DAY 2
TUESDAY, OCTOBER 28 2008

THE Review
Class Report

THOUGHT LEADERSHIP ON THE KEY RENEWALS ISSUES

TODAY ▸ MODELLING

Balanced modelling

A FIRM GRASP OF CATASTROPHE MODELLING ISSUES IS ESSENTIAL FOR A BALANCED ESTIMATION OF RISK, SAY ERIK RÜTTENER AND MANUEL PRECHTL

The scientific modelling of natural perils has become the most effective means to estimate insured risk, allocate capital, control exposure accumulations and price re/insurance covers. Despite this broadly accepted fact, the large variability of model outputs and lack of transparency and understanding as to how the models work is causing frustration and an ensuant fall in credibility.

USING MULTI-MODELS

The commonly adopted solution is to use a variety of models at the same time, the so-called 'multi-modelling approach'. This avoids the risk of bias associated with using a single model. Multi-modelling is however a complex procedure involving the determination of the most suitable result from a number of different models using appropriate criteria developed from experience and model understanding. Unfortunately, in practice it is often no more sophisticated than averaging the different model results and/or disregarding outliers. This latter take on multi-modelling can not reliably produce a balanced judgement of risk.

While a multi-modelling strategy is an effective approach to avoiding model biases and to make balanced risk judgements, the key challenge that absolutely has to be addressed while doing this is to understand what is causing the differences in modelled results.

ACTION POINTS

The prerequisites for managing the inherent uncertainties in catastrophe modelling and to arrive at a balanced analysis for an individual risk situation are to fully comprehend:

- the scientific and methodological assumptions of the model
- the sensitivity of its outputs to the key assumptions of the model
- the quality of the exposure data.

MAKING ASSUMPTIONS

Accurate modelling of any physical system is often impossible due to a limited understanding of the involved processes, and also due to incomplete and imprecise data. As with catastrophe models, such limitations are addressed typically by parameterisation and other assumptions, yielding to an acceptable level of confidence.

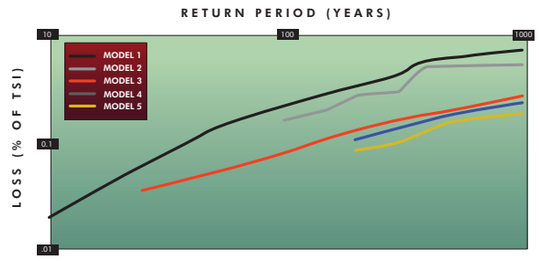
Assumptions are made in all catastrophe model modules, as for example:

- When describing the hazards, it is assumed that storm losses can be parameterised by maximum gust and earthquake losses by ground motion intensity.
- Probabilistic event sets are generated using numerous simplifications and assumptions, such as frequency distribution functions derived from limited historical observation.

Model outputs are extremely sensitive to this choice of parameters and other modelling assumptions, and these must therefore be understood if an appropriate estimation of risk is to be made.

PARAMETER SENSITIVITY DATA ON PAGE 2

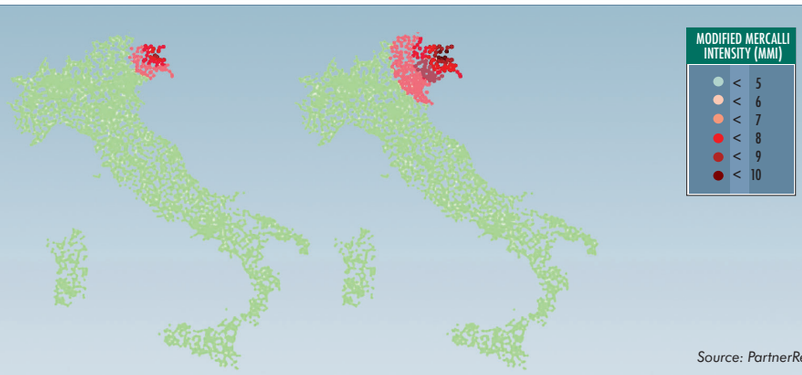
CATASTROPHE MODEL VARIABILITY



Model results for the same natural peril and insured risk portfolio; the expected loss as a percentage of the total sum insured for the given return periods varies here by up to a factor of four. Multi-modelling is a complex procedure requiring an understanding of the differences in modelled result. *Source: PartnerRe*

FROM PAGE 1: PARAMETER SENSITIVITY

Illustration of catastrophe model sensitivity to a particular parameter. The two maps of Italy show the contrasting modelled earthquake intensities for an identical earthquake event, but in each case using a different assumption of the ground motion attenuation.



