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Validating External Catastrophe Models Under Solvency II

Lloyd's Old Library
9th July 2012

CONFIDENTIAL

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Agenda

- Introduction – Trevor Maynard (Lloyd's)
- Principles of validation – Phil Holt (Lloyd's)
- Lloyd's Validation Project – Simon Sherriff (Lloyd's)
- LMA-Lloyd's Collaborative Validation
  - Risk ranking & materiality – Lars Schmid (LMA)
  - Validation process & evidence – Grant Baxter (LMA)
  - Working with model vendors – Stephen Gentili (LMA)
- Close – Trevor Maynard (Lloyd's)

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Introduction

Trevor Maynard (Lloyd's)

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Welcome

- Ravi Pachai, as observer on behalf of the Financial Services Authority
- Representatives from catastrophe model vendors:-
  - AIR
  - EQECAT
  - RMS
- Members of the LMA-Lloyd's Catastrophe Model Validation Group

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How We Got Here

- Presentation January 18th
- The LMA-Lloyd's collaborative validation project - LMA Cat Model Validation Group created
- Managing Agents' documentation submitted for review 14th February
- Progress of the LMA-Lloyd's collaborative project:-
  - established what is and isn't possible on a collaborative basis
  - further articulated the requirements of work for validation
  - published "Framework for Validation of External Cat-Models" on May 3rd
  - engaged with vendors

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Next steps

- LMA-Lloyd's collaborative project now delivering:-
  - example of the structure of a model validation document (not an actual validation, but an illustration of the process in action) – the FSA has seen this, and we have incorporated their comments
  - specific "limitations & weaknesses" analysis
  - invited vendors to (separate) collaborative meetings with LMA Group to investigate some standardisation of validation data
- New Lloyd's project for remainder of 2012 supporting cat model validation only (not other SII-related cat-model work) - Lloyd's has allocated resources specifically for this project
- Lloyd's will create the space for further collaboration by the market

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Principles of Validation

Phil Holt (Lloyd's)

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Recap

- On January 18th we said "**It is not possible to fully validate every aspect of an external catastrophe model, and there is no requirement to do so"**
- Validation is **… the process by which you determine whether the external catastrophe model provides a valid representation of the catastrophe risk <u>for your portfolio</u>**
- SII requires that you demonstrate:
  - that you have a **process** for gaining <u>enough</u> understanding about an external cat model to make decisions about its selection and use for your portfolio
  - **evidence** that the process has been followed

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How Much Validation is Enough?

- Extent of validation should be proportionate to the materiality of the peril to your SCR
- Starting point - ability to rank risk
- Your risk ranking and materiality assessment define how much validation (and evidence) is required
- You must be able to demonstrate that your understanding of the external catastrophe model is sufficient to be able to make decisions about its use for your portfolio – taking into account materiality and proportionality
- Validation is not a linear process

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Lloyd's Validation Project 2012

Simon Sherriff (Lloyd's)

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Validation Project

- Project will run from now until the end of the year
- Purpose is to support the market in providing an appropriate level of evidence of their model validation processes
- Document reviews to be submitted by:-
  - 31st October for high materiality
  - 15th December for lower materiality
- Lloyd's project management will align with each managing agent's Solvency II project timelines
- Currently reviewing all the latest documentation MAs have submitted; we will be contacting MAs shortly to set up meetings

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Validation Project

- The documentation submissions on February 14th covered all aspects of using external cat-models within an Internal Model under Solvency II.
- This project relates to the validation of external catastrophe models ONLY
- The scope of this project does not extend to any other Solvency II documentation requirements for external catastrophe models
- This does not affect Lloyd's IMAP timetable
- Not actually doing validation; reviewing documentation, providing guidance, monitoring progress, regularly reporting to Lloyd's Solvency II team

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LMA Cat Model Validation Group

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LMA speakers

- The LMA Cat Model Validation Group was set-up by the LMA and Lloyd's in early 2012 to investigate how much validation work could be done collaboratively, rather than individually by each Managing Agent.
- The LMA Group is not involved with the Lloyd's project that Simon has just explained. The purpose of the LMA Group is to collaborate and share expertise on behalf of the whole Market.
- The speakers here today are members of the LMA Group who have worked particularly closely on the material you are about to see. Their presence does not mean they have completed all their own validation work – they all still have work to do.
- We will have Q & A after their presentations. Please address any technical questions to the whole panel; but anything specific to the Lloyd's process should be addressed to Trevor Maynard.

