stress testing exercise
Agenda

SCOR’s Nat Cat Operating Model

Anchoring

The Scope of your RST

RST value add
Global Nat Cat Modelling Team
Nat Cat Operating Model

Global Head
Paul Nunn

Cat Analytics
Henry Bovy

Solvency II
Junaid Seria

Cat Systems
Jakir Patel

Model Development & Evaluation
Claire Souch

The Americas
Derek Hausknecht

Asia-Pacific
Nigel Winspear

Europe, Middle East & Africa
Kirsten Mitchell-Wallace

Agri / Specialty Lines
Tobias Hoffmann

Business Solutions
Richard Deem

TCMA / SUL
Phil Holt

[Diagram showing the structure of the Nat Cat Operating Model with the team leaders and their respective regions.]
Wisdom of the Crowds
Nat Cat Operating Model

- Clear Solvency II mandate

- Engaged with industry to extract industry perspectives:
  - RMS Joint Development Partner
  - OASIS Directorship and Oasis Support Project
  - Lloyd’s Exposure Management WG
  - PhD Sponsorships
  - SCOR Corporate Foundation for Science
  - Nat Cat Industry initiatives
    - Institute of Risk Management (Nat Cat Comms WG)
    - Institute of Actuaries (Nat Cat Validation WG)
Highlights
Nat Cat Operating Model & Group ERM Framework

1. Embedded ERM Framework
2. Embedded Risk Appetite Framework
3. Solvency Management
4. Risk Tolerances – Solvency Target
5. System of Limits – Extreme Scenarios
6. Footprint Scenarios
7. SCOR’s Dynamic Portfolio Management system allows daily roll-up of the entire global property cat portfolio

However, we cannot succeed unless we are integrated within the Group ERM Framework
1. Embedded ERM Framework
Nat Cat Operating Model & Group ERM Framework

**ERM is embedded in decision making**

- The Management and the Board are deeply involved in steering the Group’s risk profile
- For specific strategic decisions such as an acquisition or significant initiatives, Risk Management actively assesses risks to support Management and Board decision making

**ERM development over the “Optimal Dynamics” horizon**

- SCOR’s Risk Appetite Framework continues to evolve to enhance management of risk and capital
- SCOR more systematically uses economic metrics across the organization
2. Embedded Risk Appetite Framework
Nat Cat Operating Model & Group ERM Framework

Optimal Dynamics

- A mid-level risk profile (after hedging) with a focus on the belly of the risk distribution, avoiding exposure to extreme tail events, but aligned with the increased size, diversification and capital base of the Group
- Volatility is controlled through diversification and Capital Shield Strategy

Risk appetite

- Business focus on selected reinsurance risks
- Most mainstream insurance risks covered in Life and P&C, with a recalibration reflected in an increase in longevity risk and a slight increase in Nat Cat risk
- Low appetite for interest rate risk (at least in the short term) and D&O for Financial Institutions and no appetite for operational risk, clients’ asset risk and GMDB\(^1\) new business

Risk preferences

- Solvency target
  - SCR, Buffer capital and flexible solvency target driving a process of gradual escalation and management responses

- Capitalization level
  - Risk drivers (probabilistic)
    - Post-tax net 1:200 annual aggregate loss for each risk driver ≤ 20% Available Capital
  - Extreme scenarios (probabilistic)
    - Post-tax net 1:200 annual per-event loss for each risk ≤ 35% Buffer Capital

- Limits per risk in the underwriting and investment guidelines

Risk tolerances

Footprint scenarios

Impact assessment of past events (deterministic)

---

1) Guaranteed Minimum Death Benefit
2) The buffer capital is defined as the 97% VaR of the change in economic value distribution
3. Solvency Management
Nat Cat Operating Model & Group ERM Framework

- The management responses reflect the dynamic process which enables SCOR to steer its risk and capital positions towards the optimal area.

