

# OPENING THE BLACK BOX

The pressure is on to bring transparency to catastrophe modelling and to better understand an inexact science

## AT A GLANCE

- Questions raised over transparency:** As cat models become an integral part of (re)insurance companies, any change in a model can create a great deal of discomfort for the entire industry. Understanding how the models work is more important than ever.
- Attitudes are changing:** Many operators in the modelling industry have recently begun to show willingness to open up and talk about the broad range of confidence surrounding results. Unsurprisingly, however, they have stopped short of sharing insight on how the models work in fear of intellectual property theft.
- Gaps to be filled:** Superstorm Sandy has identified gaps in the coverage of cat models. Predicting nature still has its inherent risks, but lessons are being learnt.

**R**MS calls it a paradigm shift, Karen Clark calls it a mind shift, while Oasis lauds it as a quiet revolution. Whatever the terminology, it is clear that something is happening within catastrophe modelling and 2013 seems to be the year it is all set to change. Much of this change is driven by the users of the cat models and their desire to peer within the models and better understand the uncertainty inherent in their results.

Major catastrophe events over the past couple of years have once again tested the models. The release of RMS Version 11 produced an industry backlash by dramatically changing one of its assumptions, overnight increasing the exposure of many insurers' books of business. And Solvency II states that (re)insurers need to demonstrate they fully understand the output of any third-party models they use.

Guy Carpenter analytics head David Lightfoot says: "[Superstorm] Sandy's storm track itself was very wide – its duration was long and it didn't match particularly well with events that were included in the catastrophe models. It brought further attention to how companies need to continue to understand what cat models can do and what their limitations are.

"We and the rest of the industry are trying to get increasing transparency from cat modelling vendors, because that will help companies better understand the results of the cat models," he adds. "That enhanced understanding better supports their business decisions in the area of risk and capital management, so it's an area the industry is pushing for and, by and large, that cat modellers are becoming more responsive to."

For 30 years, catastrophe modelling has been dominated by three modelling agencies: RMS, AIR Worldwide and Eqecat. The barriers to entry in the industry remain high and the models have stayed opaque.

"The modellers will not disclose everything," says Karen Clark, chief executive of the eponymous consulting firm she founded in 2007, and founder of cat modelling agency AIR, which she sold in 2002.

"They give thousands of pages of documentation, but you can never see inside the box and can never really see what's going on," she says. "The industry was okay with that as long as they thought the models were becoming more and more accurate and better, because that's the trade-off. We'll let the modellers keep their proprietary trade secrets because they're giving us more and more accuracy, but that's not the case."

The cat modelling community is at pains to point out that the models have improved immeasurably since their inception. Big leaps in computer science combined with improved understanding of how hazards behave have increased their sophistication, speed and accuracy. Some argue that the increasing ability of (re)insurers to absorb major cat losses without going into run-off is testament to that improvement.

