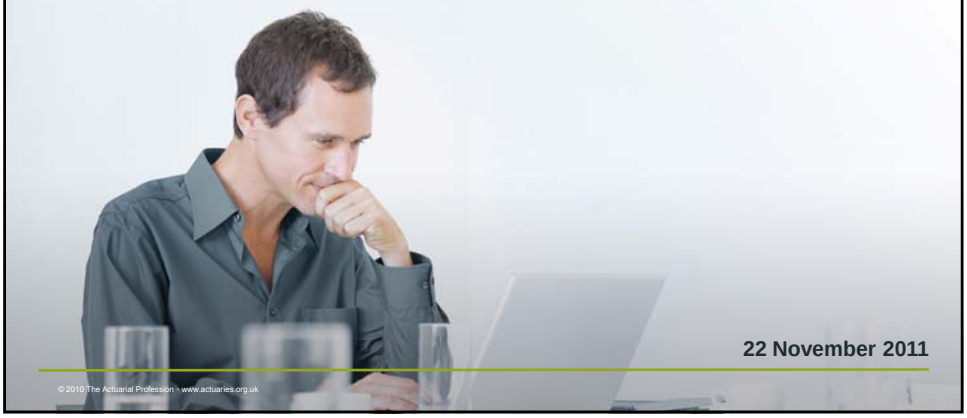
The Actuarial Profession
making financial sense of the future

Old Mutual: Solvency II Internal Model Challenges and Benefits

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Overview

Background

- Brief overview of Old Mutual Group
- Solvency II Programme (iCRaFT)
- Programme challenges and wins
- Capital Modelling ambitions

Capital Model

- Scope
- Implementation timeline
- High level approach

Distributions and Dependencies

- Achieving a consistent group-wide approach to assumptions

Successes and future challenges

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Overview of the Old Mutual Group

- Global insurance based business, but top co (OM plc) officially a financial conglomerate (have large asset managers, investment platforms and banks)
- Largest insurance businesses in South Africa (life + short-term), UK (Skandia), Nordics (Skandia), US and Bermuda. Small head-office function in London.
- Growing businesses in Continental Europe, Rest of Africa, Latin America and Asia
- Risk and control breakdowns a few years ago required strategic refocus and change in group operating model, including:
  - Greater strategic control and oversight from the centre
  - Implementation of groupwide capital, risk and financial transformation programme ("iCRaFT")
  - Rationalisation of marginal businesses / those outside of risk appetite (sale of US life, closure of Bermuda to new business)

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iCRaFT (Solvency II) Programme

- iCRaFT has become a groupwide Solvency II "compliance +" programme
  - Not just compliance, but for sound business reasons (regulations just provide additional impetus to implement)
  - Although the Group is not UK ICA regulated, we have had an existing Economic Capital and Risk Appetite framework in place for a number of years
  - Not starting from scratch - this provided a sound base for implementing a Solvency II Internal Model and ORSA framework. But enhancements and greater embedding was needed.
- Groupwide budget signed off at board level in mid-2009, since then moving **downward** (and now many workstreams have delivered and transitioned into BaU)

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Challenges faced during the Programme

- Embed new operating model and deliver a large groupwide programme into businesses that are used to being run autonomously
- Justify additional workload and cost, where benefits often aren't seen
- Legal structure complications
  - Insurance entities vs. business units vs. full group
  - Internal model vs. standard formula for each insurance entity
- Resourcing and competing priorities (current BaU)
- Keeping scope in line with requirements (different expectations)
- New concepts and complex problems which are often technically challenging and have a range of possible solutions
- Moving regulatory target: some regulations are still not yet sensible
  - Difficult to judge, but don't want to overshoot where no added value

... there are many more!

