IMIF - Two years on

José Morago
Group Risk Director at Aviva Plc
IMIF Founder and IRM Chairman
IMIF Purpose and Objectives: Creating value through internal models

- Understanding challenges for the insurance industry in complying with Solvency II regulation for Internal Models
- Understanding the stage of maturity of industry in embedding Internal Models, as a key tool of risk and capital evaluation
- Identifying the current gaps and best practices in the Industry
- Ensuring alignment in the industry including good balance between pragmatic solutions and regulatory requirements
- Enabling a communication channel with the regulator, industry associations (e.g. IRM, IFoA, ABI) and other stakeholders (i.e. consulting firms)
A strong industry forum

Over 40 life and non-life insurance players represented
Over 300 forum members
The IMIF’s contribution so far

Kick off meeting June 2014
25 Steerco meetings
10 workstreams
8 Forum meetings
5 booklets
4 ‘use’ case studies
2 Industry surveys
1 webinar
Speaking opportunities
Articles in the press
The IMIF in 2016: From compliance to creating value

Areas of improvement for your business in 2016 based on the recent IMIF survey*

- Validation - efficiency of process
- Documentation - maintenance/depth of documentation
- Extending model usage
- Board engagement/education
- Profit & loss attribution
- Model change - making the process practical
- Statistical quality - operational risk

* June 2016 survey based on 11 insurance companies, including 4 CROs. 2014 Survey based on 17 responses
Cost pressures and questions about the efficiency of the Internal Model Validation process remain.

*Does your organisation consider its IMV framework to be...*

- Not value adding and not cost effective
- Not value adding but cost effective
- Value adding but not cost effective
- Value adding and cost effective

..and this is the view of risk/the actuaries!!
Opportunities to extend of model uses, but capabilities need to be understood

Potential uses for IM on a business as usual basis
(# of companies)

- Capital Management and optimisation
- Risk appetites
- Business planning
- Strategic asset allocation
- Reinsurance purchase
- Limit setting
- Risk management
- Mergers & acquisitions
- Pricing & product design

- Major decision factor
- Considered but not a major factor
- May be considered - minor factor
Level of challenge and understanding from the Board is improving but some way to go

How effective is the level of challenge/understanding from the Board of the IM (and its limitations) as well as of the IMV process

- Basic
- Partially adequate
- Mostly adequate
- Fully adequate and value adding to the IMVF

<table>
<thead>
<tr>
<th></th>
<th>Challenge</th>
<th>Understanding</th>
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</thead>
<tbody>
<tr>
<td>Basic</td>
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<tr>
<td>Fully adequate and value adding to the IMVF</td>
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0% 10% 20% 30% 40% 50% 60% 70%
Key IMIF workstreams for 2016

• Role of CRO
• Alternative uses of capital models - practical cases (e.g. investment management decisions and pricing)
• Catastrophe Model Communication
• Life after IMAP – model change
• Profit and loss attribution
Model Change – The Story So Far.....

Matt Saker – Group Chief Risk Actuary
1. Includes Polish and Hong Kong subsidiaries
2. Includes other GI entities e.g. Ireland Health
3. Holding company including (re)insurance entities
4. Includes Lithuanian subsidiary
5. Standard formula on a solo basis; partial internal model on a consolidated basis (i.e. for Aviva plc calculation)
6. Includes other Polish entities, Poland GI, Singapore (group services), and life insurance entities in Indonesia, Taiwan, Vietnam, and India
7. Includes all Italian entities
8. Includes other Spanish entities, Turkey Life, and services entities in Ireland and France
9. Includes Aviva Re, Singapore entities, and Hong Kong entities
10. UKLAP is on a Partial Internal Model basis because the Irish business SCR is calculated on a Standard Formula basis.
Internal Model Governance is a mechanism where all the components are inter-connected and always in motion.

We need to ensure that the Internal Model remains fit for purpose by managing impacts on the model, as they happen.
Influences on the Internal Model

Model validation

Data quality assessment

Model testing

Use of the model

Expert judgement log

Internal Audit review

Regulatory change

Infrastructure change

Risk Identification report (inc. Risk Repository)

Methodology change

Model testing

1st line log

Attestation (M&E)

Governance change

Instruction/standard change

Production process

Management view
Clear accountabilities

- Internal Model Owner
- Model Element Owner
- W&L Action Owner
- IOE Document Owner
- Database Administrator
- SAT Report Owner
- Model Change owner
- Group IMG Team
- IMIV Lead
- Data Governance Lead
How does Aviva govern its Internal Model?

