Risk and capital analytics – added value or wasted effort?

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Agenda

1. Industry changes and the catalysts of change
2. Extracting value from risk and capital analytics
3. Tools to enable value adding analytics
4. Effective risk appetite and capital frameworks in practice
Industry changes and the catalysts of change
Evolution of reporting requirements and information
Drivers of the risk and capital analytics evolution

Financial Regulators

Rating Agencies and Financial Analysts

The Board and Senior Management
Prudential in 2008

Embedded Value
- Group new business profit up 8% to £1.3 billion
- EEV operating profit up 17% to £3.0 billion
- Embedded value shareholders’ funds £15.0 billion (2007: £14.6 billion)
- Net Asset Value per share £5.99 (2007: £5.91)
- Group Return on Embedded Value 15.0% (2007: 15.4%)

IFRS
- IFRS operating profit up 12% to £1.3 billion
- IFRS shareholders’ funds £5.1 billion (2007: £6.1 billion)
- Net Asset Value per share £2.03 (2007: £2.45)

Capital and Cash
- IGD surplus £1.7bn; £2.5bn post completion of Taiwan transfer
- Operating cash positive in 2008
- Full year dividend up 5% to 18.9 pence; cover 2.2 times

IFRS Operating Profit* – at AER. £m

<table>
<thead>
<tr>
<th>Year</th>
<th>Spread Income</th>
<th>Fee Income</th>
<th>Insurance Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>265</td>
<td>14%</td>
<td>72%</td>
</tr>
</tbody>
</table>

Growth rate:
- +32%
- +39%
- +36%
- +6%

Analysis of Movement in EEV shareholders’ funds – at AER. £m

<table>
<thead>
<tr>
<th>Component</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
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<tbody>
<tr>
<td>Opening Shareholders Funds</td>
<td></td>
<td></td>
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<tr>
<td>Operating Profit</td>
<td></td>
<td></td>
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<tr>
<td>Short term fluctuations</td>
<td></td>
<td></td>
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<tr>
<td>Dividends</td>
<td></td>
<td></td>
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<tr>
<td>Mark to market movements on core borrowings</td>
<td></td>
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<tr>
<td>Economic assumptions changes</td>
<td></td>
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</tr>
<tr>
<td>Tax and Other*</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Foreign Exchange</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Closing Shareholders Funds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Holding company cash flow – at AER. £m

<table>
<thead>
<tr>
<th>Year</th>
<th>Overall Cash Flow</th>
<th>Corporate Cash Flow</th>
<th>Dividends Paid</th>
<th>Interest Income</th>
<th>Tax and Other</th>
<th>Net cash from Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1,023</td>
<td>516</td>
<td>417</td>
<td>199</td>
<td></td>
<td>1,023</td>
</tr>
<tr>
<td>2006</td>
<td>516</td>
<td>417</td>
<td>417</td>
<td>199</td>
<td></td>
<td>516</td>
</tr>
<tr>
<td>2007</td>
<td>516</td>
<td>417</td>
<td>417</td>
<td>199</td>
<td></td>
<td>516</td>
</tr>
<tr>
<td>2008</td>
<td>54</td>
<td>461</td>
<td>461</td>
<td>199</td>
<td></td>
<td>54</td>
</tr>
</tbody>
</table>
Prudential in 2013

**Economic capital position (£bn)**

- **Solvency cover**: 257%
- **Surplus**: £11.3bn

**Economic capital by risk type (before diversification)**

- Operational/Expense: 11%
- Mortality/Morbidity: 8%
- Longevity: 9%
- Lapse: 19%
- Interest rates: 13%
- Other market: 5%
- Credit: 20%
- Equity: 15%

**Movement in economic capital surplus (£bn)**

- 1 Jan 2013: 8.8
- 31 Dec 2013: 11.3

**Economic capital sensitivities (£bn)**

- Base position (as reported): £11.3bn
- 40% equity fall: (1.0) £10.3
- 20% equity fall: (0.3) £11.0
- 100bp interest rate fall: (1.3) £10.0
- 100bp interest rate rise: 0.8 £12.1
- 100bp credit spread widening: (1.3) £10.0
Old Mutual in 2000

Underlying life assurance value of new business increased 16% to £72 million

Operating earnings per share* increased 38% in Sterling terms to 17.0p

Dividends per share increased by 18% to 4.7p

Embedded value† up 3% to £5,553 million

Embedded value† per share £1.56

Risk management

The Group recognises that effective risk management is an essential part of its value and earnings. At the Group level the principal risks are interest rate risk and currency risk. The Group operates (Rand and US$) to Sterling and investment returns are translated at the average exchange rate for the year.

