



The Actuarial Profession
making financial sense of the future

Solvency II – GIRO IMAP Working Party

Challenges for GI Actuaries

SIAS, 10th August 2010

Our brief

Our brief

The internal model approval process for Solvency II presents a number of specific challenges for GI actuaries. For example, what level of documentation is sufficient for a third party actuary to gain comfort over the model? How are the requirements for risk ranking, calibration, being interpreted in practice? and what level/extent of use are other firms targeting?

In this interim update, we will cover

- the results of our research to date (esurvey and face-face interviews);
- firms' plans for the use test, external models and partial model approval
- range and scale of approaches seen for profit & loss attribution, risk ranking and documentation
- key issues/questions facing firms

Our brief

Agenda

Chair

Introduction

ESurvey Results

Key areas of research

- Risk Ranking
- P&L Attribution
- Documentation

Close & Next Steps

Our brief

Our focus

Bridging CEIOPS requirements and business/ modelling reality

Key Questions

How are the requirements being interpreted by experienced modellers?

How is the industry approaching the tests?

Topics

Use Test

Risk Ranking

Profit & Loss Attribution

Documentation

Calibration

Expert Judgement

Our brief

IMAP – Where are we now?

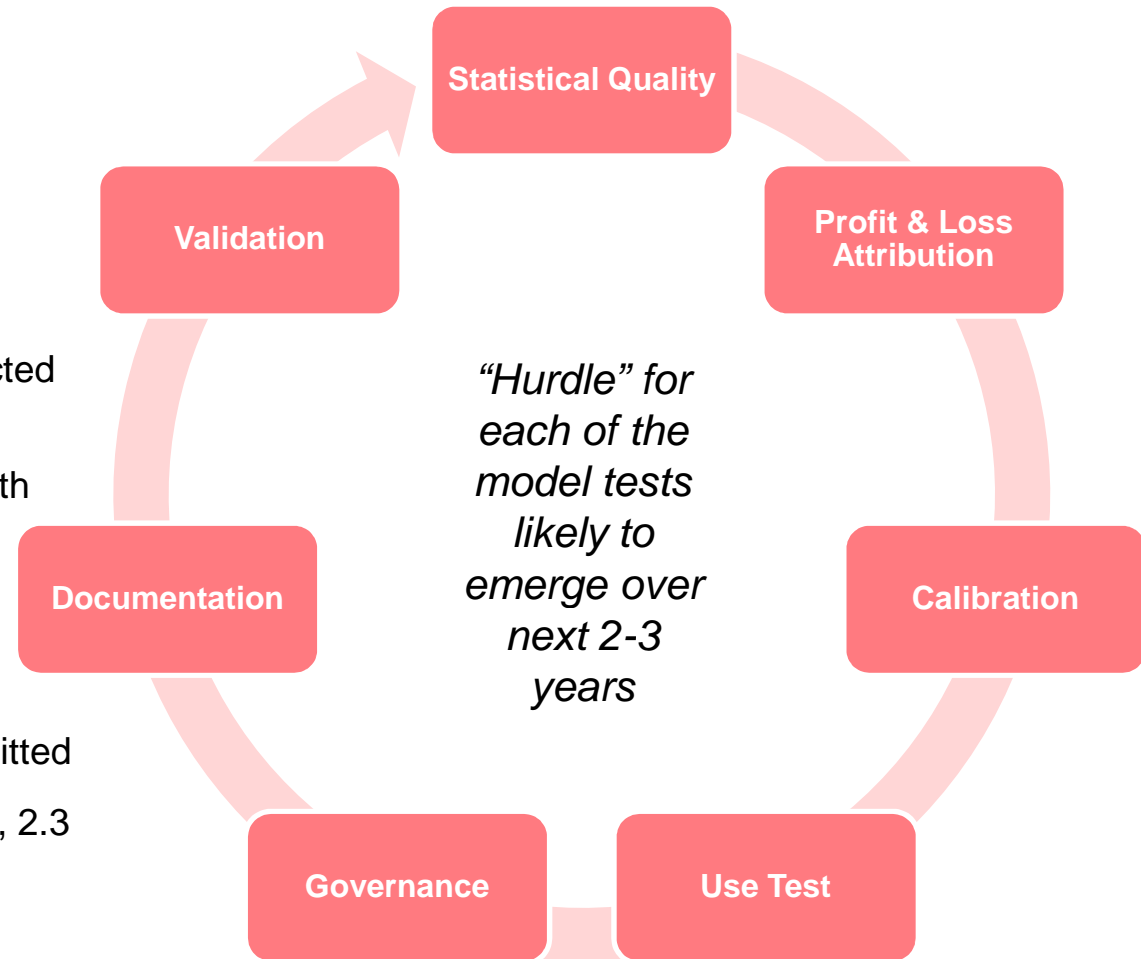
Europe

European Commission, in conjunction with CEIOPS:

- Level 1: finalised Oct 2009
- Level 2: Draft advice now. Final expected Q1 2011+
- Level 3: running parallel to Level 2 (with Groupe Consultatif).

