

Models for managers

Catastrophe models, an essential part of the armoury of insurers and reinsurers in managing their property risk books, are increasingly attractive to businesses.

By Lee Coppack

Starting as a process by which insurers and reinsurers managed the accumulation of catastrophe exposures in their property portfolios, catastrophe models are developing into risk management tools for the property owner as well, thanks to their increasing precision in terms of location and property-use. Catastrophe models are now available for a wide range of catastrophic risks and territories worldwide, including specific industry types. They can create a profile of the probability of different damage levels and costs from thousands of possible events in geographic locations defined as precisely as single sites.

Today's catastrophe model is a computer based process which generates thousands or tens of thousands of possible variations of physical effects from an event, such as wind speed or ground shaking. The reason for this is that extreme events are by their nature so rare that the historical record does not give a statistically significant sample from which to draw conclusions about future event intensities and geographical footprints.

The model, however, can do so. It then applies these potential hazards to property in a geographical area to assess how badly the structures would suffer and how much the damage would cost. Finally, it incorporates insurance or reinsurance parameters, such as deductibles or attachment points, and creates a profile of the probability of the loss from an event exceeding certain levels.

Models use huge databases of information, primarily about historical events, physical conditions, geology, topology and property construction quality, age and usage. To work acceptably fast, they also need an enormous amount of computer power to generate the huge number of variations in hazards and calculate the effect of all these

hazards on property, the likely cost of damage and insured losses. An enormous amount of scientific, engineering and mathematical expertise goes into the selection and structuring of data and creation of the mathematical statements or algorithms that act as the engine for the model. Vast amounts of computer coding make the process run in a matter of hours, not weeks or months as would have been the case in the past.

This is the statistically based model, but in this century models are becoming increasingly able to incorporate scientific data of, for example, developing weather systems. Not surprisingly, therefore, catastrophe models are time consuming and expensive to create.

Licence fees start in tens of thousands of dollars or euros and run into hundreds of thousands, depending on the size of the model. During the soft insurance market, their cost alone would have made them unattractive to property owners or developers. Jonathon Gascoigne at Benfield ReMetrics adds that primary property insurance covers are often all-perils or multi-risk, where as catastrophe models are peril specific. “There is, thus, more latitude for pricing a bundle of exposures than a single risk.”

Three companies have largely captured the market for proprietary models: Risk Management Solutions (RMS), which is owned by the Daily Mail and General Trust; AIR Worldwide, now owned by Insurance Services Office (ISO) in New York, and EQE, which is part of ABS Consulting. Brokers, such as Aon, Benfield, Guy Carpenter and Willis license models from these companies and develop their own to assist both their major direct clients and primary insurers.

EQE gives as a breakdown of its client base: reinsurers 30%; primary insurers – 55%; brokers/intermediaries – 10% and insureds and others – 5%. AIR says it is roughly 50% reinsurers, 40% primary insurers and 10% others. RMS does not specify but says essentially its client base follows the market proportions for reinsurers, primary insurers and brokers. RMS traditionally has not marketed directly to corporations.

Today, however, the situation is changing as the current hard market and realisation of the potential impact of extreme events are stimulating interest in catastrophe modelling among corporate risk managers. Ming Lee, senior vice president at AIR Worldwide, estimated the use of catastrophe modelling by corporates today is about a decade behind the use of catastrophe modelling by insurance companies but growing. He says: “In the work we have done for major corporations, we have helped risk managers take the guesswork out of making insurance decisions. In some cases, companies have been underinsured. In other cases, they were over-insured. Going with more insurance was easy in a soft market when insurance was cheap. But in this hard market, a risk manager needs to be more cost-effective.”

ABS Consulting vice-president Bob Healy says there is “very strong” interest from business and public authorities in highly exposed regions and during hard insurance markets. ABS, he says has modelled portfolio risk for hundreds of corporations for over 20 years and done site specific risk assessments (engineering walk-downs) for thousands of corporate and government sites worldwide and advised firms of risk mitigation actions. “EQECAT software is used for these projects to quantify risk in a standardised manner.”

Oliver Prior, research and development director at broker Willis has some reservations. He believes that while some property owners with large portfolios may make extensive use of a captive insurance company, they are few and unlikely to spend the necessary money on licensing models themselves.

“I think most captive insurance company owners are reluctant to directly employ extensive modelling skills. Rather, they rely upon their consultants or reinsurers. In most cases running a captive insurance company is non-core and committing money to non-core activities such as insurance underwriting is not something undertaken lightly. As long as property reinsurance is available then I don’t think modelling will become a major feature in the captive world.”

However, RMS lead engineer Phil LeGrone says that energy companies are showing an interest, mainly through their brokers, in the company's industrial facilities model, which covers a number of business types in the sector, and its new windstorm model for US gulf offshore platforms. “They are looking at their exposures from the ground up, and they are also interested in the different coverage permutations for different return periods, average annual losses and benchmarking their coverage rates.”

