ALM in a Solvency II World

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Agenda

• Solvency II Background
• Implications of SII on ALM
• Case Study
• What it means for Australian Actuaries
• Questions/Discussion
Solvency II Background

- Pan-European risk-based regulatory capital regime
- Attempt to harmonise the prudential regulation of insurers and reinsurers across a number of disparate markets
- Move beyond quantitative measures to overall risk management
- 3 Pillar approach
- Solvency based on an aggregate (group) economic balance sheet approach
- Current timetable
  - Draft framework published
  - 4th Quantitative Impact Study commenced, results Nov 08
  - Implementing measures adopted 2010
  - Regime operating by 2012
Why Solvency II?

• Current regime not particularly risk-based
• Improvements in Solvency methodology & best practice within member states
• Attempt to better align risk, usage of capital and shareholder returns
Overview of Solvency II

- Market consistent asset and liability definitions
- Liabilities measured on an “exit value” basis
- Two distinct liability valuation methods
  - Hedgeable risks
    - TP = Market Value
  - Non-hedgeable risks
    - TP = BE Value + Risk Margin
  - Note that BE liabilities are ALL liabilities, not just contractually guaranteed obligations
- Calculation of risk margin based on a cost-of-capital methodology
  - Project basic (non-market risk) SCR capital requirements for each future time
  - Risk Margin = PV of frictional cost of capital x future SCR requirements
- MCR breach is point of ultimate supervisory intervention
- SCR is trigger for closer regulatory action
  - Calculated either by standard formulae
  - Or via an internal model
Calculation of SCR – Standard Formulae

- Individual risk charges calculated for each risk on a policy-by-policy basis.
- Combined via a simple linear correlation matrix approach.
- Aggregate capital charge intended to be consistent with a 1 in 200 1-year probability of ruin / 99.5% VaR.
Internal Models

- Insurers can use an internal model to set their SCR
- Models can be full or partial models
- Models will need to pass various tests & standards before they can be allowed for regulatory purposes
  - Use Test
  - Statistical Quality Test
  - Calibration standards
  - Documentation standards
- Net impact is that firms’ will likely require large-scale, market-consistent stochastic asset-liability models to be able to justify use of internal model
Implications of SII on ALM

- Increased pace of development of large-scale stochastic asset-liability models
- Need for market-consistent valuation of all liabilities (including non-contractual options & guarantees)
  - Embedding of increasingly sophisticated stochastic valuation and risk management techniques in certain lines of business with significant non-linearity
- Projection models used to assess capital need to deal with valuing increasingly complex instruments & strategies
  - E.g. credit derivatives, MBS/ABS, commodities, alternative assets, etc
  - Plus need for basic calibration of real-world stochastic models which can (and should!) be subjective.
- Need for development of methodologies for real-world projection of uncertainty in mortality, lapse & expense assumptions
Implications of SII on ALM (2)

- Big increase required in verification of data quality and data management
- Significant effort to embed models into “the business”
- Modelling and usage of increasingly complex derivative assets, dynamic strategies & hedging programs
  - Increasing appreciation of exposure to Greeks, e.g. vega exposure appears on balance sheet
Implications of SII on ALM (3)

- Use of complex stochastic techniques necessarily much wider than previously
- Stochastic valuation of liabilities requires stochastic-on-stochastic simulation techniques and resulting complications
  - E.g. nested simulations, dynamic “on-the-fly” model re-calibrations, etc.
Case Studies

• Wish to consider the impact of Solvency II on capital of business over time, and impact on management of capital
• Two case study examples provided
  – Conventional Par Endowment contract
  – Unit linked contract
• Analysis via integrated stochastic asset-liability model
  – Projects SII capital requirements on standard formula, plus actual asset/liability position over multiple time periods
  – Economic scenarios produced by Barrie & Hibbert
  – Simple models for mortality experience & expectations, lapse & expense experience
Case Study 1 - Endowment

- Single endowment, 5 year term
- Benefits $30,000 SA + $3,000 Bonus
- Asset share / VSA $30,000
- Surrender value assumed to equal asset share
- Backing assets invested 30%/60%/10% in Eq/Bonds/Cash