<table>
<thead>
<tr>
<th>Action</th>
<th>Possible management responses (examples)</th>
<th>Escalation level</th>
</tr>
</thead>
</table>
| Redeploy capital                         | ✓ Consider special dividends  
✓ Consider acquisitions  
✓ Buyback shares / hybrid debt  
✓ Increase dividend growth rate  
✓ Reconsider risk profile, including capital shield strategy  
✓ Enlarge growth of profitable business | Board/AGM                       |
| Fine-tune underwriting and investment strategy | ✓ Permanent check and optimization to remain in the optimal zone                                      | Executive Committee            |
| Re-orient underwriting and investment strategy towards optimal range | ✓ Improve selectiveness in underwriting and investment  
✓ Improve the composition of the risk portfolio  
✓ Optimize retrocession and risk-mitigation instruments e.g. ILS  
✓ Consider securitizations          | Executive Committee            |
| Improve efficiency of capital use        | ✓ Issue hybrid debt  
✓ Reduce and / or issue stock dividends  
✓ Reconsider risk profile, including more protective capital shield  
✓ Slow down growth of business  
✓ Consider securitizations         | Board/AGM                       |
| Restore capital position                 | ✓ Consider private placement / large capital relief deal  
✓ Consider rights issue (as approved by the AGM)  
✓ Restructure activities            | Board/AGM                       |

- Below minimum range - submission of a recovery plan to the supervisor

1) The 2014 solvency ratio is available capital at year-end 2013 divided by the SCR as of that date, allowing for planned business in 2014
2) When Solvency II comes into force - Article 138 of the Solvency II directive. Subject to approval of SCOR’s internal model for use under Solvency II. It is expected that applications for approval can be made beginning in April 2015
4. System of Limits – Extreme Scenarios
Nat Cat Operating Model & Group ERM Framework

Estimated post-tax 1-in-200 year annual one-event exposures in € m

- **Major fraud in largest Credit & Surety exposure**: 130 (2013) / 210 (2014)
- **Terrorist attack**: 390 (2013) / 390 (2014)

**2013 limit 35% buffer ~ € 570 m**

**2014 limit 35% buffer ~ € 580 m**

All exposures are represented post-tax (15% haircut)

---

**System of Limits**

<table>
<thead>
<tr>
<th>Risk Driver (1-in-200 post-tax net annual aggregate view)</th>
<th>Risk</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>NatCat</td>
<td>P / C</td>
<td>Group 2015 Exposure</td>
</tr>
<tr>
<td>Terrorism</td>
<td>P / C</td>
<td></td>
</tr>
<tr>
<td>Long-tail reserves deterioration</td>
<td>P / C</td>
<td></td>
</tr>
</tbody>
</table>

**Risk Driver (1-in-200 post-tax net annual aggregate view)**

- NatCat
- Terrorism
- Long-tail reserves deterioration

**figures in € millions (as GRC 24 February 2015)**

**2013 limit 35% buffer ~ € 570 m**

**2014 limit 35% buffer ~ € 580 m**

**All exposures are represented post-tax (15% haircut)**

---

**SCOR**
Whereas risk drivers and extreme scenarios are probabilistic-based, the footprint approach consists in carrying out an impact assessment on the Group under a deterministic scenario.

The footprint approach is complementary to a probabilistic-based view.

Taking into account SCOR’s current exposures and all risk mitigation instruments, footprint scenarios provide the impact on:
- the Group’s solvency ratio
- the Group’s liquidity
- the Group’s own operations

For Nat Cat, key historical events have been selected.

SCOR regularly produces and evaluates footprint scenarios, providing comfort that the impact of such events on the Group’s current solvency would be limited.
5. Footprint Scenarios – Impact Assessment
Nat Cat Operating Model & Group ERM Framework
6. DMS – Daily Global Roll-up
Nat Cat Operating Model & Group ERM Framework

**SCOR has benefited from exclusive access to the Dynamic Portfolio Management component of RMS(one) since Q4 2011**

Capacity consumption projection through 2015 renewal campaigns (€ / USD ‘000)

- SCOR is able to closely monitor the effect of thousands of underwriting decisions made during every renewal campaign throughout the year on a daily basis.
7. Embedded Frameworks
Nat Cat Operating Model & Group ERM Framework

Documentation Framework
Nat Cat Operating Model & Group ERM Framework

SII Documentation Structure

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Nat Cat Summary Document (static)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2</td>
<td>Nat Cat Governance Framework (static)</td>
</tr>
<tr>
<td>Level 3</td>
<td>Calibration Results (dynamic) Primary &amp; Independent Validation (dynamic)</td>
</tr>
<tr>
<td>Level 4</td>
<td>External vendor reference documentation (static)</td>
</tr>
</tbody>
</table>