Source: PartnerRe

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THE ISSUES:

- **Adopting a balanced approach to modelling**
- **Pricing parametric covers**
- **Cat models and cycles**
- **Pros and pitfalls of portfolio modelling**

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Pricing parametric covers

INTERNAL MODELLING EXPERTISE AND A MULTI-MODEL APPROACH APPLY EQUALLY TO BOTH INDEMNITY AND PARAMETRIC ALTERNATIVES FOR COVER, EXPLAINS **RICK THOMAS**

Natural catastrophe cover is widely available on an indemnity basis within the reinsurance market; $150bn of catastrophe excess of loss limits are currently purchased in this way.

PARAMETRIC PURCHASING

A smaller but significant amount of capacity is now also purchased on a parametric basis. These deals are a valuable addition to the range of natural catastrophe covers offered to insurers by reinsurance companies and the capital markets.

Parametric deals span a wide range of types, from Industry Loss Warranties (ILWs) to complex indices calculated using measured ground acceleration (earthquake risk) or wind speed.

POTENTIAL DISADVANTAGES

From a cedant's perspective, the largest problem is basis risk: a parametric deal can fail to trigger when the buyer has a significant loss. Detailed modelling can help to minimise this risk, but the unquantifiable problem of unforeseen and unmodelled aspects of catastrophe events remains. Currently market players have taken very divergent views of the magnitude of this potential risk, and how much it is worth.

Nevertheless, it is most likely to be outweighed by the advantages of parametric covers especially in the case of risks typically difficult to place in the reinsurance market.

From a reinsurance perspective, parametric deals have the disadvantage that they are not a mainstream market product. This means that there is potential reputational risk if they have a significant loss through a parametric deal and no significant insurance losses occur. This can be mitigated either by setting double triggers requiring actual losses to have occurred, or by ensuring that only limited catastrophe capacity is offered on a parametric basis.

ACTION POINTS

The provision of a sustainable product in the parametric domain requires investment in modelling and careful analysis of the real outcomes of parametric deals, triggered or untriggered

THE SKILL IN PRICING

Parametric deals are frequently one off deals and while there are no standard 'off the shelf' models to price these covers – as exist for traditional indemnity reinsurance – vendor modelling companies have been constantly improving their respective service offerings.

What must be noted, however, is that models for pricing all forms of catastrophe protection – indemnity and parametric – are based on the same underlying natural hazards analysis. The same multi-modelling approach and in-house expertise in catastrophe modelling and in the variance of model results is therefore essential, both from a supply (pricing) point of view and to maintain cedant appeal through availability and the minimisation of basis risk.

Cat models and cycles

WHEN CAT RATES FALL THE TECHNICAL PRICE FROM MODELS HAS POTENTIAL TO FOLLOW SUIT. RICK THOMAS DISCUSSES THE HIDDEN RISK TO RE/INSURERS IF IT'S ALLOWED TO DO SO

A frequently hailed virtue of catastrophe models is that they will ensure that catastrophe reinsurance pricing remains relatively stable and that there will be a technically defined minimum market price that reinsurance companies will find acceptable. The reality, however, is somewhat more complex because model outputs are sensitive to the vulnerability assumptions made about the modelled property risk portfolio. By assuming that the building stock is of a higher storm or earthquake resistance, for instance, it becomes possible to reduce the technically modelled price.

SENSITIVITY ANALYSIS

There is now an increasing tendency to carry out model sensitivity analysis on a property portfolio to identify just which assumptions can be tweaked to produce the largest (downward) changes in technical price. This feature of models can be used to substantiate further reinsurance price reductions in the soft market and is potentially allowing the models themselves to become, in contrast to their 'impartial' virtue, a contributory factor to overall price cyclicality.

