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Analysis

Print Comment

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Eqecat's Keogh stresses the limitations of models

Models have a very defined role in risk management and they do what they do very well but they don't do everything, the Eqecat president tells InsuranceERM, as he talks about Japan, US hurricanes, global warming and clustering.



It is a bright, late spring morning when InsuranceERM meets Bill Keogh, president of Eqecat. Keogh is in the UK for the firm's London catastrophe modelling conference, the last in a series of three conferences that kicked off in Miami and Singapore.

Given the heightened interest in the performance of cat models in the wake of this year's devastating natural disasters, Keogh is pleased to have had the opportunity to explain to clients what catastrophe models are trying to achieve and their limitations.

The recent spate of extreme events has been "a bit of a blessing for our business," Keogh says. The past four years

before this one saw few catastrophes apart from Chile and people had become a little complacent about models, he explains. "People get into a psychological pattern where they believe models don't quantify uncertainty, they eliminate uncertainty." But when there are large events, "we get access to the C-suites of a lot of our clients because they're paying attention",

New Zealand and Japan produced significant surprises, the former with an unknown fault system and the latter with an earthquake of a magnitude that was completely unprecedented and unanticipated. Keogh's conclusion from this type of event is: "We'll always have surprises from events but we shouldn't have surprises from models."

"It's not that models should be able to do everything," he hastens to add. Just the opposite. "Models have a very defined role in risk management and they do what they do very well but they don't do everything. When you come to understand that, you won't be surprised by the model because you'll know that the model doesn't include tsunamis and doesn't include a nuclear meltdown."

Keogh says that Eqecat models the uncertainty of the magnitude in all its earthquake models. Of the Tohoku earthquake, he notes: "While the consensus for the maximum magnitude for that fault system was 8.4, we modelled up to 8.76. That's not a 9.0 but it's certainly headed in the right direction and helped our clients understand the uncertainty."

Stressing more than once that "catastrophe risk is all about uncertainty", he describes the classification system Eqecat uses for thinking about modelling and uncertainty which the firm has borrowed from former US defense secretary Donald Rumsfeld. Keogh observes: "There are the 'known knowns', the 'known unknowns' and the 'unknown unknowns', so every time an event happens it adds to this first category of the known knowns and we learn a lot."

In the world of extreme events, there are very few known knowns. "What a cat model does," says Keogh, "is take the known knowns and extrapolates from those to create known unknowns in a stochastic simulation."

He adds: "Unknown unknowns are everything else, and that's the largest category, but we don't address that."

The Tohoku earthquake was a known unknown because the experts knew about the fault system but didn't think a magnitude of 9.0 was likely.

Unknown unknowns

The series of events that led up to the nuclear meltdown were more in the realm of unknown unknowns, Keogh relates. "First you had a megathrust fault rupture at a magnitude that released 500 times more energy than was anticipated. The second thing that happened was that this caused a larger than expected tsunami: instead of having a 30-foot wave, you had an 80-foot wave.

Next, the nuclear plant shut down, as it was supposed to, from the ground motion. Then the back-up generator was supposed to put cooling water into the core so it didn't melt down. But the back-up generators and the oil tanks were situated on the coast side of the plant and quite low on the ground. If they'd built it differently - higher up - it might not have happened."

It's a challenge to communicate what models can and cannot do, Keogh accepts. "We have a minority of people who say the models don't work. But I think that debate is long settled. They need to appreciate the uncertainty. We don't claim to do everything. We can't. There

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are some things that can't be parameterised."

And the model must be useful, he adds. "For example, there is so little data on tsunamis that our conclusion is that it [modelling tsunamis] probably wouldn't be useful and it would probably undermine modelling. Our goal is to set rational expectations about risk. It's not about accuracy or focusing on a point estimate, it's about helping people understand all of the uncertainty involved and what they should expect from Japanese earthquake, US wind, European windstorm and so on."

The Tohoku earthquake will have ramifications for the catastrophe modelling community, he says. Egecat is very involved in the post-event research. "This is going to take some time and we're not rushing to change things. If you look at the data for earthquakes in, say, the US, it goes back over 200 years," says Keogh. "But 200 years is a very short period of time for extreme events like intense earthquakes of magnitude 9.0, so there's a lot of learning that can be done."