UK

- FSA pilot exercise complete
- Preapplication started >20 firms submitted
- Lloyd's: Dry Run Phase 2.2 underway, 2.3 due Sept 2010
- Institute of Actuaries – SII Group responding to requirements





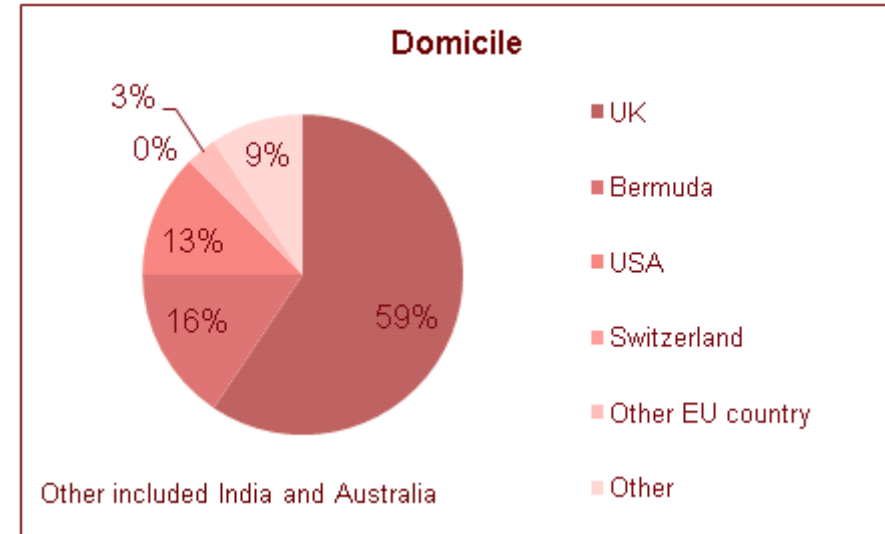
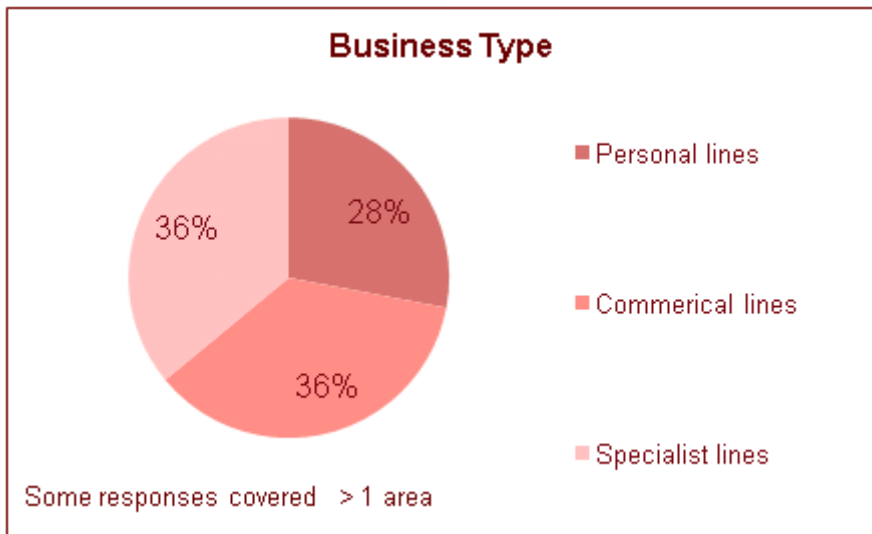
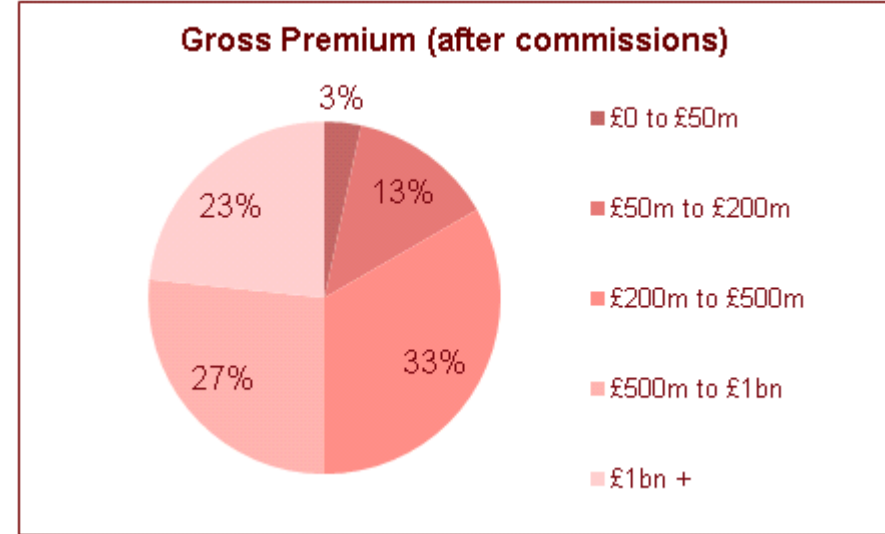
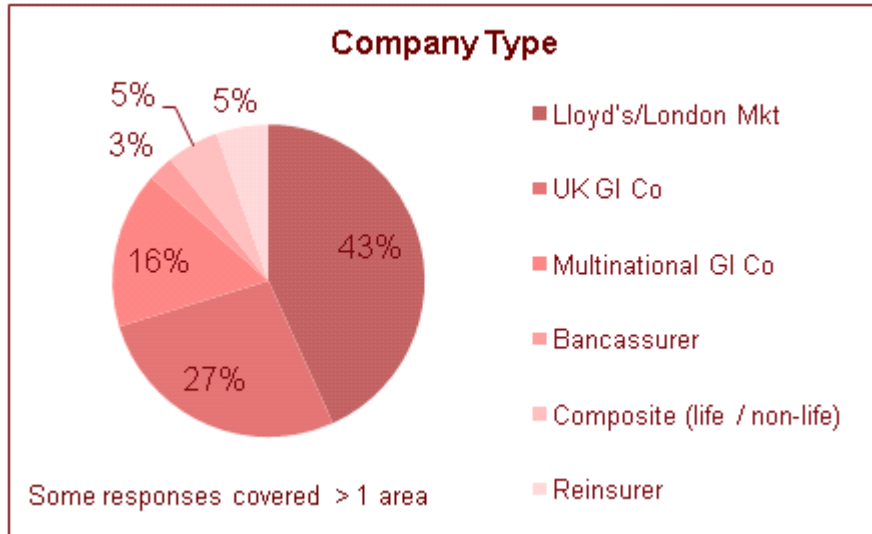
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Results from our ESurvey

