SOLVENCY II: EXTERNAL CATASTROPHE MODELS

18 January 2012

Confidential

Purpose of meeting

- Use of external Catastrophe Models in Internal Models
- We are assuming:
  - material element of catastrophe risk on your books
  - you licence one or more external cat models
  - outputs represented in your internal model
- Discussion today concerns catastrophe risk
  - Similar considerations apply for any external model (ESGs)
- Interactive – your opportunity to ask if more guidance required!

Agenda

- “In Scope” – Lloyd’s interpretation of SII Directive (John Parry)
- Documentation & Evidence
  - Overview – David Clouston
  - Outsourcing – Phil Holt
  - Materiality and Proportionality – David Clouston
  - Validation – David Singh
  - Understanding and Use – Suzanne Laurent
- LCM Update – Trevor Maynard

- You are broadly on track
- Final steps require:
  - Describing and documenting
  - Focusing on materiality
  - Articulate clear internal views
- ABIs Industry Good Practice guide
- We’re happy to discuss

Collaborative Validation

- Consider “base level” of validation that agents can consolidate with own work
- FSA happy in principle that this initiative is explored
  - Clearly no assumptions in advance
- Core aspects validate mutually
  - E.g. hurricane landfall rates
- Specific aspects – validate for YOUR portfolio
- Ownership of the results
  - Further work if outcomes unfavourable
- LMA have confirmed this is of great interest and we are working with them to set things up

CAT MODELS -

IN SCOPE OR NOT?

Solvency II Directive requirements

Article 121.4

The internal model shall cover all of the material risks to which insurance and reinsurance undertakings are exposed.

Internal models shall cover at least the risks set out in Article 101(4).

Article 101.4

The Solvency Capital Requirement shall cover at least the following risks:

- non-life underwriting risk;
- life underwriting risk;
- health underwriting risk;
- market risk;
- credit risk;
- operational risk.

Lloyd’s Detailed Guidance on Model Scope & Governance (March 2010)

- Agents should note that any component or process that can have a significant impact on the SCR must satisfy the requirements of Solvency II, irrespective of whether or not it has been defined as “within scope” of an internal model.
- Lloyd’s review will not be limited by the scope of the internal model and will cover anything which is considered material to its review and decision making.
- Each process could be considered systematically along the following lines to help decide if it should fall within the internal model scope:
    - key risk within the business?
    - material to the decision making processes with the business?
    - material to the governance around the internal model?
    - do changes materially impact calculation of the SCR?

Does it matter?

Article 126 - The use of a model or data obtained from a third party shall not be considered to be a justification for exemption from any of the requirements for the internal model set out in Articles 120 to 125.

- The cat model must still be validated and meet all tests and standards whether in scope or out
- Putting it out of model scope does not mean that it is out of scope of Lloyd’s review
- Implications for model change policy
- Lloyd’s cat model is in scope of LIM

WHERE CATASTROPHE RISK IS MATERIAL, LLOYD'S VIEW IS THAT THE EXTERNAL CAT MODEL USED TO DERIVE THE NUMBER SHOULD BE IN SCOPE