Given the lack of deep and liquid markets for African trading, the Group does not currently hedge translation risk, although this is possible for certain cash flows, such as the payment of dividends from South Africa.

In order to manage investment risk, the Group makes limited use of derivatives, primarily only for the purpose of risk reduction or efficient portfolio management.
Old Mutual in 2013

Risk appetite metrics

<table>
<thead>
<tr>
<th>Measure</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings at Risk (EaR)</td>
<td>1 in 10</td>
</tr>
<tr>
<td>Economic Capital at Risk (ECoR)</td>
<td>7 in 10,000 (1 in 200 from 2014 onwards)</td>
</tr>
<tr>
<td>Cash Flow at Risk (CFaR)</td>
<td>1 in 10</td>
</tr>
<tr>
<td>Operational risk (OpRisk)</td>
<td>1 in 10</td>
</tr>
</tbody>
</table>

* During 2014 a risk culture metric will be included

Risk profile of the Old Mutual Group by region

- **US Asset Management**: 2%
  - Market: 57%
  - Credit and counterparty: 43%
- **Old Mutual Wealth**: 28%
  - Market: 42%
  - Credit and counterparty: 58%
- **Emerging Markets, Nedbank and Property & Casualty**: 68%
  - Market: 38%
  - Credit and counterparty: 62%

* The risk profile of the Group is based on standalone economic capital at risk, ie, the relative contribution of each risk is determined before allowing for the impact of diversification between risks, as at 30 June 2013
* Note that the South African businesses include our exposure to Africa, Latin America and Asia
* Note the above excludes Old Mutual Bermuda which provides the remaining 3% of economic capital

Impact on Group EC surplus and cover ratio at 31 December 2013 (£ billion)

- **Base Economic Capital Surplus**: 4.8
- **Equity markets fall by 10%**: 4.6
- **Equity markets fall by 25%**: 4.4
- **Interest rates rise by 100 basis points**: 4.7
- **Interest rates fall by 100 basis points**: 4.9
- **Credit spreads increase by 100bps**: 4.8
- **ZAR:GBP exchange rate depreciates by 10%**: 4.6
- **ZAR:GBP exchange rate depreciates by 30%**: 4.3
Practical challenges faced by insurers

- Creating management buy-in
- Improving the reliability and robustness of results
- More information
- Transparency
- Results at a sufficient level of granularity
- Producing results in short timeframes
Extracting value from risk and capital analytics
Do our risk and capital analytics really add value?

- Significant resources have been spent on quantification capabilities, but has this added business value?
- Effective utilisation of analytics in practice:

  - Credibility of results
  - Clarity & transparency
  - Proactive & informed management action
  - Enhanced optimisation capabilities
  - Metric-driven strategic decision-making

To get this right, we require:

- Appropriate & relevant metrics
- Clear communication [utilising effective visualisation]
Example 1: AXA

Digestible results – effective visualisation

Economic solvency

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Published</th>
<th>Adjusted¹</th>
<th>Adjusted²</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY12</td>
<td>47.3%</td>
<td>22.9%</td>
<td></td>
</tr>
<tr>
<td>FY12</td>
<td>45.6%</td>
<td>22.9%</td>
<td></td>
</tr>
<tr>
<td>FY13</td>
<td>50.8%</td>
<td>24.7%</td>
<td></td>
</tr>
</tbody>
</table>

FY13 Economic capital* by geography

- Holdings & other: 15%
- UK: 5%
- Asia Pacific: 12%
- United States: 6%
- MedLA: 9%
- NORCE: 29%
- France: 25%

FY13 Economic capital* by risk

- Operational: 5%
- P&C risks: 19%
- Life risks: 17%
- Counterparty: 10%
- Market: 50%
Example 2
Logical communication of technical results
Example 3