Results from our ESurvey

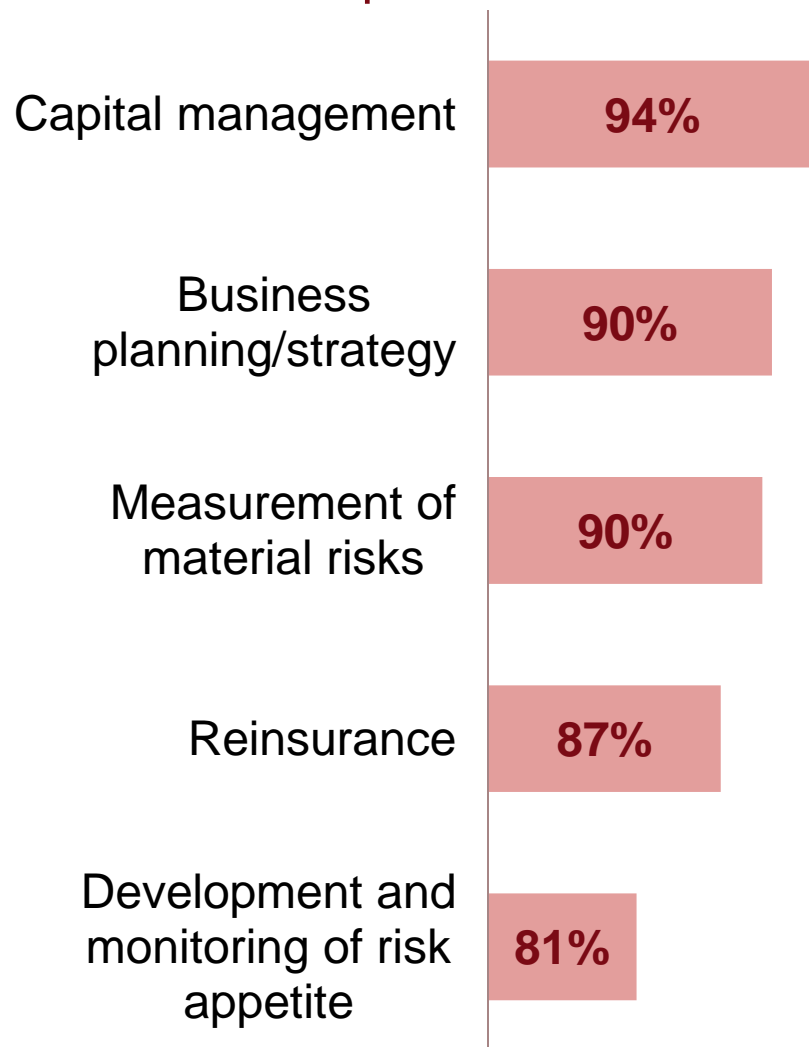
Who responded to this survey?