Relationship with insurers

Karen Clark, an economist then with broker E. W. Blanch and now president of AIR, developed the world's first commercially available hurricane model, called Catalyst, in 1987. But it was the devastating effect of Hurricane Andrew in 1992 on the insurance industry that really spurred the large scale development of modelling. Insurers and reinsurers simply did not know the extent of their exposures to a major Florida Hurricane; 11 of them failed and others had to recapitalise.

Insurers and reinsurers increasingly used the models to monitor their aggregate exposures which in turn has helped them to structure their excess of loss programmes, increase rates to respond to additional pressures on their capital or simply avoid accepting further business from specific areas.

Florida windstorm and California and Japanese earthquake were the perils most in demand by re/insurers in the early days. Since then the three modelling companies, as well as brokers and re/ininsurers, have broadened and deepened their capabilities. Not only is windstorm and earthquake covered in many countries, there are even models now for risks as difficult to quantify as terrorism. Most months there is an announcement from one of the modelling companies of a new model or significant refinements to an existing model.

In March 2003, RMS launched an offshore energy platform model for the US Gulf. It also has an industrial facilities model for 26 types of occupancies in about 15 countries, and construction risk and US workers' compensation. AIR is currently developing a tropical cyclone model for Mexico, tropical cyclone and earthquake

models for other Central American countries and a severe thunderstorm model for Australia. Both have US terrorism models for property and other classes.

EQE models property and workers' compensation risks for US terrorism, US flood, tornado-hail, wildfire and western European flood. In preparation are US winter storm/ice, an expansion of European flood and European urban terrorism.

In addition to developing models for new perils and new territories, the companies regularly update all their existing models with the latest data and scientific research. Thanks to consolidation, many re/insurance companies have geographically wide exposures, and demand for models is high. According to Matthew Grant at RMS: "Many clients license all the models that we develop."

More information

Insurers define their portfolios in terms of the location of the insured assets. Their aim is to match the information they get from their clients about risk sites as closely as possible with the geocoding used in their catastrophe models.

Early models were described as "high level". The level of geographical definition was such that the exposure was averaged across quite large areas that may actually have been far from homogenous. With increasing precision in the models, insurers are turning to their possible use to make rating techniques more quantitative. This means they want more information from the risk owner.

According to Mr Gascoigne: "This issue of moving from accumulation focus to an individual risk rating is certainly current, especially with regard to flood. This requires a great deal of (generally expensive) high resolution data."

Matthew Grant of RMS explains: "The data that actually makes significant changes in loss results will depend on the building location – for example, whether a building is one mile from the coast or 25 miles makes a big difference. However, whether it is

100 miles or 500 miles makes less difference for hurricane. Likewise the closer a building is to an earthquake fault the more important it is to have detailed data.”

What is more, re/insurers want the information in compatible format, so it can be “cut and pasted” into the model, according to Neil Flatman, portfolio manager international property for QBE International. The general feeling is that data standards, notoriously difficult in the insurance industry, have improved but can go considerably further.

Making this information available should work to the risk manager’s advantage in the hard market. Mr Flatman explains why: “Models have become more and more information hungry,” he says. “What we really need from clients is the understanding that if they give more information and better information, we have a closer relationship. If the quality of the information is poor, then the model assumes that the risk is own/worse results, which can lead to higher rates, higher attachment points and smaller lines.”

At the same time, there are drawbacks. According to Oliver Prior, thanks to modelling, re/insurers have been able to distinguish more accurately where certain events like flood are remote, a one in a hundred or lower probability, or where flooding has to be expected. “This has led to risk selection in certain instances or requirements for flood controls to be adopted. Total non-availability of flood insurance is a major problem since it impacts on property and technically puts a property owner in breach of their mortgage/lending requirements to fully insure a building.”

FM Global as one of the largest insurers of industrial risks in the world, has been using catastrophe models, particularly US east coast windstorm models, for around ten years for portfolio management. Mike Birke, vice president and head of catastrophe management for FM Global, says to extend their usefulness into risk rating, models need to be able to incorporate differences in vulnerabilities between risks of the same types. “If a customer has spent \$10 million to improve their facilities so they are not likely to have a loss, we take that into account but the model would not be able to differentiate.”

FM Global employs around 1500 engineers who inspect customers' facilities and recommend ways to reduce risks.. Experience has shown, Mr Birke says, that effecting these measures reduces very significantly the damage suffered by industrial facilities exposed to windstorm, earthquake and other natural hazards. However, these are often not obvious, large projects; 70% of the measures recommended cost less than \$1000 to implement.

When insurance rates were low, it was not cost effective for modelling companies to do the time-consuming work of allowing the models to reflect individual risk variations – as compared to general building, occupancy and value parameters. That is changing. For example, Florida Department of Insurance requires insurers to reduce premiums for homeowners who have effected certain storm resistant improvements to their homes. This has given the incentive for models to capture that information.

The RMS model for oil platforms in the US Gulf does have a “laundry list” of secondary modifiers which the user can tick to build a profile individual risk characteristics. Says Phil LeGrone: “That is ultimately the direction in which we need to head - but it is time consuming and expensive to do.”

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