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Major Programme wins to date

- Getting remuneration basis (economic profit) in place early
- Entered FSA IM Pre-Application early and first time
- First large UK retail group to submit QIS 5 results
- First UK company to submit IM Self Assessment Questionnaire
- Rollout of new groupwide risk management system (Open Pages)
- Rollout of new groupwide capital modelling platform (Risk Agility Economic Capital)
- Produced June 2011 SCR and EC results as part of BaU
  - BUs presenting and discussing economic capital results (available by product group)

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Capital Modelling ambitions

- The Capital Model is a subset – but one of the most important parts – of the Internal Model
- Initially very wide aims, but tempered so not to overshoot requirements
- High level aims
  1. Upgrade current risk-based EC framework to an embedded Solvency II compliant approach across the group
  2. Ensure a greater understanding of our risks and their interactions
  3. Improve forecasting, capital monitoring and stress and scenario testing ability, with information more rapidly available
- The complexity in achieving this is very different for a large multi-national group, than for a small local insurer!

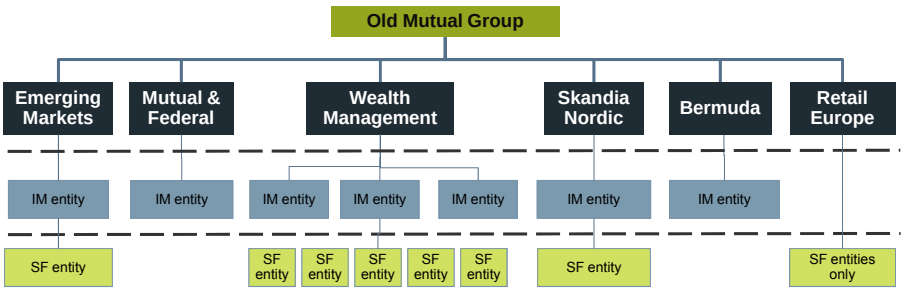
  => Balance practicality against theoretical perfection (cost-benefit)
- Software selected to implement Old Mutual's chosen methodology: RiskAgility Economic Capital Aggregator

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Legal Entity scope of the Internal Model

- Defined largest, most complex insurance entities as full Internal Model

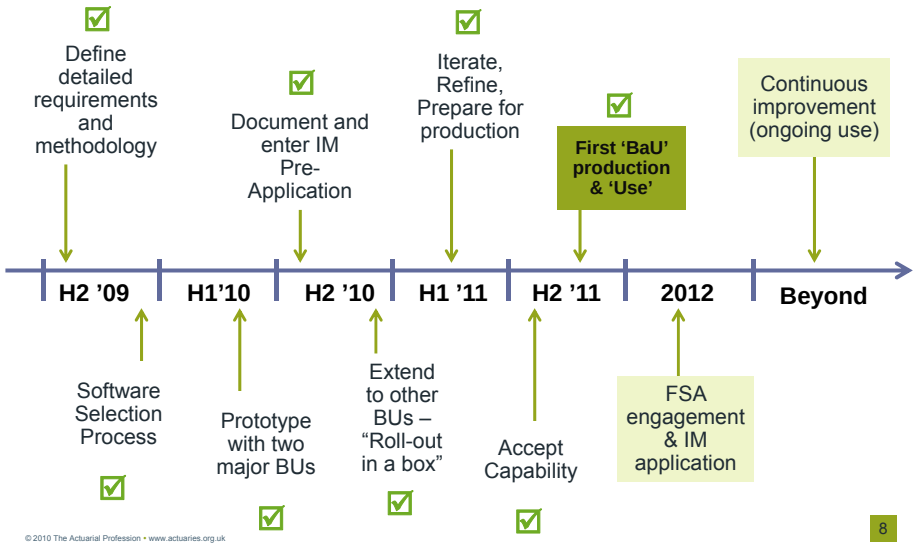


- Largest non-European entities also covered in scope
- Remainder of material insurance entities are Standard Formula
- 3 European insurance sub-groups (one Std Formula, two partial model)
- OM plc "insurance group" is Partial Internal Model

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Capital modelling implementation timeline



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Key technical design aspects

With specific requirements to:

1. Generate a fuller distribution of losses / capital results
2. Enable an improved and more rapid estimation ability, and
3. Meet Solvency II statistical quality standards

Modelling Approach

- Modular risk type approach, splitting risk distributions (probability of loss) from amount of loss incurred for a risk factor outcome.
- Use value response / loss functions (curve fitting) to extend current "single point" method to full distribution approach.
- Stochastic aggregation (rather than correlation matrix) to handle full distributions and model non-normal (non-Gaussian) risks and capture non-linearity and interactions between risks.