In any case, Egecat favours incremental change to its models. Egecat is updating its US hurricane model next month, as it has done every year since 2003.

"Our approach is to maintain our US hurricane model on a regular basis. So this release that we have in 2011 involves some refinements, some modest reductions of 10% or less, with the most significant reductions in Florida. And I think that's within the expectations of our clients."

The new version of RMS's hurricane model, version 11.0, which was released in February, resulted in estimated loss exposures more than doubling in some areas and caused Deutsche Bank analyst Josh Shanker to write of an "RMS v11 backlash" among reinsurers in Bermuda (IERM, Cat risk/ILS, 23 May 2011, RMS faces Bermuda backlash to new hurricane model).

Has the controversy created new opportunities for Egecat? All Keogh would say is: "We have a lot of new clients and we have a lot of people interested in our hurricane model."

An English literature graduate, Keogh started his career at AIG and spent most of his time there in the developing markets. After a spell in reinsurance, he moved to RMS where for 12 years he led business and client development. He joined Egecat two years ago, becoming president in November last year.

The Egecat hallmark, according to Keogh, "is our robust treatment of uncertainty and our methodology. We are obsessive about characterising as much uncertainty as we can. I would also include our unique approach to correlation."

## Using more than one model

But he recognises that one model isn't always enough. "The trend seems to be increasing to use more than one model. Having multiple perspectives can promote a healthy debate within an insurance company about risk."

Keogh admits to being a proponent of the use of multiple models. "If you only have one perspective, I think it's easy to become complacent with that view of risk. If you have two, you have to reconcile, and that reconciliation leads to knowledge."

He says he tells companies not to worry about models disagreeing. "I would be more worried if the models agreed. Clients owning their own perspective on risk is a strategic asset. You can't outsource your understanding of risk to a modelling firm."

Keogh is dubious about the effect of global warming on hurricane activity. Egecat keeps an eye on the research but Keogh says: "Our conclusion is that while that work is interesting, it has no role in catastrophe risk modelling. The amount of uncertainty associated with the postulation is so high it is not useful."

"200 years is a very short period of time for extreme events like intense earthquakes of magnitude 9.0, so there's a lot of learning that can be done."

time - from 20 to 35 or 40 years.

"If you look at the historical records, you'll see that during the warmer periods you have more and intense hurricanes and during the cooler periods you have fewer and less intense hurricanes."

"That's a cycle," he stresses. It doesn't have anything to do with global warming. "We don't buy into the idea that a warmer climate creates increased hurricane frequency and intensity."

## Clustering important for modelling

By contrast, clustering is probably one of the most important things to understand in modelling, particularly for climate risk. "If you look at what happened in 2004 and 2005 with US hurricane, that was clearly a clustering phenomenon, and capturing that accurately in a catastrophe risk model is extremely important. We use a non-Poissonian approach to modelling that risk which we think is very appropriate for capturing that effect of clustering."

Egecat explains that the problem with using the Poisson recurrence model for catastrophe modelling is that it has no memory - "the probability of an event next week is independent of any past event occurrences." So the firm uses other (non-Poissonian) recurrence models that can better simulate the cluster patterns exhibited in nature. "The product of this effort is a more complete model of catastrophic risk," Egecat says. "These models are reflected in our aggregate loss exceedance curves and in the modelled probabilities of multiple event occurrences in a year."

Keogh stresses there are important effects of correlation for earthquakes that Egecat does

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"Our goal is to set rational expectations about risk. It's not about accuracy or focusing on a point estimate."

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He maintains that you have to distinguish between what is observable and what is speculation.

"What we do know," he observes, "is that in the North Atlantic basin there is a statistical correlation between increased sea surface temperatures and increased frequency and severity of hurricanes."

This is based on the warm Atlantic multi-decadal oscillation, and that phenomenon switches between cooler than average and warmer than average over long periods of

capture, for instance, in its Canadian earthquake model and Pacific North West US model. "The plate tectonics are connected," Keogh observes, "and this is reflected in the models. That's also true for our Latin American models and for a number of our Asian models."

The question Keogh gets asked a lot is: are there more catastrophes?

The answer is "no", he says. "But what is happening is that the global economy continues to grow. We do continue to put things in harm's way. And there's more insured building stock in the world today than there was last year and it continues to expand, particularly in Asia, so the potential to have more and more insured losses increases."

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