Aviva governs its Internal Model through the following standards and frameworks:

- **Internal Model Governance Standard**
- **Data Governance Standard**
- **Internal Model Independent Validation Standard**
- **Internal Model Results Validation Framework**
The Solvency II Model Governance Business Standard is structured around 17 objectives and controls (covering Internal Model and Standard Formula entities) to ensure Aviva’s risk and actuarial models in general and the internal model in particular is being developed in line with Article 115 and 116 of the Solvency II Directive, i.e.:

- In a controlled manner;
- The internal model remains robust and fit for purpose;
- It continues to meet the Solvency II tests and standards; and
- The output of the internal model is credible for use in both the business and for regulatory purposes.
What Issues did we have with the process?

The Solvency II Model Governance Business Standard and related processes were initially developed in a theoretical world.

From a practical perspective, it became clear that the process needed to be refined to separate “business as usual” operations and management actions from other internal model changes that require the College of Supervisors approval.

A quarterly model change process was proving to be very onerous.
What solutions did we put in place?

Following the feedback received from the PRA and ACPR, we reviewed our Solvency II Model Governance Business Standard and Guidance to:

i) Revisit the scope of the standard to ensure the College of Supervisors can focus on the more relevant model changes, while maintaining an awareness of all updates to the model, and;

ii) Reduce the number of change applications to one application a year.
How does Aviva govern its Internal Model?

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- Internal Model Governance Standard
- Data Governance Standard
- Internal Model Independent Validation Standard
- Internal Model Results Validation Framework
Aviva’s Results Validation Framework comprises a number of tools, focusing on “top down” validation of various key areas of the Internal Model. These tools provide comfort that all material areas of risk have been appropriately modelled within the Internal Model, and that the results produced by the model are fit for purpose.

A sample of the tools and tests is as follows:

- Reasonableness of Internal Model results
- Multi-risk results validation
- Profit & Loss Attribution
- Stability testing
- Sensitivity testing
What did the Results Validation Framework tell us?

<table>
<thead>
<tr>
<th>Validation Tools</th>
<th>Validation Tests</th>
<th>Group Validation Results</th>
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</thead>
<tbody>
<tr>
<td>1. SCR Results Analysis</td>
<td>a) Comparison of SCR risk profile vs YE2014 IM Restatement</td>
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<td></td>
<td>b) Comparison of Risk Profile with ICA results and SF results.</td>
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<td></td>
<td>c) Analysis of Change of IM SCR from YE2014 Restatement by key drivers</td>
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<tr>
<td>2. Reasonableness of Internal Model Results</td>
<td>a) Validation of Critical Scenario – Smoothing Window</td>
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<td>b) Validation of the tail and other percentiles of the Internal Model results</td>
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<td>c) Validation of skewness of risks observed in the Internal Model results</td>
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<td></td>
<td>d) Validation of Internal Model results using Risk Ranking</td>
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<tr>
<td>3. Robustness of Diversification Benefit</td>
<td>a) Analysis of diversification benefit by risk</td>
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<td>b) Analysis of diversification benefit accumulation</td>
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<td></td>
<td>c) Analysis of diversification benefit at different percentiles</td>
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<tr>
<td>4. Multi-Risk Scenario Validation</td>
<td>a) Comparison of Algo results with ALM results for a selection of scenarios.</td>
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<tr>
<td>5. P&amp;L Attribution</td>
<td>a) Analysis of change in own funds</td>
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<td>b) Attribution of change in own funds to Internal Model Risks</td>
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<td></td>
<td>c) Comparison of own fund movements with Internal Model (1:X)</td>
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<tr>
<td>6. Back-Testing</td>
<td>a) Back testing of results (1 year own fund movements and P&amp;L)</td>
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<td></td>
<td>b) Back testing of loss functions (actual vs expected)</td>
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<tr>
<td>7. Stability Testing</td>
<td>a) Stability testing on alternative random seeds (and the same input data)</td>
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<td></td>
<td>b) Stability testing on 100k and 500k simulations</td>
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<tr>
<td>8. Sensitivity Testing</td>
<td>a) Identify changes in SCR based on changes in material inputs:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. Risk factor calibrations</td>
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<td></td>
<td>ii. Correlations between risk drivers and risk driver categories</td>
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<td>iii. Economic sensitivities</td>
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<td>iv. Expert judgements applied in the Internal Model</td>
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<tr>
<td></td>
<td>b) Plausible range analysis on material expert judgements</td>
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<tr>
<td>9. Benchmarking</td>
<td>a) Comparison with Standard Formula</td>
<td></td>
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<td></td>
<td>b) Comparison with External Benchmarks</td>
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<tr>
<td>10. Stress and Scenario Testing</td>
<td>a) Comparison with management’s view of impact of stressed scenarios on balance sheet</td>
<td></td>
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<td>b) Validate non-linear dependencies observed in the Internal Model results by comparison with management’s view.</td>
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<tr>
<td>11. Reverse Stress Testing</td>
<td>a) Determine size of loss corresponding to SCR, Own Fund Depletion and Solvency Coverage Ratio &lt; 100%.</td>
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<td></td>
<td>b) Management identify plausible scenarios, impact and probability for identified size of losses.</td>
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<tr>
<td>12. Chief Risk Actuary’s Opinion</td>
<td>a) Chief Risk Actuary’s Opinion on overall robustness of results by considering each of the validation tests performed</td>
<td></td>
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</tbody>
</table>