DOCUMENTATION AND EVIDENCE

Documentation & Evidence

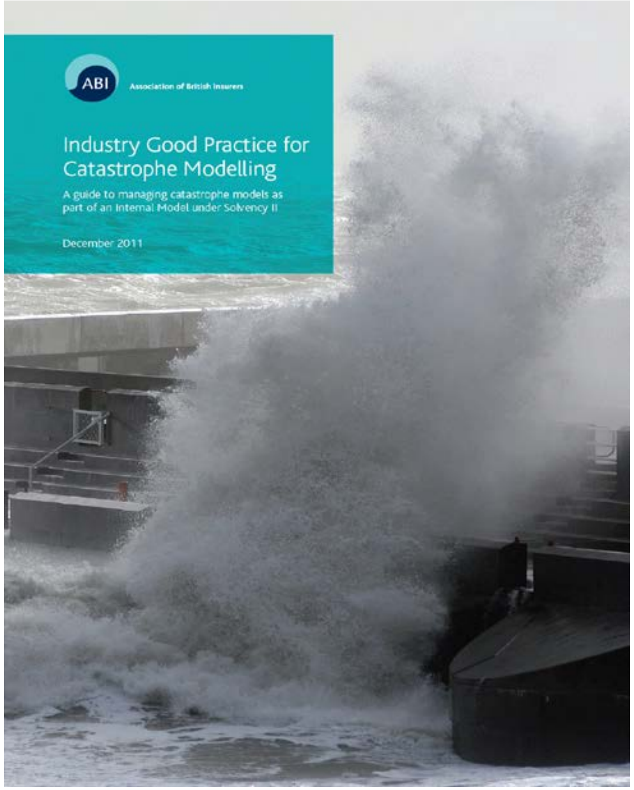
- Not so much about WHAT you are doing…
- … as about HOW you are doing it.

Documentation & Evidence

Solvency II texts:-

- Level 1 text dated 19th October 2009 - “the EU Directive”
- Level 2 draft text dated 31st October 2011
- Level 3 draft proposal for “Systems of Governance”, dated December 2010
- Level 3 draft proposal for “External Models and Data”, dated 10th August 2011

“Industry Good Practice for Catastrophe Modelling”, published by ABI, December 2011



Documentation & Evidence

- Demonstrate that you have a process
- Evidence that you followed the process
- Process reports its conclusions **and** its limitations

OUTSOURCING

Outsourcing

Solvency II Level 1 text

Article 49 – Outsourcing

1. Member States shall ensure that insurance and reinsurance undertakings remain fully responsible for discharging all of their obligations under this Directive when they outsource functions or any insurance or reinsurance activities.

2. Outsourcing of critical or important operational functions or activities shall not be undertaken in such a way as to lead to any of the following:

   a) materially impairing the quality of the system of governance of the undertaking concerned

   b) unduly increasing the operational risk

   c) impairing the ability of the supervisory authorities to monitor the compliance of the undertaking with its obligations

   d) undermining continuous and satisfactory service to policy holders.

Outsourcing

- Managing agents cannot outsource their obligations to:
  - understand the external cat-models which they use; or
  - validate the cat-models; or
  - document and evidence their use

- Managing agents must have a formal Outsourcing Policy
- Any outsourced activity must be governed by a specific Outsourcing Agreement, within the framework of the Policy

Outsourcing

- Examples of activities which would require an outsourcing agreement
  - Cat modelling results provided by a reinsurance broker are used in the internal model
  - Data cleansing / enhancement / geocoding performed by a third-party supplier
  - Regular validation model-runs by a model vendor

- An Outsourcing Agreement does not necessarily have to be separate contract

Outsourcing: Intra-group

- Under SII, functions performed by other divisions within the same corporate group are considered to be "outsourced"
- Where activities are performed by a company or division within the same corporate group, "*some of the requirements may be applied more flexibly*" (Level 3 draft for Systems of Governance, Guideline 60)
  - For example, an intra-group outsourcing agreement may not need to reference due diligence, but may need to define obligations and agreed service levels

MATERIALITY & PROPORTIONALITY DO NOT APPLY TO THE NECESSITY FOR OUTSOURCING AGREEMENTS

QUESTIONS ON OUTSOURCING?

MATERIALITY
&
PROPORTIONALITY

Materiality and Proportionality

- Proportionality & Materiality drive:-
  - **WHAT** you do
  - **HOW** you do it
  - The **EXTENT** of the requirement for documentation & evidence
- Risk ranking

Materiality and Proportionality

Solvency II Level 2 text

Article 121 – Statistical Quality Standards

Ability to rank risk

The ability of the internal model to rank risks […] shall exist for all material risks covered by the internal model.