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Risk Ranking & Materiality

Lars Schmid (LMA)

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Cat Model Validation Summary

- The three main steps for Cat Model Validation
- Understand the relative importance of cat risk to your portfolio:
  - Percentage of Capital which is Cat based
  - Risk Ranking of Perils
- Validate the model based on the ranking of perils. We find it helpful to categorise them:
  - Deep *(very high cat-risk materiality for the region/peril)*
  - Advanced *(significant cat-risk materiality)*
  - Regular *(low cat-risk materiality)*
- Relate the model to your own portfolio and react on findings

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Risk Ranking

- Rank your Exposure by territory and peril
- Take into account Materiality and Proportionality, for example:
  - percentage of SCR
  - sensitivity on SCR of variations of +/-25% per peril
  - sensitivity of the Internal Model to variations in cat-model
- Decide which perils require what type of validation, use both quantitative and qualitative judgement
- Then divide into Validation groups

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Regular Validation for Minor Risks

- Validation of minor risk perils is mainly based on an independent review and analysis of Vendor Validation documents.
  - Read Vendor Documentation
  - Summary with your own internal opinion
  - Demonstrate understanding of key parts of external model
  - Inspect vendor's published results of own validation tests.
  - Demonstrate an understand of risks not included in vendor model.

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Advanced Validation for Medium Risks

- Validate the model itself - as for Regular, plus:
- More detailed understanding and Summary of Vendor Validation documents including meetings / Q&A sessions with model vendor.
- Ask vendor to disclose:
  - Data sources used, including data quality checks.
  - Key assumptions, and their uncertainties.
- In addition analyse model independently of Vendor:
  - Compare As-If losses on own portfolio losses to the model
  - Investigate Model Settings and Options

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Deep Validation for Major Risks

- Validate the model itself - as for Advanced, plus:
- Thorough Understanding and Summary of Vendor Validation documents, but also own evaluation based on loss experience or Exposure data. This could be for example an As-If analysis on past losses versus the model.
- Consider sources of alternative materials, independent of the vendor:
  - NOAA rates vs Model
  - Compare industry losses
  - Validate against other research

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Model Suitability for Own Portfolio

- Findings during model validation should be able to show suitability of the model for your own portfolio
- Ways to compare Portfolio vs Model:
  - Geography: where within regions, e.g. North / south?
  - Peril: similar or not ? (For example is Flood included in wind policies?)
  - Lines of business: residential, commercial, agricultural, etc.
- Findings need to be taken into account in the Internal Model, maybe use Loading Factors or other adjustments
- Multi Modelling as one option, but does it increase or reduce uncertainty?

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Catastrophe Model Validation

Grant Baxter (LMA)

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Validation is…

- **Validation is time consuming...**
- It took me 2 weeks, with actuarial input, to validate one "very high" materiality peril
  - If I were to validate all 5 LCM perils I would estimate ~12 weeks work for me (given highest level of materiality)
  - To fit that in over the next 6 months will take ~50% of my time
  - It can be difficult to delegate this work
- **… but it is not overly complex work.**
- **It cannot be avoided. It is a requirement of Solvency II**

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You Are Not Alone

- The vendors have been very busy
- ABI document from last year remains an excellent resource
- FSA Catastrophe Analytical Tool provides guidance
- Lloyd's and the LMA have been working collaboratively:-
  - illustrative validation report, available to all tomorrow
  - model limitations and weaknesses summary documents
  - engagement with vendors (Steve Gentili)