The BUs or Group are judged to have passed the test
The BUs or Group are judged to have qualitatively passed the test
The BUs or Group are judged to have failed the test
Test not applicable at Group level
What Lessons have we learned from having used our Results Validation Framework?

• Start from the premise that the model is fit for purpose
• Be challenging……but not too ambitious
• Recognise that you are on a journey
• Make sure that the Board focusses on what’s important
Overall conclusions

Keep it simply!

Don’t under-estimate the size of the task
The Evolving Role of the CRO
– getting value from a seat at the table
Martyn Rodden, Deputy CRO, MS Amlin
Justin Elks, Director, BaxterBruce
Context of paper

• Consider how CRO role will evolve following Solvency II implementation

• Provide practical guidance to help organisations and individuals think through their requirements of the role – helping them to increase alignment and value

• Audience – CROs and risk teams, HR, Board members and committees

• Focus mainly on insurance, but lessons for other industries
Where is the CRO role today?

• Developments in governance and regulation have led to the CRO role becoming a crucial member of firms’ senior management
• There continues to be debate around the purpose, focus and means of achieving maximum value from the role
• Essentially the question should not be “if”, it should be “how”
• A highly effective CRO must be empowered and supported to execute the role
Recap on IMIF Survey

• Most important attributes required by a CRO are risk management, risk culture & appetite, communication and organisation understanding
• Surprisingly (given the impact of Solvency II) change management was not seen as important
• Top competencies for CRO are integrity & values as well as influence (the conscience of the business)
• The prime external stakeholder of CROs are seen as the regulator
• Although this position is rapidly changing as over next 5 years 40% anticipate less emphasis on regulation
• In future there will be more focus on commercial decision making, efficiency & effectiveness of the risk function and business planning & strategy
IRM Professional Standards

- IRM have defined functional professional standards against 4 competency levels:
  - Leadership
  - Senior
  - Management
  - Support

- IRM have also defined 6 behavioural competencies
  - Courage and confidence
  - Influence and impact
  - Integrity, ethics and values
  - Innovation and catalyst
  - Building capability
  - Collaboration and partnering
Shaped by Regulation and Some!

- Corporate governance failures continue to drive increased focus on ERM, with accountability and ownership for risk at executive level made explicit through regimes such as SIMR and other similar Fit & Proper standards.
- The insurance sector is facing a high-stakes, strategic set of challenges.
- Weak global growth impacting top and bottom-line, with increasing focus on cost efficiencies.
- A prolonged low interest rate, reducing investment returns and potentially amplifying volatility.
- More structural reforms expected.
- Uncertain political outcomes.
- Changing trends and disruptive influences.
Where is the CRO role today?