The ability to rank risks shall provide a risk-ranking that is sufficiently precise for the purposes of risk-management, decision-making and capital allocation.

The ability to rank risk shall be consistent with the classification of risks used in the internal model and the classification of risks used in the risk management system.

Similar risks shall be ranked consistently throughout the insurance or reinsurance undertaking and ranked consistently over time. The ranking of risk shall be reconciled with the capital allocation.

Materiality and Proportionality

- Clear rationale

> “Undertakings shall be also able to explain the reasons for preferring external models or data to internal ones. They shall also be able to list the alternatives considered and explain the decision for a particular external model or data.” *(Level 2 draft 10.20)*

Materiality and Proportionality

- You have a process for systematically assessing the materiality of your overall catastrophe risk
- You have processes for assessing the relative materiality of different region/perils
- You can demonstrate that you have such a process
- You have evidence that you have followed it
- That the process is continuous (i.e. not just a one-off exercise)…
- … determines the relative requirements for model-validation, documentation etc.

Materiality and Proportionality

- Tailoring

“… expectations of external models […] should be appropriate to their nature, scale and complexity. This recognises the principle of proportionality.” (Level 3 draft)

MODEL VALIDATION

Model Validation

Solvency II Level 1 text

Article 124 – Validation Standards

Insurance and reinsurance undertakings shall have a regular cycle of model validation which includes monitoring the performance of the internal model, reviewing the ongoing appropriateness of its specification, and testing its results against experience.

[…]

The model validation process shall include an analysis of the stability of the internal model and in particular the testing of the sensitivity of the results of the internal model to changes in key underlying assumptions. It shall also include an assessment of the accuracy, completeness and appropriateness of the data used by the internal model.

Model Validation

- The external cat-model “inherits” all the obligations of the Internal Model, including for validation
- “The use of a model or data obtained from a third party shall not be considered to be a justification for exemption from any of the requirements for the internal model set out in Articles 120 to 125.” *(Solvency II Directive Article 126)*
- How much model validation is required?

IT IS NOT POSSIBLE TO FULLY VALIDATE EVERY ASPECT OF AN EXTERNAL CAT MODEL

THERE IS NO REQUIREMENT TO DO SO

"… expectations of external models […] should be appropriate to their nature, scale and complexity. This recognises the principle of proportionality." *(Level 3 draft)*

Model Validation

- What is meant by “validation”?
- Validation is a process of coming to understand whether the external cat-model provides a valid representation of the risk for your portfolio

- *Not necessarily for “the industry”, or “the market”*
- *Not necessarily for someone with a totally different portfolio*
- *Not necessarily someone for whom the materiality of cat-risk for this region/peril is quite different from yours*

Model Validation

- SII requires that you demonstrate:
  - There is enough understanding about a cat model to make decisions about its selection and use for your portfolio (taking into account M & P)
  - Evidence that this process has been followed

Model Validation – a simplified example

- An aggregate-level cat-model, that has not been significantly revised for five years
- Organisation 1
  - material cat risk for the region/peril, but of relatively limited significance within the overall Internal Model (evidenced by […])
  - exposure data for the region tends to be provided at CRESTA-level
  - exposure derives from a few very large clients, with similar portfolios

Model Validation – a simplified example

- An aggregate-level cat-model, that has not been significantly revised for seven years
- Organisation 2
  - very material cat-risk for the region/peril (evidenced by […]);
  - exposure-data for the region is provided at Postcode, Street-Level and Lat/Long;
  - exposure derives from many diverse clients, very widely distributed throughout the region.