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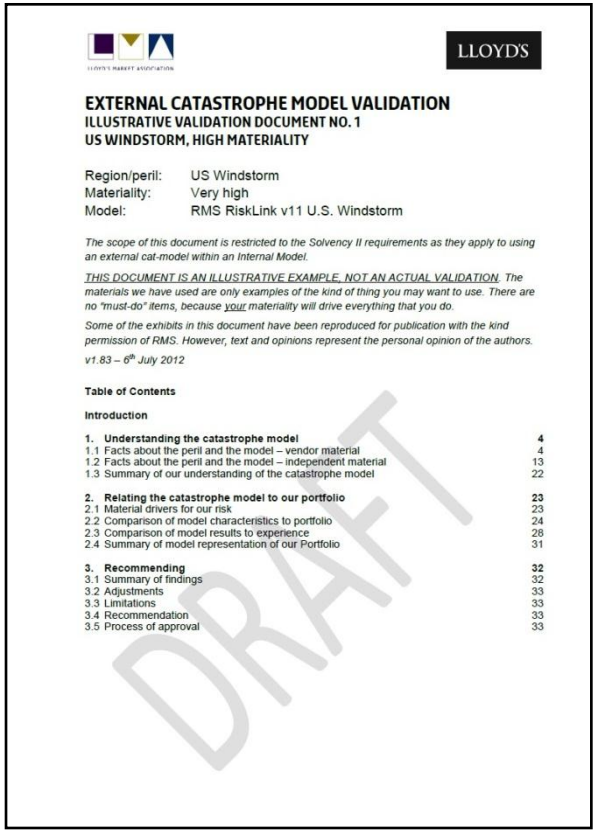
Illustrative Validation Document

- The LMA-Lloyd's illustrative validation document is an example of the process – not an actual validation
  - illustration of how the principles of validation may be applied
  - represents the opinions of the working group as to a suitable threshold for validating a "very high materiality" peril
  - we pooled our existing work on U.S. Hurricane validation
- Does not replace the need for you to undertake your own validation
  - this is not a validation of US Hurricane
  - it is an example of what a validation report may look like

Illustrative Validation Document

- If you have taken a different approach…
  - If you believe it meets the SII standards, then please don't change anything, and don't waste time reformatting existing work to match this example!
  - If you have done something brilliant, please share your approach
  - LMA would greatly appreciate your input



EXTERNAL CATASTROPHE MODEL VALIDATION
ILLUSTRATIVE VALIDATION DOCUMENT NO. 1
US WINDSTORM, HIGH MATERIALITY

Region/peril: US Windstorm
Materiality: Very high
Model: RMS RiskLink v11 U.S. Windstorm

The scope of this document is restricted to the Solvency II requirements as they apply to using an external cat-model within an Internal Model.

THIS DOCUMENT IS AN ILLUSTRATIVE EXAMPLE, NOT AN ACTUAL VALIDATION. The materials we have used are only examples of the kind of thing you may want to use. There are no "must-do" items, because your materiality will drive everything that you do.

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v1.83 – 6th July 2012

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Example Validation Document

- Example illustration split into three sections:-
  - UNDERSTANDING the catastrophe model
  - RELATING the catastrophe model's representation of risk to the catastrophe risk in your portfolio
  - RECOMMENDING its use, subject to adjustments/settings etc
- Keep in mind throughout the question: does this model provide a valid representation of catastrophe risk for my portfolio?
- Take into account proportionality and materiality

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Example Validation Document - section 1

- **Understanding the Catastrophe Model**
  - Fact
    - Background facts about the model
    - Vendor's validation of various model components
    - Independent validation work (ours and others)
  - Opinion
    - Our opinion and understanding of this work
    - Relating the Catastrophe Model to (y)our Portfolio

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Example Validation Document - section 2

- **Relating the Catastrophe Model to (y)our Portfolio**
  - Description of portfolio, identifying key model elements
  - Comparison with experience, etc.

Example Validation Document - section 3

- **Recommendations**
  - Summary of findings
  - Adjustments, limitations, etc.

Catastrophe Model Limitations & Weaknesses

- Catastrophe model limitations and weaknesses must to be taken into account when validating
- LMA Group is working on summaries of some key examples for your use. These examples are vendor specific.
- AIR one has been prepared and is being reviewed by the vendor
- RMS one covers:
  - Generic issues
  - US Earthquake
  - US Hurricane
  - EU Windstorm
- You may still need to alter this to reflect weaknesses or limitations that are specific to your book

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Catastrophe Model Vendors

Stephen Gentili (LMA)