Results from our ESurvey

Full Internal Models

Top 5 – Uses

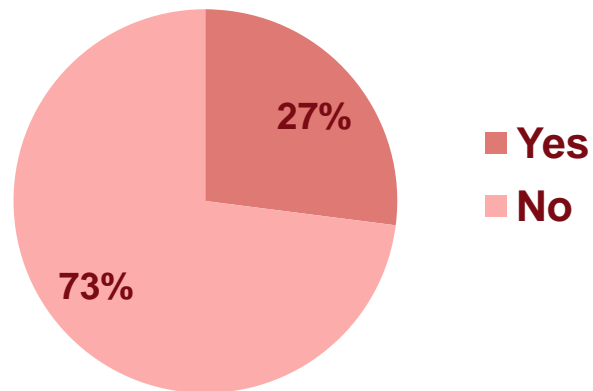


Top 5 - Influence



Partial Internal Models

Do you intend to use a partial internal model?



Reasons for using a partial model

- Materiality - focus on large classes and lines of business, key risks
- If approval for full model fails

Challenges

- Some specific issues with PIMS:
 - Can be accused of “cherry-picking”
 - Scope is fluid as business mix and volume changes constantly
 - Reinforces “silo” management
 - How do you integrate formula elements?
- But also similar issues to full model build:
 - need detail but... detail ↑ parameter risk ↑
 - hard to meet statistical quality – e.g. operational risk



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Risk Ranking

Interpretation of the requirement is mixed

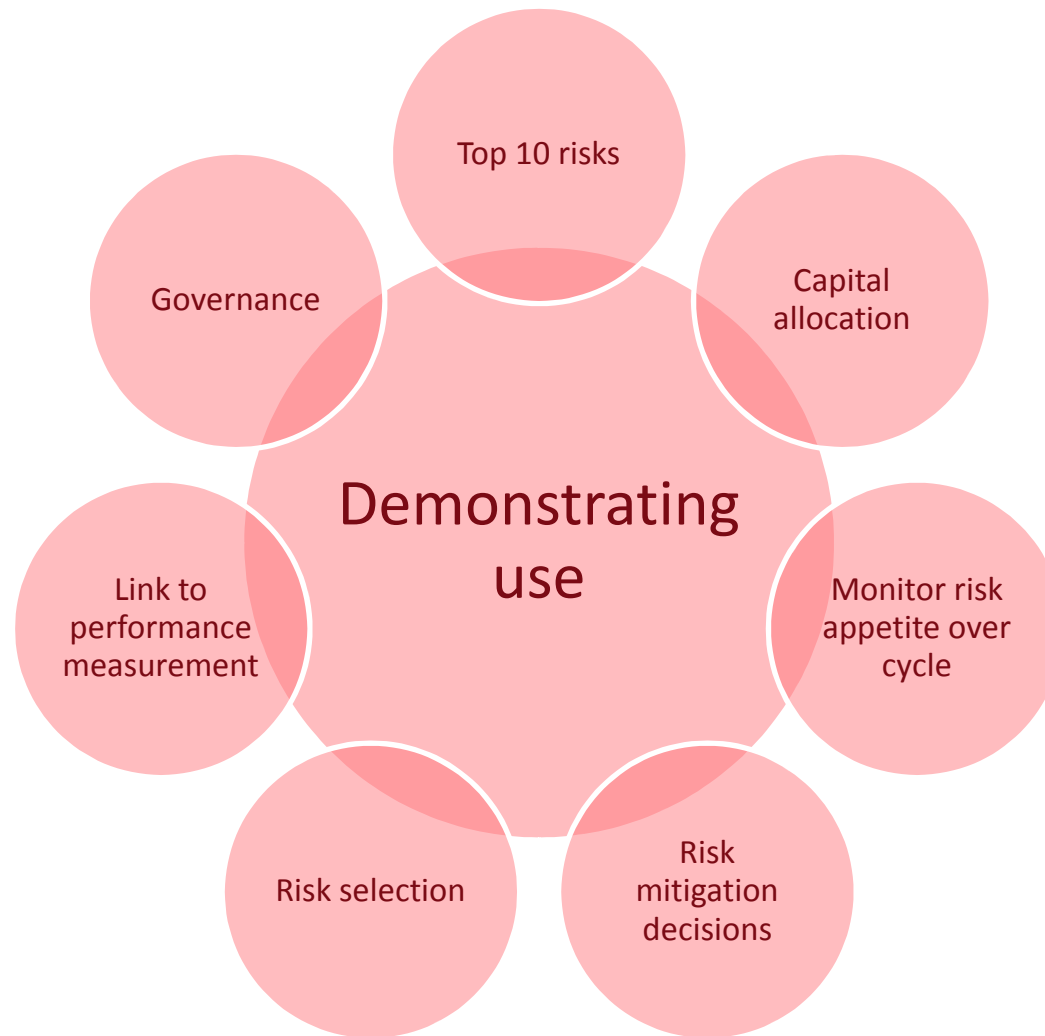
“the ability of the internal model to rank risk shall be sufficient to ensure that it is widely used in and plays an important role ... their risk-management system and decision-making processes, and capital allocation” Article 121