Model Validation – a simplified example

	Org 1	**Org 2**
Sensitivity	little impact on Internal Model	significant impact on Internal Model
Exposure assessment		
Quality of dev. data		
More recent cat-model		
Conclusion		

Model Validation – a simplified example

	Org 1	Org 2
Sensitivity	little impact on Internal Model	significant impact on Internal Model
Exposure assessment	broadly similar to industry assumptions in c-m	different from industry assumptions in c-m
Quality of dev. data		
More recent cat-model		
Conclusion		

Model Validation – a simplified example

	Org 1	Org 2
Sensitivity	little impact on Internal Model	significant impact on Internal Model
Exposure assessment	broadly similar to industry assumptions in c-m	different from industry assumptions in c-m
Quality of dev. data	similar to our exposure-data	much lower-resolution than our exposure-data
More recent cat-model		
Conclusion		

Model Validation – a simplified example

	Org 1	**Org 2**
Sensitivity	little impact on Internal Model	significant impact on Internal Model
Exposure assessment	broadly similar to industry assumptions in c-m	different from industry assumptions in c-m
Quality of dev. data	similar to our exposure-data	much lower-resolution than our exposure-data
More recent cat-model update	limited benefit – no hazard update	geo-coding and financial-module updates may be of benefit
Conclusion		

Model Validation – a simplified example

	Org 1	Org 2
Sensitivity	little impact on Internal Model	significant impact on Internal Model
Exposure assessment	broadly similar to industry assumptions in c-m	different from industry assumptions in c-m
Quality of dev. data	similar to our exposure-data	much lower-resolution than our exposure-data
More recent cat-model update	limited benefit – no hazard update	geo-coding and financial-module updates may be of benefit
Conclusion	seems to be a valid representation of our risk, without adjustments	not a valid representation of our risk, without significant adjustments – requires further validation

QUESTIONS ON VALIDATION?

DOCUMENTATION

Documentation

Solvency II Level 1 text

Article 125 – Documentation Standards

Insurance and reinsurance undertakings shall document the design and operational details of their internal model.

The documentation shall demonstrate compliance with Articles 120 to 124.

The documentation shall provide a detailed outline of the theory, assumptions, and mathematical and empirical bases underlying the internal model.

The documentation shall indicate any circumstances under which the internal model does not work effectively.

Insurance and reinsurance undertakings shall document all major changes to their internal model, as set out in Article 115.

Documentation

- You need to show:
  - that you have formal processes for **understanding** enough about a cat-model to make decisions about its selection and use as part of your Internal Model (taking into account Proportionality & Materiality)
  - that you have formal processes governing your **use** of the external cat-model
- A separate, but related, obligation is to provide **evidence** that you have followed those processes