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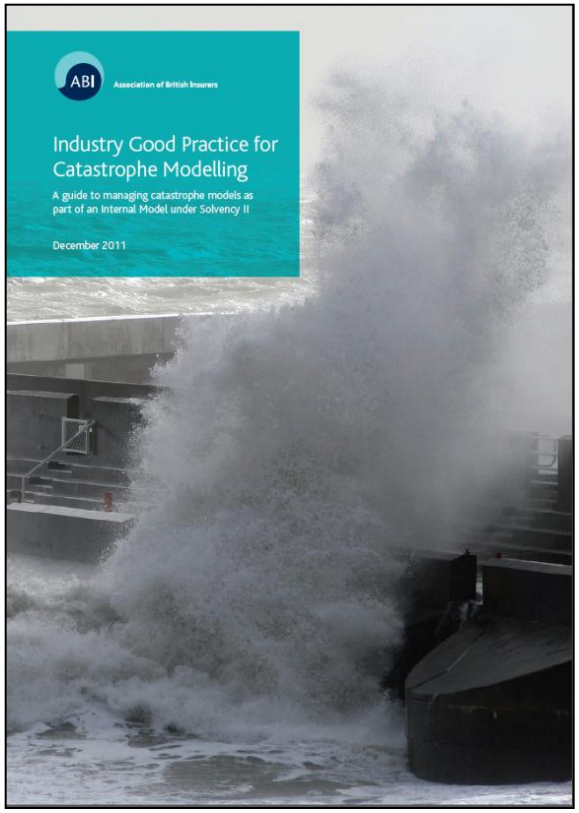
Model Vendors

3.4.1 Restrictions on vendor documentation (p26)

"The Solvency II obligations to understand a catastrophe model, for the purpose of an Internal Model submission, rest squarely on the company itself.

It should be noted that Solvency II places no obligation on catastrophe model vendors to provide documentation, although many do provide a significant amount of information to their licensees."



Source: http://www.abi.org.uk/Publications/59999.pdf

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Model Vendors

- Vendors have helped enormously to date
- Regular update meetings (and bulletins) with licensees
- Specific section of their website dedicated to Solvency II documentation
  - Produced specific Solvency II documents
  - In addition to existing suite of model documentation
- Engage with your model vendors!
  - As purveyors of the cat models they have valuable information and personnel at their fingertips

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http://www.air-worldwide.com

Images provided by Giovanni Garcia

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NON-CLIENT INFORMATION

EQECAT AN ABS GROUP COMPANY

- Contact EQECAT
- Media Inquiries
- Careers
- CatWatch
- Client Login

Catastrophe Models
- Catastrophe Model Perils
- Solvency II

Software
- RQE
- WORLDCATenterprise
- Results Viewer
- Integrated Catastrophe Modeling
- Change Management
- Training

Data Products
- Insured Loss Database
- Insured Exposure Data

Catastrophe Risk Consulting
- Capital Markets Consulting
- Wind Turbine Risk Assessment

CatWatch Reports
- CatWatch Catastrophe Reports
- Subscribe to CatWatch

News & Events
- EQECAT Events
- Speaking Engagements
- EQECAT In The News
- Press Releases
- Media Inquiries
- Speaker Request

Research & Publications
- Post-Event Catastrophe Reports
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Documentation to Support Compliance with Solvency II

The European Commission implemented the Solvency II directive to introduce economic risk-based solvency requirements across all EU Member States. Solvency II is currently scheduled for introduction in 2012. **Insurers and Reinsurers in the European Union** need to be preparing now to ensure that they will be able to meet the **modelling and documentation requirements of Solvency II.** Re/insurers will be required to publicly disclose risk and capital information, including modelling details.

EQECAT is providing documentation on the methodology underlying its suite of natural catastrophe peril models to support Solvency II compliance. Below is a list of technical documents relevant to EQECAT's catastrophe risk models:

EQECAT/Platform Methodology Documentation:

- EQECAT General Model Methodology Document
- WORLDCATenterprise Europe Wind and Earthquake Models - A Solvency II Perspective
- WorldCat Classic Methodology
- WORLDCATenterprise - Country-Specific Information

Country/Peril Model Documentation

- Asia Typhoon Model
- Canada Earthquake Model
- Europe Flood Model
- Japan Earthquake Model
- Latin America Earthquake Model
- North Atlantic Hurricane Model
- US Brushfire Methodology
- US Earthquake Model
- US Offshore Energy Model

Solvency II Publication

Association for British Insurers
Industry Good Practice for Catastrophe Modelling
EQECAT's Gabriela Chavez-Lopez co-authored this guide to managing catastrophe models as part of The Internal Model under Solvency II.