How do you interpret the requirement?

Thoughts and comments from the surveys:

- What are our key risks? Do we model these appropriately?
- What are our most material risks? Do these drive the tail?
- Does the model drive capital allocation?
- Needs to be a common sense and pragmatic solution

Demonstrating use - key themes from the survey



Risk Ranking

Demonstrating risk measurement is appropriate – key themes from the survey

Does the model capture:

- Individual risks
- Interrelationships and dependencies

Possible methods to evidence the model captures risk appropriately

Comparison to Risk Register	Variance, Standard Deviation or Return Period (eg 1 in 10)
Stress and Scenario Testing	Capital Allocation (eg VaR, TVaR)
Drivers of modelled result in middle of distribution, in tail	Risk v Return Measures (eg Sharpe Ratio)



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Profit & Loss Attribution

Interpretation of the requirement is clearer

“They shall demonstrate how the categorisation of risk chosen in the internal model explains the causes and sources of profits and losses. The categorisation of risk and attribution of profits and losses shall reflect the risk profile of the insurance and reinsurance undertakings.” Article 123

How do you interpret the requirement?

Thoughts and comments from the surveys:

“For each level of granularity, we will compare the actual profit or loss against the distribution of profit or losses projected by the model.”

Demonstrating P&L Attribution – some key themes emerging

Purpose of the test

- Support management understand drivers of profitability – both:
 - Underwriting result (e.g. by business unit), and
 - Investment result, expenses
- Validation of the internal model
 - As actuaries: is it credible? Compare historic means, volatilities with model forecast
 - As management: bring it to life? Compare real-world events with modelled outcomes

Profit & Loss Attribution – range of possible approaches

Range of Approaches

Definition of Profit

- Solvency II
- Accounting eg UK GAAP
- Management eg UW Year

Granularity

- By Business Unit or Line
- By Risk, Insurance, Investment, Credit
- Include / exclude Operational Expenses

Trigger Levels

- Fixed or Relative?
- Expert Review?

Historical Data

- Current Year
- How many prior years?

Profit & Loss Attribution – challenges in implementing the test

Challenges

- UW / Accident year analysis valuable to management, but SII analysis may not be seen as a value add
- Business Planning and Capital Assessment often not joined up
- Finance Allocation of e.g. investment, expenses or reinsurance result may be approximate or arbitrary
- Test becomes increasingly spurious at lower levels of granularity
- Trends are better indicator than year on year experience
- Defining trigger levels



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Documentation

Interpretation of the requirement is mixed

The documentation of an internal model shall be thorough, sufficiently detailed and sufficiently complete to satisfy the criterion that an independent knowledgeable third party could :

“form a sound judgment as to the reliability of the internal model ... and could understand the reasoning and the underlying design and operational details of the internal model.” Former CP56 9.53.