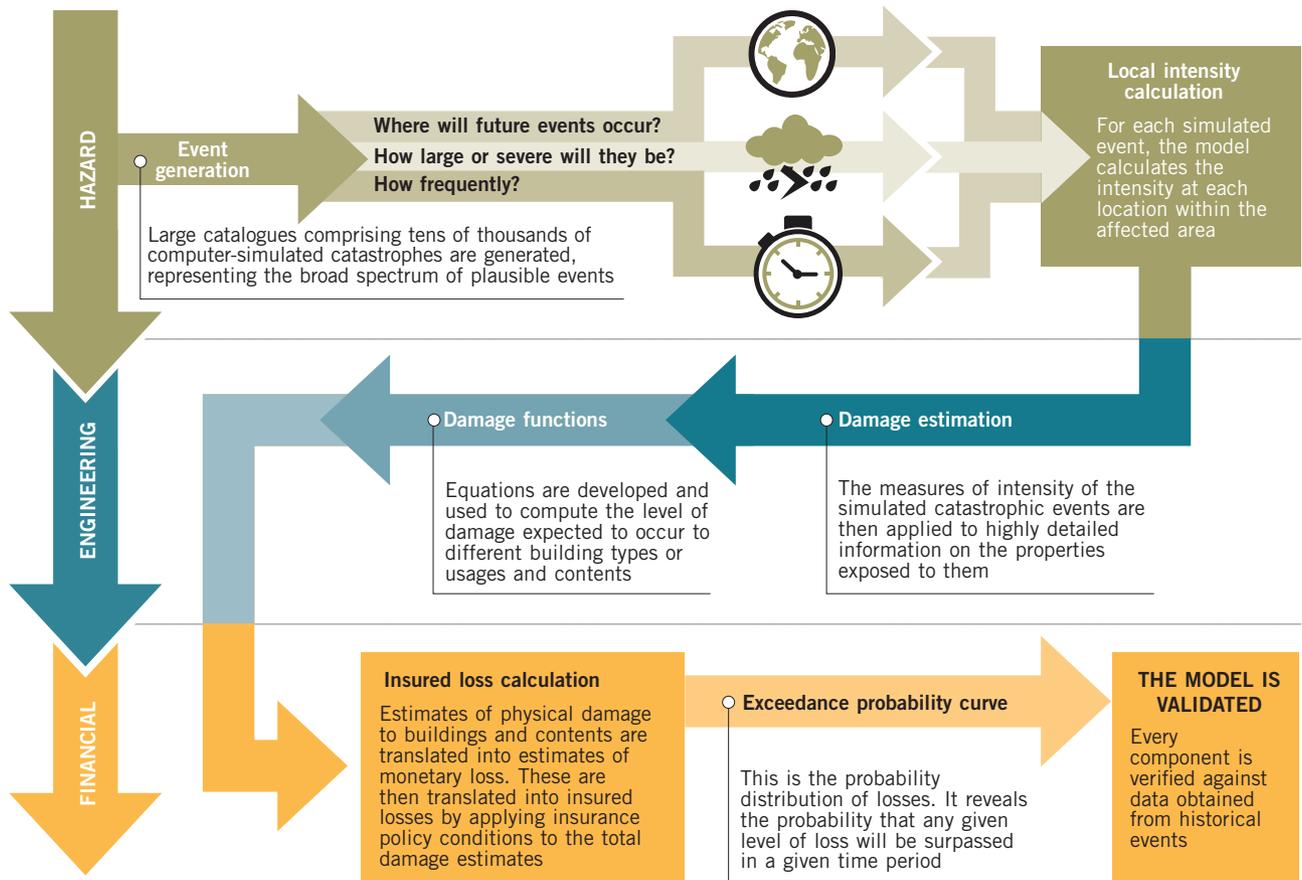
But Clark is not convinced. "In most regions of the world there is very little data," she says. "If companies would look at the actual data they would understand the magnitude of the uncertainty and why the models will never be close to being accurate, which might be a rude awakening for some companies.

"The scientific research is very seductive and it sounds very impressive; it gives the illusion that the models are becoming more accurate. But the models can never be better than the data that supports them."

### Uncertainty and resilience

The cat modellers argue they are becoming more transparent, and point out they are working closely with model users as well as each other to help the industry better understand uncertainty in model results. Sensitivity or 'what-if'

## HOW ARE CATASTROPHE MODELS CONSTRUCTED? [A MEASURED ESTIMATE OF POTENTIAL LOSSES]



INFOGRAPHIC: GR/MGONZALEZ

DATA: AIR WORLDWIDE

testing and other techniques can help determine, for example, how well a particular reinsurance programme or underwriting initiative would appear if the model results were different.

RMS modelling solutions vice-president Claire Souch says: "Sensitivity tests are becoming part of the standard suite of analyses that users get when they license the model.

"They get the best view of the risk, which is the RMS view based on our scientists' best assumptions, knowledge and data. Additionally, they get a suite of tests that allow them to diagnose the sensitivity of their own portfolios to key uncertainties in the model.

"That's the real link," Souch adds. "The link to individual portfolios, because different portfolios can be sensitive to different assumptions in the model. These tests and diagnostics will help users in the future understand whether they should be placing or hedging their bets a little bit more."

In a Guy Carpenter research paper titled, *Managing Catastrophe Model Uncertainty*, the broker argues that

## 'If companies look at the data they would see the magnitude of uncertainty'

Karen Clark, Karen Clark & Company

modelling firms need to lead the discussion about uncertainty, despite the apparent competitive disadvantage of transparency. It explains that a band of uncertainty exists around the output of any cat model, typically illustrated as a loss exceedance curve, and argues that this 'uncertainty band' paints a more realistic – albeit less precise – picture of cat risk (see chart, page 40).

"Despite considerable refinement of the models over the decades, uncertainty remains," the report states. "In 1999, Guy Carpenter & Company

published estimates of the amount of uncertainty in US hurricane risk models. The conclusion: a two-standard error interval (a plausible range that has a 68% chance of including the true, but unknown, value) for a national writer's 100-year or higher probable maximum loss (PML) goes from 50% to 230% of the PML estimate produced by the model."

"Advances within the modeling industry since 1999 have indeed reduced the width of the uncertainty band, but the consideration of smaller areas of geography only introduces additional uncertainty," it adds.

### Uncertainty and resilience

While the agencies have stopped short of fully opening up their black boxes and giving away their intellectual property, they have shown a frankness and willingness to talk about the broad range of confidence surrounding model results.