Search EQECAT.com

Search

Risk Modelling & Solvency II Compliance

Call to speak with an EQECAT representative for more information about EU Solvency II requirements related to catastrophe risk modelling:

In the Americas
(201) 287-8320

In Bermuda
(201) 287-8320

In UK/Europe/Asia
+44 207 265 2030

Related News

April 3, 2012
The model challenge: castastrophe models and Solvency II

European Commission - Solvency II

"Solvency II will introduce economic risk-based solvency requirements across all EU Member States for the first time. These new solvency requirements will be more risk-sensitive and more sophisticated than in the past, thus

http://www.eqecat.com/catastrophe-models/solvency/

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Client Home | Cat Updates | Release Documentation | Product Support | FAQs | Training | Documentation

Support to Clients Undergoing Solvency II Compliance

In January 2013, Solvency II will introduce new capital requirements and risk management standards for the European insurance industry. Insurance and reinsurance companies who intend to go down the internal model approval route, and use nat cat models as part of their Solvency Capital Requirement (SCR) calculation are required to provide comprehensive documentation around the model and its use.

Clients who are going through the Solvency II application process will be drawing from available RMS documentation to compile their submission to the regulatory bodies. Additional training and support for complying with Solvency II regulations will be launched in the coming months.

External Model Documentation

RMS has committed to producing documents specifically designed to support Solvency II disclosures. Available only to companies licensing RMS models, these documents will provide clients with content addressing the areas highlighted by the CEIOPS documentation where RMS does not have specific documentation. Where applicable, the documents will index or reference existing documentation so that clients can more readily find information related to a specific topic.

Click on the following links to access the latest Solvency II documentation.

- Supplementary Document for Undertakings Responding to Solvency II Directive (September 2011)
- Validation of RMS Natural Catastrophe Models (November 2011)

Earthquake
- Canada Earthquake Model: Data Source and Validation Matrix
- Canada Earthquake Model: Timeline and Overview
- Central America Earthquake Model: Timeline and Overview
- China Earthquake Model: Timeline and Overview
- Europe Earthquake Model: Data Source and Validation Matrix
- Europe Earthquake Model: Timeline and Overview Updated
- Japan Earthquake Model: Data Source and Validation Matrix
- Japan Earthquake Model: Timeline and Overview
- Mexico Earthquake Model: Data Source and Validation Matrix
- Mexico Earthquake Model: Timeline and Overview
- Overview of Version 11.0 Europe Earthquake Model FAQ
- Overview of Version 9.0 North America Earthquake Model FAQ
- South America Earthquake Model: Timeline and Overview
- U.S. Earthquake Model: Data Source and Validation Matrix
- U.S. Earthquake Model: Timeline and Overview

Flood
- Europe Flood Model: Data Source and Validation Matrix
- Europe Flood Model: Timeline and Overview

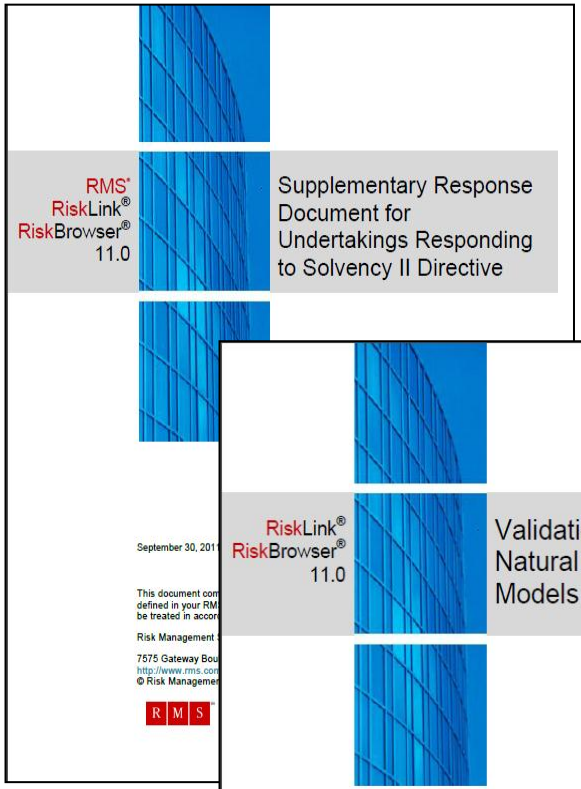
Hurricane
- Canada Hurricane Model: Data Source and Validation Matrix
- Canada Hurricane Model: Timeline and Overview
- Overview of Version 11.0 North Atlantic Hurricane Model FAQ New
- U.S. Hurricane Model: Data Source and Validation Matrix
- U.S. Hurricane Model: Timeline and Overview