“could understand the model framework, its methodology, the underlying assumptions, and the limits of applicability of the model and in principle reproduce the model outputs if all the parameters and exposure data were available.” Former CP56 9.40

“use a different platform to build a consistent internal model within a reasonable time period.” Former CP56 9.41

Interpretation of the requirement is mixed

How do you interpret the requirements?

Thoughts and comments from the surveys:

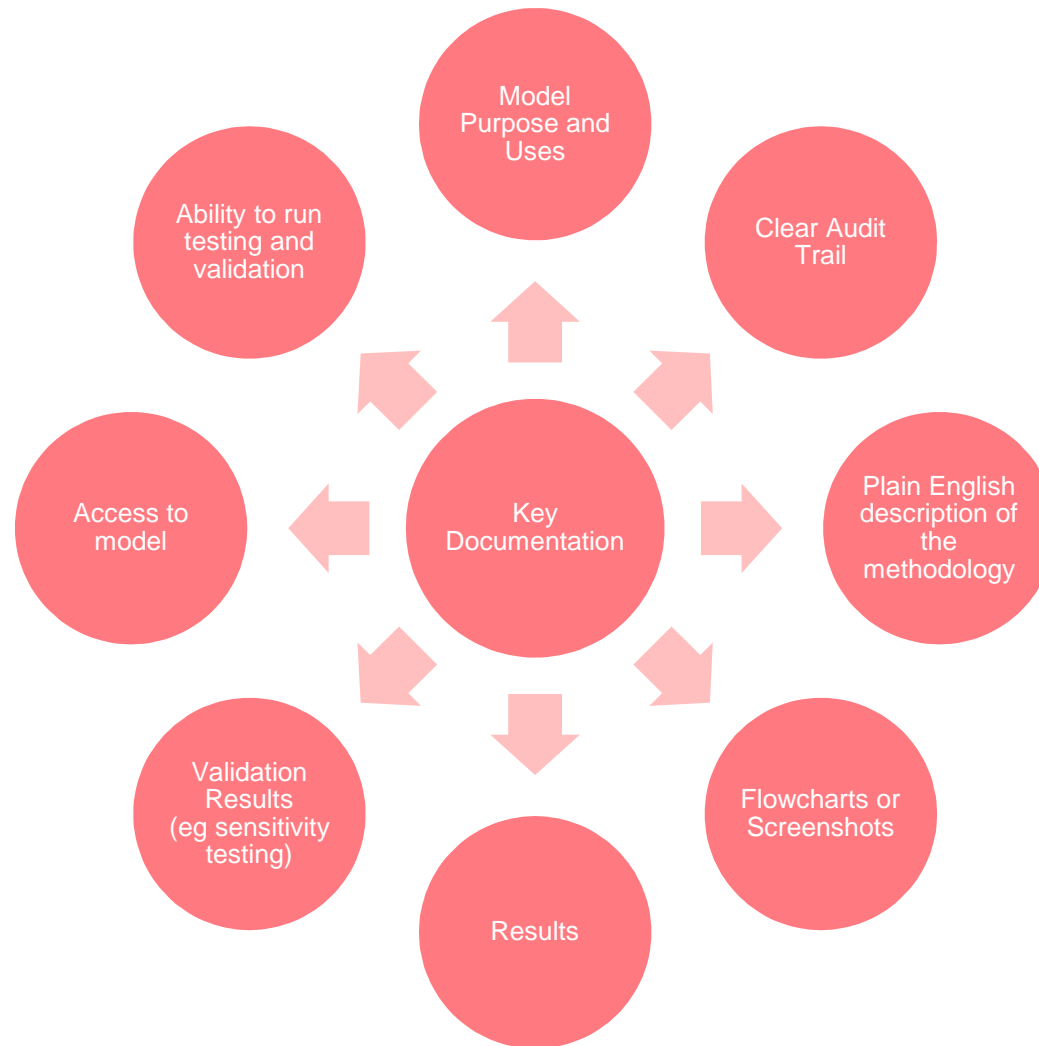
“Enough documentation for a third party actuary to reproduce the SCR, at least within a reasonable range.”

“Enough for me to understand the key methods and assumptions used, and sensitivities in the result”

“Understand the model methodology, parameterisation, output and obtain comfort that the capital number is right for the business.”

Documentation

What documentation would you need, as a third party actuary, to form a sound judgement on the model?