RMS's Souch says: "We always argue models have more value when the uncertainty is more understood →

than less. Experience in the industry over the last seven years has borne that out: people have become more aware of the uncertainties, but the use of the models has increased with that awareness.”

In a recent article, RMS chief executive Hemant Shah concedes that “more documentation, denser presentations or ever-longer meetings to ‘explain’ our models is not going to be enough to address the issue”. He urges the modelling community to focus on building resilience, which can only be achieved where there is an acceptance that catastrophe risk is characterised by deep uncertainty.

As Souch explains: “The 2011 cat loss year was one of those where there were a few black swans: the Japanese Tsunami, the Thailand floods. In the course of our discussions with clients, we have heard the market calling for a new paradigm in how they understand and use catastrophe models, and to be able to take a more resilient approach to their risk management strategy that moves beyond balancing risk and return as the two key metrics of success, and adds resilience as a more explicit consideration within the portfolio and catastrophe management landscape.”

### An open approach

Open source initiatives, such as the Oasis Loss Modelling Framework and Karen Clark & Company’s RiskInsight, are attempting to build a new way of catastrophe modelling. Their plug-and-play model allows a wide range of hazard experts to get involved, helping insurance and reinsurance companies form their own view of risk.

Clark says: “RiskInsight not only gives insurers full transparency, it also allows them to change the assumptions and build their own proprietary views of risk.

“The models are only giving you the subjective opinions and biases of the scientists who are working for the modelling companies. Insurance companies want to be able to imbed in their decision-making processes the expertise of other scientists and their own internal experts, not just the scientists who work for the modelling firms.”

Oasis, which was launched at the Monte Carlo Rendez-Vous de Septembre in 2011, has kept a low profile while it goes through various phases of development. The not-for-profit initiative is supported by a number of European, London and Bermudian insurers, reinsurers, major brokers, as well as the corporation of Lloyd’s.

One of its primary objectives is to encourage openness and transparency in model building, use and validation.

Oasis project leader Dickie Whitaker says: “If people understand the inherent uncertainty in these products they’re not going to turn around when an event has unusual characteristics and say, ‘The models have got it wrong.’”

The Oasis team has a strong pedigree. Lloyd’s head of exposure management and reinsurance Trevor Maynard is a director of the company, as is Paul Nunn, former head of exposure management at Lloyd’s and current head of natural catastrophe risk modelling at SCOR. Whitaker is a cat modelling expert from Guy Carpenter and Eqecat.

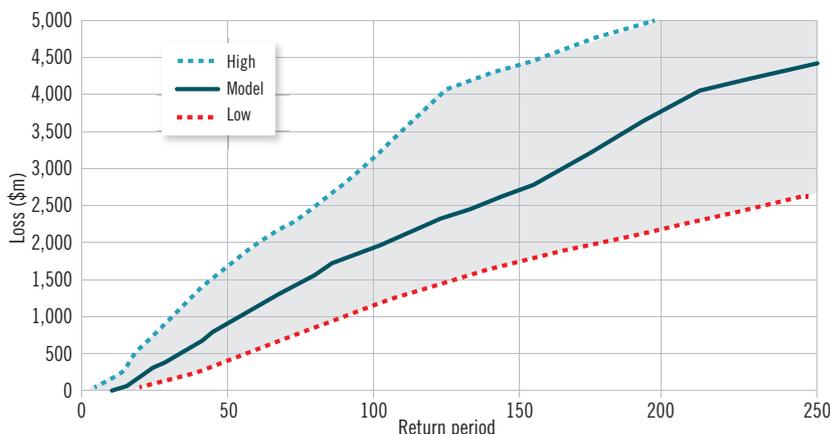
The EU-funded Climate-KIC programme is the main backer behind Oasis. It has also raised some funds from industry.

Within the community of risk modellers, Oasis is joining exposure, run time, visualisation and satellite specialists such as the UK Met Office, University College London, Karen Clark & Co, JBA Risk Management and Perils AG.

Such initiatives should further level the playing field as (re)insurers strive to get a better understanding of the levels of uncertainty in the model output. But there are plenty of trailblazers in this space, including the major European reinsurers and monoline Bermudian companies, that already have more than a head start in their understanding of the uncertainty band.

GC’s Lightfoot sums up: “It’s really becoming more business-as-usual to strive to better understand cat exposure in one’s insurance portfolio.” ■

## AN IMPRECISE SCIENCE [THE REALISTIC VIEW OF RISK]



The ‘uncertainty band’ around a typical PML curve paints a more realistic – and much less precise – picture of catastrophe model output

SOURCE: RMS AND GUY CARPENTER