- By now we would expect a firm’s board to have an appreciation of where it is on the risk maturity continuum and where it wants to end up over a period of time.
- Not all firms need to aim for the top but depending on the risks it faces, complexity of the organisation, maturity of the CRO role and risk function and the cost implications, it should make an active decision on what “success” looks like.
- Firms face the risk that the role may become too operational in nature dealing with the running of the RM function and operating the Internal Model, reducing the time available to focus on the parts of the role that add value.
- There is a continuum of risk maturity which goes in-hand with a shift in the skills and competencies of a CRO.
Factors impacting the role looking forward

- Views amongst CROs appear to be mixed. Satisfaction with roles and responsibilities is variable. Some CROs find the roles challenging and rewarding, whilst others appear to be finding it difficult to see how they add value.

- We have identified a number of factors which ultimately determine the success of the CRO and guide the skill set required to be effective:

  1. External Influences and direction of travel;
  2. The strategy of the firm;
  3. The business model of the firm; and
  4. How a firm uses its internal model.

- We believe firms and CROs alike need to give careful consideration to each of these areas in deciding the best candidate and the focus of the role holder’s attention.
What does this mean for the CRO?

• CRO will need to focus on their firms creating and capturing value through full consideration of upside and downside risks in decision making
• What this means will be different for different firms – need to consider carefully the most important elements for them

Key themes
• From process towards strategy – less day to day operational risk management and more outward leadership and influence in the business
• Shift from inward to outward focus – understanding the external environment will be ever more critical – heads up mentality is vital
• From risk assessment to risk treatment and building resilience and understanding by impact of alternative strategies evaluated through Internal Model Use
• From communication and consultation to influence and impact
• From people management to building capability
CRO focus areas

• Through our initial work we have identified a number of approaches to the CRO role
• Summarised them into 4 different ways of setting up the role going forward
The Internal Model CRO

“4th place is like another trophy”

- Using technical skills to add value
- Developing and improving ROI
- Pragmatic focus on what’s important to the business
- Increasing collaboration
The Operational CRO

• Change focused
• Cost conscious
• Using operational capability to drive strategic value
• Translating complexity to action

“My team is like an orchestra”
The Customer CRO

I would like to apologise to our fans”

- Customer focused
- Brand ambassador
- Focus on first line capability and leadership
- Pragmatism, collective effectiveness
The Strategic CRO

“Change is possible only in the long term”

- Strategic understanding
- Engaged in decisions
- Innovative contributions
- Long-term focus
- Confidence and courage
Next steps

• Consult on industry views
• Refine paper
• Feedback and discussion welcome with interested parties
• Please contact:
  justin.elks@baxterbruce.com
  martyn.rodden@amlin.com
Capabilities and Advanced Uses of Internal Models

Laurence Dunkling – Head of Model Uses, AIG
Raphael Borrel – Senior Risk Adviser, NHBC
Value-adding and high quality publications (published)
Value-adding and high quality publications (in progress)
How important is the use of the model in decision making?

**Capital Protection**
- Major decision factor: 75%
- One of the elements considered: 21%
- Considered but not a major influence: 4%
- Not used: 4%

**Value Protection**
- Major decision factor: 47%
- One of the elements considered: 31%
- Considered but not a major influence: 15%
- Not used: 7%

**Value Creation**
- Major decision factor: 25%
- One of the elements considered: 41%
- Considered but not a major influence: 25%
- Not used: 10%
To what degree are the impacts of the limitations of the model on its intended use understood by all required business decision makers?

- 12% They do not know what the limitations are
- 29% They know what the limitations are but their impacts are not understood
- 41% They somewhat understand the impact of the limitations
- 16% They understand the impact of the limitations on each relevant use
Model maturity level

Capital Protection

- Tail Losses
- Dependencies
- Risks coverage

Value Protection

- Multi point loss curve
- One year/ultimate
- Impact on P&L
- Granularity

Value Creation

- Full range loss curve
- Risk adjusted performance
- Value creation measurement
- Precision
- Response time
Model Key capabilities

- Contract Clauses
- Reconciliation & P&L attribution
- Ultimate & 1 year losses
- Frequency / Severity
- Granularity
- Tail vs full range loss curve
- Dependencies
- Risk appetites
- Scenarios / Management actions
• Reinsurance: e.g. Time limits, Indexation & inflation
• Pricing: e.g. Legal costs for workers comp.