Calibration Process

- Business Units perform parameterisation and assumption setting where possible because of detailed knowledge of underlying products and risks, and the need to use model and results in their businesses.

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Model development

Design	Build	Test	Implement

▪ Define Model Scope
▪ Agree structure in RiskAgility (Entities / Product Groups (LLPs) / Risk Factors)
▪ Define risk types consistently across Group
▪ Agree risk factors relevant for each Legal Entity
	▪ Inputs into RiskAgility
	  ▪ Distributions
	  ▪ Dependencies
	  ▪ Value response functions (Curve-fitting)
	▪ Level 1 valuation model runs for loss information (shocks to MVBS)
	▪ Aggregation approach (PIM)
		▪ RiskAgility testing
		  ▪ Functional testing
		  ▪ IT testing
		▪ Replicate existing EC results in RiskAgility
		▪ Validation requirements (robustness of results)
		▪ Equivalent scenario (validate back to Level 1 models)
			▪ Use capital model for June 11 results production as part of BaU
			▪ GHO assumption and results reviews across BUs
			▪ Documentation
			▪ Communication to stakeholders
			▪ Lessons learnt / feedback

Capital Modelling Target Operating Model (TOM)

Validation Framework (Policy, Report)

Documentation

Strong project management, BU Liaison, Weekly BU calls, Issue Calls, Programme Governance

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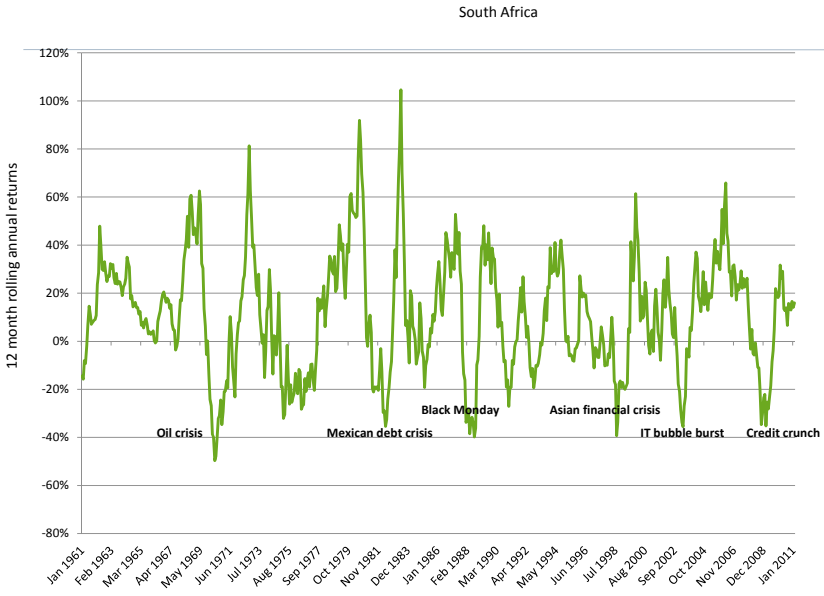
Consistent approach to modelling risk

- Leverage existing Economic Capital Framework (and ICA)
- Set up Group-wide Distribution & Dependency (D&D) committee
  - Joint Group Actuarial and iCRaFT-led initiative with involvement in a working group/forum from across BUs
  - Aim: try to ensure shock and correlation assumptions meet Solvency II statistical quality standards and are ‘consistent’ across the Group
  - Identify current best practice across BUs, emerging market practice and representation from auditors.
- Outputs include:
  - Consistent articulation /definition of risk types
  - Set of principles for deriving distributions and dependencies
  - D&D tools – developed a range of shock tools to assist BUs with calibration of risk distributions (e.g. PCA tool, Equity tool, Volatility tool etc.)