Documentation – Understanding

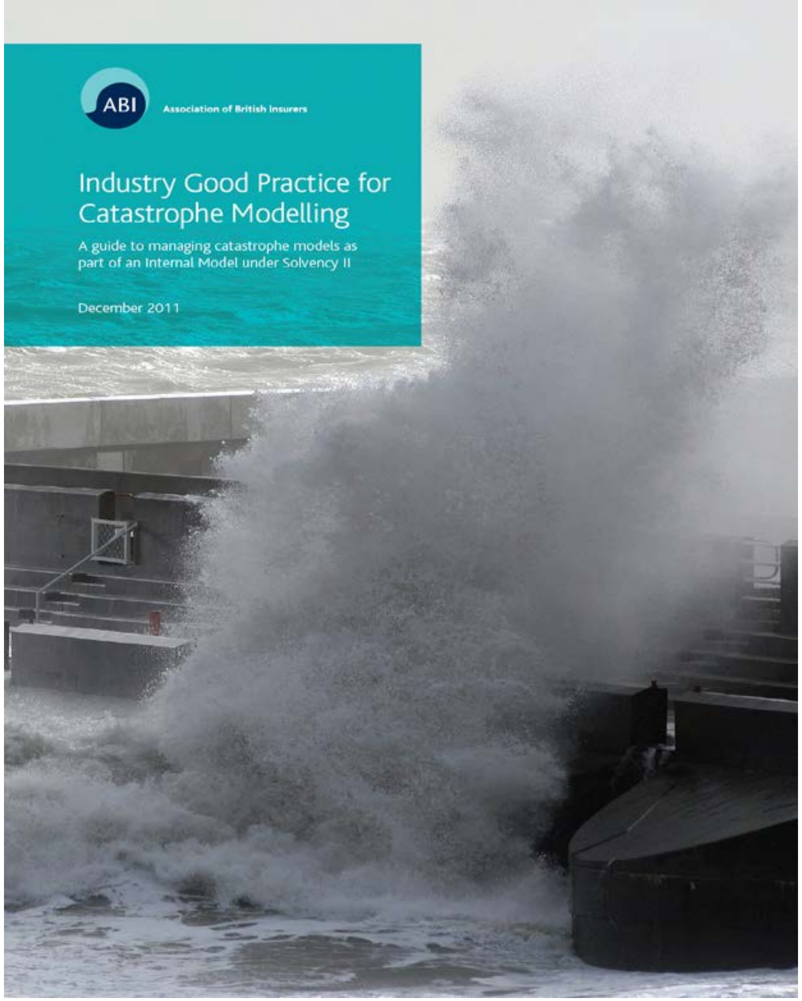
- Demonstrating understanding
  - Knowledge about the model from the supplier – “outward”
  - Knowledge about its applicability to your risk – “inward”
  - Sensitivity of Internal Model to the external cat-model
  - Demonstrate understanding as it applies to:
    - Model validation (incl methodology)
    - Model selection
    - Model change
    - Model limitations

Documentation – Use

- Demonstrating use
  - Evidence of competency, consistency, compliance with policy and governance requirements
  - Use required for
    - How the cat-model is being used (in-house, broker), and checks it is being used appropriately
    - Outsourcing
    - Data, including any adjustments
    - Integration with Internal Model

Documentation

- "Industry Good Practice for Catastrophe Modelling", published by ABI, December 2011
- Chapter 3
  - Documentation covered
  - More detail given



QUESTIONS ON DOCUMENTATION?

Documentation – Lloyd's Review Process

- Lloyd's recognise the importance of external models
- Documentation of external cat models
  - Use
  - Understanding
- February 14th
- Lloyd's will provide feedback to you
- In the meantime….
  - We are here to help
  - No.1 priority

QUESTIONS

LCM UPDATE

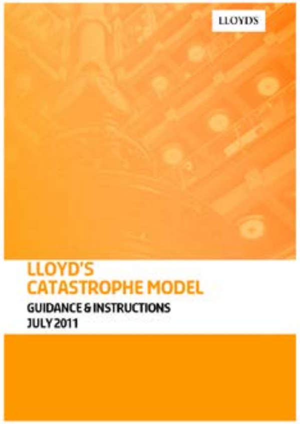
Agenda

- Market request for feedback
- Data requirements/quality
- Model design
- Playback/benchmarking capabilities
- Model uses
- Future development

LCM design principles

Principle 1: The LCM will **first seek to produce a view of risk at an aggregated market level** (essential for Cat risk monitoring). The following issues contribute materially to this view: correlations between syndicates, market level secondary uncertainty (vs. individual views) and uplifts to ensure syndicate data is complete or accurate. Where a single assumption must be made to ensure consistency we will chose one centrally and will inform Syndicates.

Principle 2: The LCM must **reflect syndicates own view of risk as far as possible**; because they are best placed to assess such risks. If this is not possible due to conflicts with LCM rule 1, the syndicate view is overridden.