Highlight critical business factors

Analysis of Change

- New niche casualty
- Market/Ins correlation recalibration

2013 ICA, Planned Profit, Fx Rate Change, ESG, Cat Model, Other Data Changes, Model Changes, Cat Risk, U/W Risk, Reserving Risk, Credit Risk, Market Risk, Operational Risk, Diversification, Other, 2014 ICA

Green: Decrease in Capital  Red: Increase in Capital
Example 4: Swiss Re
Fit for purpose reporting design

Target capital structure expected to reduce leverage by more than USD 4 billion by 2016E

- Senior leverage plus LOC target range\(^2\) = 15\%-25\% (YE 2012: 32%)
- Subordinated leverage ratio target range\(^3\) = 15\%-25\% (YE 2012: 14%)
Example 5: SCOR

Enable action

<table>
<thead>
<tr>
<th>Action</th>
<th>Escalation level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redeploy capital</td>
<td>Board/AGM</td>
</tr>
<tr>
<td>Fine-tune underwriting and investment strategy</td>
<td>Executive Committee</td>
</tr>
<tr>
<td>Re-orient underwriting and investment strategy toward optimal area</td>
<td>Executive Committee</td>
</tr>
<tr>
<td>Restructure use of capital</td>
<td>Board/AGM</td>
</tr>
<tr>
<td>Restore capital position</td>
<td>Board/AGM</td>
</tr>
<tr>
<td>Below minimum range - Submission of a recovery plan to the supervisor</td>
<td>Board/AGM</td>
</tr>
</tbody>
</table>

![Graph showing probability of 2014 SR and actions](image)
Tools to enable value adding analytics
Utilising capital & risk analytics

- Metric calculation tools
- Monitoring tools
- Projection capabilities
- Reporting / communication

Enable

Efficient (re)valuation techniques

- Faster turn-around of valuation processes at reporting dates
- Real-time re-valuations
- Quantification accessibility – reduce reliance on the reporting team
- More efficient scenario analysis capability
- Enable more relevant metric calculations (by removing practical constraints)
Efficient valuation techniques
Formula fitting – case study

- Performed for a South African risk product
- Includes complexities, such as varying product growth options
- Proxy model developed for 6 risk factors
- Executed over 800,000 model points
- Successful fit achieved ($r^2 = 0.99998$; max error = 0.31%)

\[f(x) = ax^n + bx^n y^n + cx^n y^{n-1} + \ldots + c\]
Forward looking projections
Example output

Position paper guidance to: “...evaluate the results and conclusions from its forward looking capital projections...”

• Volume of results to be produced significantly increase (in practice, not just one metric)
• Important to understand trends (not just model it)
Projection methodology choices

Increasing level of sophistication

**Balance sheet**
- Simple movement assumption
- Scaling from base assumptions
- Proxy modelling
- Model outputs from liability valuation & ALM models

**Capital**
- Input from Risk Margin calculations
- Risk driver approach
- Proxy modelling
- Full re-calculation at projection periods

- Pragmatic
- Simplicity & ease of application
- Easy to explain
- Flexibility

- Robust
- Accuracy & relevance
- Credibility
- Usable by management

Play-off
Effective risk appetite and capital frameworks in practice
How do we tackle the tools and approaches to achieve the uses?
Risk and capital analytics can enhance decision making

- Capital adequacy assessment/capital management
- Strategic planning and capital allocation
- Asset/investment strategy (e.g., hedging)
- Annual business planning
- Risk transfer (e.g., reinsurance, securitization)
- Product design and pricing
- M&A and divestitures
- Performance measurement
- Incentive compensation
How do we tackle the tools and approaches to achieve the uses?

- Use
- Business requirements
- Technical requirements
## Making this practical

**Articulating risk preferences for a notional company**

<table>
<thead>
<tr>
<th>Risk appetite statements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital under stress tests</td>
<td>All external capital requirements should be covered after specific stress tests</td>
</tr>
</tbody>
</table>
| Buffer versus excess capital | Buffer capital of equal to capital required in a 1-in-10 event (roughly 50% of required capital)  
Capital exceeding this deemed excess |
| Risk mix is in line with preferences | No more than 55% of required capital should be linked to any individual risk or risk class at all probabilities up to 1:200 |
Current view of insurer