What documentation would you need, as a third party actuary, to form a sound judgement on the model?

- Levels and Structure of documentation
 - High-level summaries for Board, Executive Management, Regulator
 - Management level summaries / (user guides) for Executive Management, mid-level Management, etc
 - Technical guides / (user manuals) by specialist function area e.g. Actuarial, IT
 - Internal Reports – for management
 - External – RTS, SFCR

Documentation

Third Party Review Documentation Framework

<p>Data</p> <ul style="list-style-type: none"> *Key attributes of the data elements that are material to IIR reporting *Data Management approach *General description of databases *Clear dictionaries to provide definitions of data items *Description and construction of the databases *Description of external and internal data interfaces *Processes used to obtain and load the data *Data consistency aspects *Filters to create and debug the database *Data security and maintenance information *Data flow chart covering internal model *Assumptions for Data <ul style="list-style-type: none"> •Where assumptions about data are made •Assumptions on values due to inadequacy of data •Rationale for assumption *Process and controls for data, data flows and data quality *Data Quality Policy <ul style="list-style-type: none"> •Data quality standards •Approaches to testing •Process for remediation of data errors *External and Internal data 	<p>External Models and Data</p> <ul style="list-style-type: none"> *Role and extent of use within internal model and associated processes *Reasons for preference over internal models and data *List of alternatives considered *Decision / Rationale for choice of particular external model or data *Demonstration of detailed understanding and knowledge of external models' and data's: <ul style="list-style-type: none"> •Methodological underpinnings •Basic construction •Capabilities •Limitations •Appropriateness for use in deriving SCR *Demonstration of a full understanding of the effect and significance of the proprietary elements in the external models *Judgement-based overrides or any other adjustments made to external data sets or external model outputs and the rationale behind them *Demonstration of appropriateness in relation to: <ul style="list-style-type: none"> •Nature, scale and complexity of risks •Business objectives •Modelling methodologies •Availability of internal data •Suitability for use within Internal Model – consistent with the standards and requirements set out for the use of an internal model to calculate the SCR *Deficiencies of internal model or data introduced by the use of external models or data *Clearly articulated strategies for validating and regularly reviewing the performance of external models results and integrity of external data *Risks arising from use of external data and models e.g. strategic risk, contractual risk, etc. *Connection with the vendor 	<p>Documentation Policy</p> <ul style="list-style-type: none"> * Drawbacks and weaknesses of the model *Circumstances under which the model does not work effectively *List of all documents considered relevant and how these can be accessed *Identify those people responsible for pulling together and/or updating documents *Overview of historical development of the internal model including <ul style="list-style-type: none"> •Methodologies •Assumptions •Data *Description of technology and software tools used. Also how included in contingency plans, security policy and business recovery plans. *Information about data management *General description of databases *Clear dictionaries of data items *Description and construction of databases *Description of external and internal data interfaces *Processes used to obtain and load the data *Data consistency aspects *Filters used to create and debug the database, security and maintenance information *Data flow chart *Version control process of internal model *Minor or major material changes made to the design or operational details of the model including rationale *Relevant testing and validation *How requirements governed in Articles 120 to 124 have been taken into account and fulfilled *Map of mathematical methods used *Description of theories and empirical basis underlying mathematical methods *Rationale for decisions on assumptions, data and parameters and its development over time. *Limitations in risk modelling *Nature, degree and sources of uncertainty *Inefficiencies in input data *Inefficiencies in IT systems, governance and related controls *Documentation Index *Model Scope 	<p>Calculation Kernel – (Methodology?)</p> <ul style="list-style-type: none"> *Detailed outline of the theory, assumptions and mathematical and empirical basis underlying the internal model *Technical Provisions – best estimate and risk margins *Capital / Solvency Requirements <ul style="list-style-type: none"> •Insurance Risk – Underwriting Risk and Reserve Risk •Market Risk •Credit Risk •Liquidity Risk •Operational Risk •Other Risks *Risks in scope / Out of scope *Business Units in scope / Out of scope *MCR *SCR *Recognition of risk mitigation instruments – Reinsurance (Gross to Net), Derivatives *Risk Ranking *Diversification benefits *Modelling of customer behaviours and management actions *Projections of the balance sheet *Aggregation policy and methodology including correlations – lines of business, risk types, business units, group level *Overview of the historical development of the internal model