Data requirements

- Please read each version – there are new requirements!
- EP info for:
  - 6 peril/regions
  - 5 COB
- Gross, Net and Final Net Loss
  - Including LAE (now mandatory)
- Not cat premium (LIM requirements changed)
- RDS and RDL submissions as usual
- Supplementary information (e.g. % Modelled)
- DFA info

Data requirements

- Analysis of change
- Sensitivities (possibly)
- Always use the latest template provided in the guidance
  - Helps with automation and our workload
  - RDMs remain fine: prefer template to other formats (CSV, Db)
- Please apply uplifts yourselves and any other adjustments

Data quality

- Please add LCM data as a “Use” in your data directory if it isn’t already in there.
- Apply Solvency II standards to this.
- Lloyd’s Min Standards => high quality.

Model design (K1 – In Force)

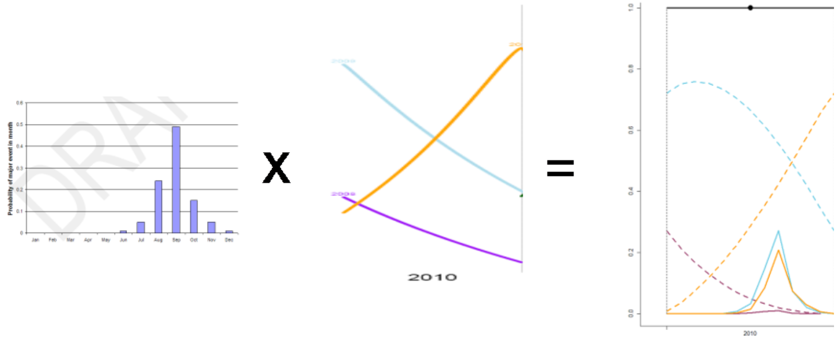
- LCM accepts multiple model outputs
  - Year based or Event based
- RMS data: medium term rates; Override syndicate rate adjustments
- Rank Matching to join AIR-RMS-Other
- GOM – Not using PMDR data now; simple RDS/ industry scaled approach for those not supplying own modelled data
- Any non-modelled (LCM relevant) syndicate risk (per RDS) we use an industry loss scaling approach

Model design (K1 – In Force)

- Perils joined by “Peril Copula”
  - Independence for majority
  - Derived Copula for GOM On and Offshore
- EU Windstorm uplift for clustering impact
- Secondary Uncertainty
  - EP curve adjustment to give Lloyd’s portfolio uncertainty
  - Would overstate if we summed syndicate values
- Glue method available for DFA data.

Model design (K2 YOA/Cal year)

- Augmenting the in-force view
  - Split into Year of Account
  - Produce Calendar Year losses – using SBF-RDS growth factor
- No longer calculates: Cat Premium or FNL
- Applies currency splits
- Uses RDS to split into LIM classes of business
- Incorporates proxy for any new syndicates.



Uses

- Ongoing Lloyd's Exposure Management oversight
- LCM -> LIM
  - Using 1/7 data augmented by SBF-RDS scaling for IMAP
  - Still ultimately uses *your* SCR in LIM
- BPSG
  - Cat VaR vs capital, P(plan loss | catastrophe)
- ICA steering group – supporting info
- Not yet in capital benchmark tool – further development required
- Cat Risk Appetite: Pilot complete, now live
- ORSA

Future development

LLOYD'S

MARKET BULLETIN

REF: Y4548

STRATEGIC REVIEW

Starting 2012, the Lloyd's Exposure Management team will undertake a strategic review of the Lloyd's Exposure Management framework and methodology.

The review will include items such as those included in the following non-exhaustive list:

- To review and assess the applicability of the current Lloyd's RDS Franchise Guidelines
- Suitability of the current RDS framework
- Monitoring of exposures in regions not well served by catastrophe models
- Incorporation of the Lloyd's Catastrophe Model results into the framework

Any changes will involve consultation with stakeholders.

Summary

- LCM now a critical component of exposure management at Lloyd’s
  - Data quality has improved steadily – thank you
  - Remains essential the feed to your DFA model has the same source (including any adjustments) as LCM data
- Development has been carried out as presented in Nov 2010
- Already in use in many BAU processes
- Expect evolution
- Questions?

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