Capital resources and requirements

Solvency ratio: **1.9**

- **Available capital**: 75
- **Undiversified capital**: 43
- **Diversification benefit**: 18
- **Target buffer**: 13
- **Required capital**: 25
- **Surplus**: 36

Solvency ratio under key stresses

- **Base scenario**: 1.9
- **Lapse + 40%**: 1.6
- **Mortality + 10%**: 1.6
- **Interest + 100bps**: 1.9
- **Interest - 100bps**: 2.0
- **Lapse + 20% & Expenses + 20%**: 1.7

Capital contribution

- **Mortality**: 69%
- **Lapse**: 19%
- **Disability**: 11%

Commentary

- Base capital shows a surplus of R36m
- Available capital exceeds required (and buffer) capital in all stress scenarios
- Mortality is more than 55% of total capital at the 99.5th level

Conclusion

- Have excess capital
- Need to take action to reduce excess, but also manage the mortality risk
Consider buying an African insurer that sells death benefit products

**Capital resources and requirements**

- Solvency ratio: 1.1
- Available capital: 60
- Required capital: 35
- Target buffer: 19
- Surplus: 6

**Solvency ratio under key stresses**

- Base scenario: 1.1
- Lapse + 40%: 0.8
- Mortality + 10%: 0.7
- Interest + 100bps: 1.1
- Interest - 100bps: 1.1
- Lapse + 20% & Expenses + 20%: 0.9

**Commentary**

- Base capital shows a surplus of R6m
- In half of the scenarios, the available capital is less than required capital in stress scenarios
- Target risk mix out of line – mortality risk exceeds 55% at 99.5th percentile

**Conclusion**

- Restore the surplus capital
- Too exposed to mortality risk
- Need to de-risk
Impact of reinsuring some of the mortality risk

**Capital resources and requirements**

- **Solvency ratio:** 1.4

- **Available capital:** 58
- **Required capital:** 27
- **Target buffer:** 15
- **Diversification benefit:** 19
- **Undiversified capital:** 46
- **Surplus:** 16

**Solvency ratio under key stresses**

- **Base scenario:** 1.4
- **Lapse + 40%:** 1.0
- **Mortality + 10%:** 1.1
- **Interest + 100bps:** 1.3
- **Interest - 100bps:** 1.5
- **Lapse + 20% & Expenses + 20%:** 1.1

**Capital contribution**

- Mortality 39%
- Lapse 51%
- Disability 9%
- Expense
- Expense Inflation
- Interest

**Commentary**

- Base capital requirements have fallen; surplus increases £16m
- Available capital exceeds required (and buffer) capital in stress scenarios
- Reinsurance has reduced the mortality risk

**Conclusion**

- Go ahead with the strategic acquisition and reinsurance strategy
- Need to monitor the lapse risk and retention
Cascade of risk appetite across the organisation

- **Capital contribution**
  - Mortality 39%
  - Lapse 51%
  - Disability 9%

- **Total appetite at Group level**
  - **Mortality risk**
  - **Lapse risk**
  - **Disability risk**
  - **Expense**
  - **Expense Inflation**
  - **Interest**

- **Allocation of appetite at BU level statement**
  - **South Africa**
  - **Zimbabwe**
  - **Botswana**
  - **Nigeria**

- **Risk appetite statement**
  - **Link to limit framework**

- **Death benefit**
- **Disability cover**
- **Dread disease**

**2014 Convention knowing more 22-23 October, Cape Town**
Allocation of capital and assessing capital adequacy

TOTAL CAPITAL REQUIREMENTS AT GROUP LEVEL

GROUP AND COUNTRY LEVEL

SOUTH AFRICA

ZIMBABWE

BOTSWANA

NIGERIA

BU LEVEL

LIFE

GROUP BENEFITS

PRODUCT AND RISK FACTOR LEVEL

DEATH COVER

• DEATH
• LAPSE
• INTEREST RATE
• ...

DISABILITY COVER

• DIABILITY
• LAPSE
• EXPENSE
• ...

DREAD DISEASE

• MORBIDITY
• EXPENSE
• EXPENSE INFLATION
• ...

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To ensure risk and capital analytics add value …

- Use
- Business requirements
- Technical requirements

Extracting value from analytics:
- Digestible – utilising effective visualisation
- Logical communication of technical results
- Highlight critical business factor
- Fit-for-purpose reporting design
- Enable action