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Comparison to equity data – South Africa



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Approach to setting correlations

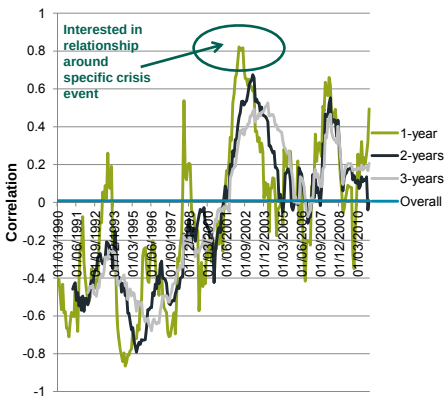
- Using a correlation matrix approach (i.e. Gaussian copula), but will set the correlation assumptions with our view of tail dependency or "correlation" in extreme scenarios
- Correlation assessments to be prioritised according to materiality of risk types included in Internal Model, with additional review and checking where correlations have a material effect on overall SCR results.
- Data to be used where possible to calibrate appropriate correlations (i.e. most financial / market risk types), with "crisis scenario" approach to be used to assess correlations over historic periods of financial stress
- Where no usable data is available, e.g. correlations between non-market risks, or correlations between market and non-market risks, correlations to be assessed subjectively using H / M / L "bucketing" approach:
  - High correlation — Default: 75%; Range: 60% < ρXY < 100%
  - Medium correlation — Default: 50%; Range: 30% < ρXY ≤ 60%
  - Low correlation — Default: 25%; Range: 0% < ρXY ≤ 30%

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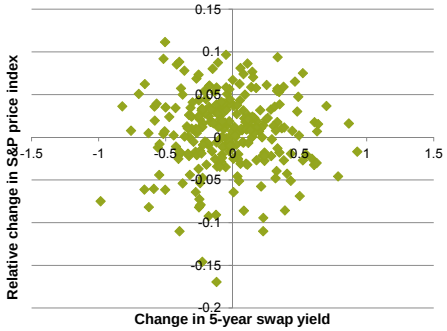
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US 5-year Swap Yields and Equity Prices

Rolling correlations between swap yields movements and S&P



Scatter-plot of risk factors over all past data



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Correlation category selection

Selection criteria	Y/N	Low 25%	Medium 50%	High 75%
Does any internal evidence exist for a correlation between the risk factors?				
Does any external evidence exist for a correlation between the risk factors?				
Is there a causal relationship between risk factors?				
Is the relationship between risk factors self-reinforcing?				
Is there a separate causal variable influencing both risk factors?				
Is there a separate modelled risk factor that is strongly correlated to both risk factors being considered here?				

Influences placement in specific category

May cause bump to next category

Comments on materiality of link between risk factors and evidence collected from subject matter experts or research reports.

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Where are we now?

Far more consistency and robustness than in the past

- Use of historic data where available, with past market data now more widely available via acquired data
- Choice of statistical distributions used for the capital model is helped by consistent use of fitting tools
- The use of expert judgement and justification better documented
- Linked to current risk management practices

But, still not there yet

- Some inconsistencies across the Group (equity dampener, lapses, correlations)
- Best practice calibration methodology required (lapse up / down)
- Better data, especially internal, required in places

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Successes and future challenges

The Good

- Got started early, generally securing resources required
- Contractors/consultants used only for specific purposes as part of a tightly managed Old Mutual team – reduced cost, smoother transition
- BUs generally working constructively – excellent progress made, building to application
- Management within the BUs starting to present and discuss results (demonstrate embedding and 'Use')

The Bad

- Despite all the effort, still going to be a challenge to meet Internal Model tests and standards

The Ugly

- Going to be a significantly increased amount of work on an ongoing "business-as-usual" basis – some rationalisation required.

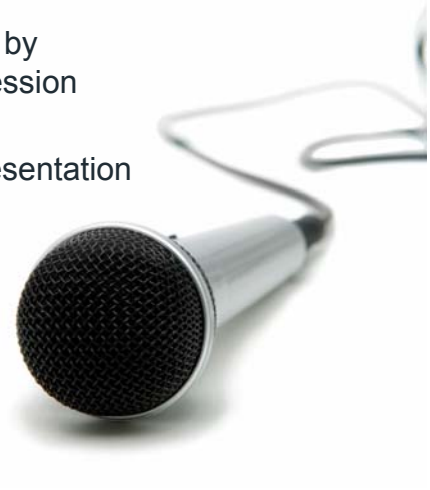
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Questions or comments?

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