Severe Convective Storm
- U.S. and Canada Severe Convective Storm Model: Data Source and Validation Matrix New
- U.S. and Canada Severe Convective Storm Model: Timeline and Overview New

Terrorism
- Terrorism Model: Methodological Steps
- Terrorism Model: Timeline and Overview
- Terrorism Model Solutions Methodology Summary and Validation
- Overview of Version 11.0 Terrorism Model FAQ

Typhoon
- Japan Typhoon Model: Data Source and Validation Matrix
- Japan Typhoon Model: Timeline and Overview

Windstorm
- Europe Windstorm Model: Data Source and Validation Matrix
- Europe Windstorm Model: Timeline and Overview
- Overview of Version 11.0 Europe Windstorm Model FAQ



http://www.rms.com

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Model Vendors

- It is recognised that vendors have provided vast amounts of assistance and documentation to date
- However, requesting assistance to complete regulatory obligations for catastrophe model validation
  - asked vendors to complete a template (example later)
  - possible framework for future model and change management release documentation
  - intention is that this approach is scaleable. Could be extended to other vendor models in the future e.g. AonBenfield's Impact Forecasting or Oasis

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Model Vendors

- Vendor letters sent 5th July (AIR & RMS) from LMA and Lloyd's
- Response requested in 4-6 weeks
- Ultimately play this analysis back to the market via vendor website
- Hopefully, dovetail with the timetable required by Lloyd's

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Model Vendors

- The letter addresses three key stages of validation:

Validation Stage	Validation Area	Onus of Effort	
		Vendor	Market
Stage 1	Install & Infrastructure	High	Low
Stage 2	Building Block(s)	High	Medium
Stage 3	Interpreting Outputs and Results	Low	High

- Per ABI document the onus is on the market but the vendors can help the market with some of the “heavy lifting” and generic validations (Stage 1 & 2)
- Stage 3 – the vendors can give some guidance but the burden is on the market to prove the model is fit for purpose in relation to your own portfolio

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Section 1 - Methodologies & Impacts

- Vendor letter suggests this template as a format:-

								Methodologies & Impacts		
Region	Territorial Scope	Peril (Version)	Model Input / Building Block	Realisation within the Catastrophe Model	Component	Indicate the materiality the individual component has upon modelled results	Indicate Internal Confidence placed on the methodology employed	Please indicate where the main sensitivity/impacts are apparent for this component e.g. tail of the distribution, uncertainty, mean losses etc	Detail if any aternative methodologies have been considered and comment accordingly	What is the review frequency or when may a methodological change be considered
US	US, Canada and Caribbean	Hurricane (v11)	Frequency	Event Rates	Component 1	Low	High			
					Component 2	Medium	High			
					Component 3	Low	Medium			
					Component 4	High	Low			

- Preference to not be too prescriptive to gain additional insight. May return some unexpected drivers of uncertainty that warrants additional assessment and validation
- Matrix approach will enable the market to target the 'reds'
  - High - materiality for modelled losses
  - Low - confidence in methodology employed

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Section 2 – Data Sources

						Data				
Region	Territorial Scope	Peril (Version)	Model Input / Building Block	Realisation within the Catastrophe Model	Component	Please list the data inputs (include all internal and external sources)	What is the data vintage? When will the data be updated?	Detail and comment on the Validation Methodologies employed	Please outline any data limitations in the data	Please comment on an adjustments made to the external data
US	US, Canada and Caribbean	Hurricane (v11)	Frequency	Event Rates	Component 1					
					Component 2					
					Component 3					
					Component 4					

- Sources of data
- Data vintage
- Data validation methodologies
- Data limitations
- Adjustments made
- Data limitations may drive some of the section 1 'low-medium-high' classifications

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Questions

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Close

Trevor Maynard (Lloyd's)

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Conclusion

- Release of the illustrative example document tomorrow morning
- Release of “limitations” document from one vendor tomorrow, with another to follow as soon as possible
- Collaboration with vendors on documentation and other validation material by the LMA Cat Model Validation Group during the summer
- Lloyd’s model validation project for the remainder of 2012, managed by Simon Sherriff
- Lloyd’s will provide facilities and space for further collaborative validation work by market participants