• Simulation of reinsurance treaties recovery for non proportional insurance

• Regulatory capital focusses on one year view.
• Reinsurance, pricing focus on ultimate losses.
• Risk appetites must be able to consider ultimate risks.
• Multi year modelling
Model Key capabilities

- Model outputs granularity consistent with Economic balance sheet & income statements.

- Testing various business mix, reinsurance, pricing assumptions during planning
Model Key capabilities

- Accuracy of calculations for higher return periods
- Income statement link (eg. to calculate Ear)
- Multi point risk appetites

- Reinsurance Break even return period
- Multi return period theoretical price calculation
- Current market conditions require consideration of short term volatilities
Model Key capabilities

- Flexible and consistent split of classes between capital modelling and uses intended.
- Support calculation at correct granularity level
- Support calculation of outputs at various return periods
Catastrophe Risk
Communication Update

Junaid Seria

Matthew Pearlman
Catastrophe Risk Communication Workstream

1. Why is it needed?
2. What are our aims?
3. How will these be achieved?
4. How can you get involved?
There are various constraints to the cat risk decision-making process:

- Cat Models are complex
- Specialist expertise required
- Frequent model changes
- Levels of knowledge among Senior Management varies significantly
- Little discussion of uncertainties and limitations in decision-making
- Limited bandwidth for Board members to understand and challenge model outputs
Why is it needed?
Workstream aims

- Improve the quality of Cat Risk communication and decision-making as a consequence, through a review of current market practice.
- By eliciting storyboards, tips and concrete examples of good communication on topics related to cat risk communication from senior management across a range of insurers and reinsurers.
- Planned outputs include guidance booklets, round-table discussions and case study articles.
Deliverables

The booklet will comprise brief practical guidance for both producers and users of modelled and non-modelled cat model outputs.

The scope is confined initially to Nat Cat Risk, however later iterations may focus on catastrophic sources of accumulation from other perils across other lines of business.

Planned for publication in December 2016.
Approach

1. Identify key decision-making contexts
2. Consider the stakeholders involved, key decisions and information flow
3. Elicit good practices from industry via interview process
4. Assimilate ideas and approaches and communicate
Identify key decision-making contexts

Risk Appetite statement and risk tolerance setting

Internal Model sign-off

Capacity Monitoring / Exposure Management

Pricing / Underwriting

Business Planning / large deals (M&A / Binder)

Reinsurance Purchase
Decisions where Cat Risk metrics may be used

- Risk Appetite statement and risk tolerance setting
- Internal Model
- Pricing / Underwriting
- Business Planning
- Reinsurance Purchase
- Capacity Monitoring / Exposure Management

Internal Stakeholders

Users

- Board : Execs and NEDs
- Senior Management
- Underwriters
- Actuaries
- Cat Modellers
- Nat. Hazard Scientists

Producers

Investors, Regulators & Rating Agencies
Interviews

• Focus on the *presentation pack* and *quality of discussions* in meetings
• Understand how the Board and its delegated committees and sub-committees:
  • Get an understanding of work carried out and the recommendations / conclusions
  • Evaluate the evidence presented
  • Challenge the evidence
• Interview responses will be summarised and individual responses *anonynmised*. 
## Interview questions

<table>
<thead>
<tr>
<th>Topic</th>
<th>Question</th>
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<tbody>
<tr>
<td>Presentation pack and pre-meeting prep</td>
<td>What do you like / dislike about the material presented in these meetings?</td>
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<tr>
<td>Understanding Cat Risk Uncertainty</td>
<td>How do you think the level of uncertainty relating to cat risk is perceived relative to other risks faced by your firm?</td>
</tr>
<tr>
<td>Engagement and Challenge</td>
<td>What &quot;challenge&quot; questions do you think should be asked to aid more effective decision-making?</td>
</tr>
<tr>
<td>Lessons learnt</td>
<td>What metrics, exhibits or presentation styles have worked well to stimulate discussion in these meetings?</td>
</tr>
<tr>
<td>Cat Model uncertainties / limitations</td>
<td>How is the uncertainty inherent in cat model methods and results presented in the context of a key decision?</td>
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</table>
• We need Senior Management representatives to be interviewed

• We need your success (and horror) stories

• We need your ideas about what needs to change to improve decision-making

Get in touch!

JSeria@scor.com
Matthew.Pearlman@lcp.uk.com
Closing remarks & next steps

José Morago, IMIF Founder and IRM Chairman
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