Governance Framework
Nat Cat Operating Model & Group ERM Framework

Model Change
Pricing
Expert Judgement
Processes and Controls
External Models
Data Quality

Validation Framework
Nat Cat Operating Model & Group ERM Framework

Test Topics
Test Structure
Test Tools

- Data
- Model Design
- Results
- Governance
- Key drivers: Expert judgement, key assumptions, key switches/options, key distribution choices
- Test description – risk / scope / objective and limitations
- Quantitative / Qualitative
- Pass / fail criteria (what is the hypothesis / expectation?)
- Test result and rationale
- Recommendation (including escalation procedure where tests fail)

- Top-down justification / bottom-up model component analysis
- Analysis of change
- Back-testing
- Sensitivity testing
- Scenario testing
- Stress testing
- Benchmarking
- Functional testing
- Reconciliation testing
- Stability testing
- Risk attribution testing (variant of P&L attribution)
Agenda

- SCOR’s Nat Cat Operating Model
- Anchoring
- The Scope of your RST
- RST value add
Positive Reinforcement

Anchoring

- Internal (and External) Model approval
- Robust validation
- +200% Solvency Ratio
The Pre-mortem Approach
Anchoring

- Developed by psychologist Gary Klein as a tool to overcome planning fallacy, positive groupthink and overconfidence

- In a re/insurance context we start with the assumption: "the business is no longer viable – how did we get here?"

- Consider Reverse Stress Testing as a pre-mortem approach – that is, a genuine attempt to find an alternative hypothesis

- Not just a validation tool to show that insolvency is implausible.
Agenda

- SCOR’s Nat Cat Operating Model
- Anchoring
- The Scope of your RST
- RST value add
Scope of RST

1. Cat Models provide a quick, easy and reasonable way to quantify extreme scenarios, however caution is needed

2. Estimating related direct losses:
   - Property Cat: adjust for non-modelled components, reinstatement premiums
   - Non-Property Cat: Auto, Marine, Engineering, Aviation, Agriculture
   - Life
   - Assets – ILS portfolio
   - P&C Investments with UW risk – business underwritten at Lloyd’s

3. Indirect losses:
   - Supply chain interruption,
   - Environmental pollution
   - Others: crime, looting, claims fraud
   - State intervention - deductibles


5. Cascading effects / Super cats: 1906 SFEQ and 1907 Banker’s crisis
Agenda

- SCOR’s Nat Cat Operating Model
- Anchoring
- The Scope of your RST
- RST value add
RST Value Add

- Employ Delphi method
- Consider cluster scenarios: e.g., repeat of the 2005 US Hurricane Season + 1990/99 Eurowind losses
- Perturb historical events and near-misses (JPEQ case-study)
- Analyse largest individual contracts: MGAs, Cat Pools, etc.
- Conduct root cause analyses (e.g., NZEQ and liquefaction risk => Singapore EQ)
- Consider PML creep (proportional programmes with increasing event limits…)
- Emerging urban centres
- Claims resilience
- Emerging Risks
- Less calibration, more challenging of fundamental assumptions
Cluster Scenarios
RST Value Add
Historical Event Perturbation
RST Value Add
Historical Event Perturbation
RST Value Add

Max winds over Paris and Munich

+5% windspeeds for the whole footprint
“Non-peak” perils: Emerging Urban Centres
RST Value Add
Fundamental Assumptions
RST Value Add

1. A and B are independent
2. B follows A
3. A and B need to happen together
4. A is capped
5. A is implausible
6. A = f(x)

Aftershock sequence: Northridge (1994, left) and Canterbury (2010, right)
Source: Swiss Re
Key messages

1. The Operating Model is key to embedding Solvency II

2. Post Internal Model Approval, Reverse Stress testing is arguably the most important validation tool.

3. Use Cat Models, but ensure your assessment captures all material sources of loss

4. Through a robust elicitation process, we can extract more creative threats to the viability of our business model
Junaid SERIA
jseria@scor.com
@S2NatCat