**Initial Balance Sheet**

<table>
<thead>
<tr>
<th>Solvency II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td></td>
</tr>
<tr>
<td>Asset Value</td>
<td>$31,307</td>
</tr>
<tr>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Asset Share</td>
<td>$30,000</td>
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<tr>
<td>Put Option Value</td>
<td>$231</td>
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<tr>
<td>Risk Margin</td>
<td>$423</td>
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<tr>
<td>Tech Provisions</td>
<td>$30,653</td>
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<tr>
<td>Net Assets</td>
<td>$653</td>
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<tr>
<td>SCR</td>
<td>$653</td>
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<tr>
<td>Free Capital</td>
<td>$0</td>
</tr>
</tbody>
</table>
Case Study 1 - Analysis
Case Study 1 - Observations

- Cap Ad and Solvency II should in theory produce very similar results
  - Assuming close to a “market-consistent” interpretation of Cap Ad rules
- Capital requirements actually higher than Solvency II standard
  - Calibration differences
  - Lack of diversification allowed for in standard formulae
- Over time presence of risk premia alleviate some of shorter term capital requirements
- Risk margins are not significant contributors to capital movement (or management) over time
- Key risk remains asset-liability mismatch risk arising from writing put option
  - But heavily watered down by impact of lapses
- SII modelling limited by need to project capital requirements & use stochastic liability valuation method
Case Study 2 – Unit Linked

- $100,000 unit fund
- Assets invested based on balanced fund style holdings
- Man Charge 1% pa
- Expenses 0.2% pa + $500

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Holding</th>
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<tbody>
<tr>
<td>Cash</td>
<td>5%</td>
</tr>
<tr>
<td>Equity</td>
<td>30%</td>
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<tr>
<td>Property</td>
<td>20%</td>
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<tr>
<td>Alternative Assets</td>
<td>15%</td>
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<tr>
<td>Overseas Equity</td>
<td>10%</td>
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<tr>
<td>Risk Free Nominal Bond</td>
<td>10%</td>
</tr>
<tr>
<td>AA Bond</td>
<td>10%</td>
</tr>
</tbody>
</table>

Initial Balance Sheet

Solvency II

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Assets</td>
<td></td>
</tr>
<tr>
<td>Asset Value</td>
<td>$100,922</td>
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<tr>
<td>Liabilities</td>
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<tr>
<td>BE Liability Value</td>
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<tr>
<td>Risk Margin</td>
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<td>Tech Provisions</td>
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<td>Net Assets</td>
<td>$2,185</td>
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<tr>
<td>SCR</td>
<td>$2,185</td>
</tr>
<tr>
<td>Free Capital</td>
<td>$0</td>
</tr>
</tbody>
</table>
Case Study 2 - Analysis

![Scatter plots showing relationship between Fund Net Assets @ time 1 and Expense Experience Relative to Expectation (1yr) on the left, and Lapse Experience Relative to Expectation (1yr) on the right.](image)
Case Study 2 – Comparison with minimum of unit value
Case Study 2 - Observations

- Capital requirements lower under internal model
  - Strength of assumed lapsation charge and allowance for Op Risk in capital, not in model
- Once again, fundamentally similar capital behaviours to APRA rules
- Impact of excess of assets over charges on solvency balance sheet affects behaviour of solvency capital position
  - Initial assumed exposure to unit fund as these excess assets “invested” in fund
  - Over time strength of this watered down by other experience, e.g. lapse/expense experience.
  - Opposite effect witnessed where take no credit for these, and have a minimum of the unit fund liability
- Again, presence of minimum of unit fund holding impacts this effect on Australian capital requirements
What does it mean for Australian Actuaries?

• On the surface, not a lot
  – Current regime requires discretion and allowance for many of the issues raised in SII
  – No large-scale problem with complex guarantees & optionality in Australian products

• In practice, a fair bit more
  – Many Asian territories likely to adopt SII principles if not specific rules
  – Growing demand for global best practice in ALM
  – Trend towards more complex options & guarantees
Questions / Discussion?