methodologies *External models *Summary of methodologies *Simplifications / Approximations 	<p>Validation Policy</p> <ul style="list-style-type: none"> *Purpose and scope of validation <ul style="list-style-type: none"> •Design and operational details •Exclusions from validation •Validation of expert judgement *Validation tools used *Frequency of validation process <ul style="list-style-type: none"> •Limit to when events become significant to necessitate ad hoc checks *Governance of validation results <ul style="list-style-type: none"> •Responsibilities for tasks •Escalation procedure •Senior management involvement *Where, if anywhere, external review and systems are used *Limitations and future developments *Description of Independent review *Testing results against experience <ul style="list-style-type: none"> •Results of back testing below trigger event •Above trigger event, identification of where event was triggered •Description of root cause of event e.g. movement in market prices •Explanation of how root causes reflected in model •Potential model weaknesses *Testing robustness <ul style="list-style-type: none"> •Sensitivity testing and tests on stability of the model •Significant assumptions and effect of changes in these assumptions •Underlying reasons for sensitivities *Profit and loss attribution *Compliance with Articles 118 – 122 *Analysis of Change *Actual versus Expected
<p>Internal Model Governance</p> <ul style="list-style-type: none"> *Policies & Standards <ul style="list-style-type: none"> •Validation Policy •Model Change Policy •Documentation Policy •Calibration Standards *Controls and Procedures *Responsibilities and accountabilities *Drawbacks and weaknesses 				
<p>Model Change Policy</p> <ul style="list-style-type: none"> *Definition of a major and minor model change *Model change procedures 				
<p>Use Test</p> <ul style="list-style-type: none"> *Description / List of Uses *Description / Evidence of Use Test i.e. integration of model within the business *Senior management understanding of model *Level of detail required to demonstrate passing the Use Test *Policy on Use Test i.e. where model is used, how and when 	<p>Calibration Standards</p> <ul style="list-style-type: none"> *Risk measures & time periods for different business units and justification of these *Demonstrate internal model takes into account time effects *Significant risks over a one-year period are properly managed *Choice of data used *Demonstrate consistency between SCR calculation and internal model *If SCR cannot be directly derived from probability distribution then <ul style="list-style-type: none"> •How risk is escalated and justify how bias is immaterial •Shortcuts used to reconcile outputs of internal model with distribution of Basic Own Funds •Demonstrate solvency position at earlier time horizon if selected time horizon longer than in Article 101.3. Also justify assumptions in order to properly take account of the dependencies between consecutive time steps. *Benchmark portfolios used 			
<p>Assumptions and Parameters</p> <ul style="list-style-type: none"> *Summary of methodologies and formulae to estimate parameters *Sources of data backing assumptions *Expert Judgement 		<p>Internal Model Output and Reporting</p> <ul style="list-style-type: none"> *Supervisory and external reporting <ul style="list-style-type: none"> •Report to Supervisor (RTS) •Solvency and Financial Condition Report (SFCR) •Ancillary own funds approval •Non arms length intra-group transactions •ORSA – Economic Capital *Internal reporting <ul style="list-style-type: none"> •Strategy •Business planning •Risk management •Capital MI •ORSA 	<p>Systems</p> <ul style="list-style-type: none"> *Hardware and software environment. Include information for: <ul style="list-style-type: none"> •policy administration systems •actuarial models •spreadsheets •reporting tools •documentation platform *IM calculation engine. Explain: <ul style="list-style-type: none"> •Coverage •Component parts (including level of granularity and sophistication) *Contingency plans, security policies and business recovery plans for the technological elements of the internal model *Identify key controls for the IT environment and IM calculation engine *Calculation engine changes *Inefficiencies in IT-systems, governance and controls surrounding the internal model *Limitations and drawbacks of the model [and future improvements to the model] 	<p>Technological Specifications</p> <ul style="list-style-type: none"> *Description of the Information Technology platform used in the internal model *Description of Contingency plans relating to the technology platform used *User guide *Source code <p>Statistical Quality Standards</p> <ul style="list-style-type: none"> *Detailed description of Internal Model Methodology and parameterisation *Description of underlying assumptions *Risk ranking and drivers of risk *Review of results <p>Expert Judgement</p> <ul style="list-style-type: none"> *Description of where Expert Judgement is applied in the model *Justification of use of Expert Judgement where used in the model *Validation of Expert Judgement as applied in the model *Data adjustments / parameterisation

Our focus going forward to GIRO (October 2010)
Bridging CEIOPS requirements and modelling reality

Key Questions

Do firms have practical experience of implementing the tests?

What are the challenges?

Topics

Use Test

Risk Ranking

Profit & Loss Attribution

Documentation

Calibration

Expert Judgement

