Managing Catastrophe Risk
A2II 29/11/2023

Portfolio Risk Management, Lloyd’s
## Oversight of Catastrophe Risk Management

### Principles for doing business

Managing agents should ensure syndicates maintain appropriate control of catastrophe risk (from natural and non-natural perils) in line with their wider business strategy.

<table>
<thead>
<tr>
<th>Sub-Principles - Managing agents should...</th>
<th>10 components to consider</th>
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<tbody>
<tr>
<td>Manage catastrophe exposure in line with their agreed risk appetites.</td>
<td>• Risk Appetite</td>
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<tr>
<td>Employ data standards, risk quantification tools, controls, expertise, and reporting frameworks which are appropriate to their risk profile.</td>
<td>• Data and Tools&lt;br&gt;• Exposure Monitoring and Reporting&lt;br&gt;• Resourcing</td>
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<td>Adequately justify and validate methodology and assumptions, including expert judgements.</td>
<td>• Model methodology&lt;br&gt;• Model validation</td>
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<td>Have a complete representation of catastrophe risk in the internal model, reflecting all possible sources of loss and allowing effective use by wider business functions.</td>
<td>• Model completeness&lt;br&gt;• Model change&lt;br&gt;• Model use and capital modelling</td>
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<td>Have robust governance and oversight of risk aggregations.</td>
<td>• Governance and Oversight</td>
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Managing Catastrophe Risk

**Deterministic**

Modelled losses from a suite of prescribed Realistic Disaster Scenarios (RDS) are submitted by syndicates and collated to form a market level view. These include scenarios for the five most material region-perils.

**Probabilistic**

Aggregate/Annual Exceedance Probability (AEP) modelled losses are collected for Lloyd’s five most material region perils. All other worldwide modelled losses are collected in a combined 'Rest of World' AEP curve for each syndicate.

**Additional Data**

Lloyd’s collects country aggregates and exceedance probability curve return period modelled losses for a prescribed set of region / perils which represent a ‘second tier’ of materiality at market level for nat cat perils.
Managing catastrophe risk

Top 5 region/perils
- probabilistic (LCM)
- and deterministic (RDS)

Other region/perils & other accumulation risks
- deterministic only (RDS)

Potentially material region/perils
- compulsory aggregate exposures

Other region-perils

Materiality
- High
- Low
Deterministic: Realistic Disaster Scenarios
Lloyd’s maintains a suite of Realistic Disaster Scenarios

**Natural Catastrophe scenarios**

**US windstorm**
- 2 events
- Pinellas
- Miami Dade
- Gulf of Mexico

**Other windstorm**
- Japan
- Europe

**Earthquake**
- Los Angeles
- San Francisco
- New Madrid
- Japan

**Other natural**
- Europe flood

**Non-Natural Catastrophe scenarios**

**Terrorism**
- Rockefeller centre
- One-world trade centre

**Cyber**
- Cloud cascade
- Ransomware
- Business blackout
- Data breach

**Other non-natural**
- Marine
- Major complex
- Aviation
- Satellite risks
- Political risks

**Liability**
- Financial products & markets
- Pharmaceutical
- Construction
- Chemicals in food
- Off/on-shore energy
How Catastrophe Models Work

The hazard module generates the event set – locations, magnitudes, frequencies - and assesses the physical hazard of each event e.g. wind speeds or storm surge.

The engineering module calculates the damage from each event to every exposure using damage functions. Exposure data is overlayed in this calculation e.g. location, building height & construction type.

The financial module translates physical damage into monetary loss, which is in turn translated into insured loss with policy terms applied.
Lloyd’s Catastrophe Model

Aggregates the outputs provided by syndicates to form a market-level view

Syndicate Year Loss Tables (YLT)

Aggregation by rank matching methodology

Combine the separate region perils

Lloyd’s catastrophe model view of risk

View is validated by Lloyd’s and syndicate outputs reviewed by individual syndicates

At least 10,000 years
Lloyd’s Catastrophe Model Output

Return period:
- 10
- 20
- 50
- 100
- 250
- 500

Final Net Loss (£bn)

2023 plan figures
Additional Data: monitoring “non-peak” cat
# Catastrophe Model Validation

## How we ensure models are fit for purpose

### Solvency II

### Lloyd’s Oversight

<table>
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<tr>
<th>Foundational</th>
<th>Intermediate</th>
<th>Established</th>
<th>Advanced</th>
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<td>Validation of external model(s) is conducted as required under SII standards and requirements</td>
<td>The use of alternative models and assumptions is regularly considered, and model choice decisions are demonstrably validated.</td>
<td>Programme of model change frequently updated, driven by validation work, and material progress made. Areas of uncertainty and sensitivities of the model(s) used are well understood.</td>
<td>Feedback from validation is linked back to other parts of business such as pricing/reserving/risk management to help with decision making</td>
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