ACTION POINTS

PROTECTION AND PRICE

With the 1/1 renewals looming, the natural conflict between protection and price is on everyone's minds. Event volatility and the catastrophe experiences of past years should remind us to question and understand changes in modelled price as a fundamental component of the pricing discussion

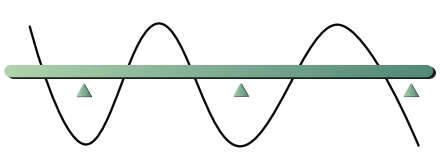
DRIFTING DOWNWARDS

The current soft cycle is not the first time that modelled loss distributions have drifted downwards. Prior to Katrina, Rita and Wilma in the US in 2004, the introduction of detailed modelling and the wider range of associated vulnerability classifications available had tended to reduce PML estimates relative to the first hurricane models produced in the early '90s. The reality of the losses that occurred in 2004 and 2005 however, challenged many model assumptions and led to among other changes a detailed review of vulnerability assumptions by modelling companies.

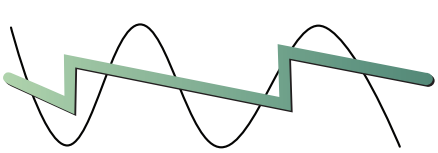
Tweaking catastrophe modelling in this way is a potentially dangerous practice. For insurance companies, the adjusted outputs also indicate that less reinsurance protection is needed, resulting in the risk of inadequate cover when an event happens.

For reinsurers, the danger is that they also use these results to systematically make more optimistic assumptions across their whole portfolio. If a reinsurer combines such optimistic assumptions with a model based approach to accumulation control, they may significantly underestimate their potential catastrophe exposure. This over reliance on modelled PMLs was highlighted for some reinsurers in 2005 and potentially leads to a significant and devastating loss of capital after an event or in one year.

MODELS AND PRICE CYCLICALITY



Cat models exert upwards pressure on price as the cycle hits its low point.



Models follow the cycle down as users apply more optimistic parameters, but major events will subsequently drive the models back up.

Portfolio modelling

A NUMBER OF IMPORTANT TECHNICAL FEATURES AFFECT THE QUALITY OF MODELLING, AS GAUTIER DE MONTMOLLIN EXPLAINS

Risk management requires exposure capping and an intelligent approach to the potential annual accumulation of losses. Catastrophe events are a principal concern. Portfolio modelling provides risk profiles that are in effect a snapshot of potential loss by catastrophe peril-zone given various loss scenarios.

This information provides a better understanding of the main components of a portfolio, and is important both for internal risk acceptance and reporting, as well as for external reporting to rating agencies and regulators.

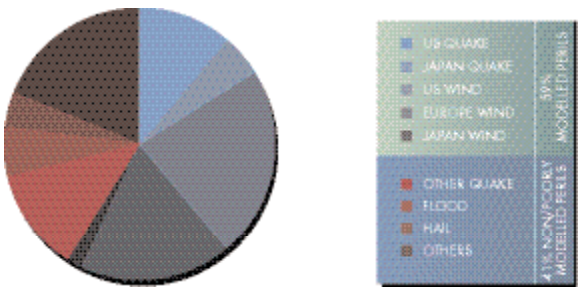
Catastrophe models are central to providing this snapshot of risk accumulation; they estimate loss potential for the main catastrophe perils and regions, and help to describe risk dependencies. Certain catastrophe models are however better than others for specific regions, perils and lines of business.

One also has to be aware that a comprehensive description of risk requires the inclusion of minor, unmodelled perils; which can account for up to 40% of the risk in a globally diversified portfolio. Certain programmes may also be unsuitable for catastrophe modelling due to data quality and/or complex structure. The available actuarial pricing estimates for these risks provide the only source of exposure data.

For a portfolio model to provide a full description of risk, it is therefore critical that it can accommodate the outputs of multiple catastrophe models and also pricing estimates. Aggregating pricing estimates within and across catastrophe peril-zones is an additional challenge for modellers requiring techniques that also effectively deal with the tail-risk element.

A PARTNERRE PUBLICATION THAT REVIEWS THESE FEATURES IN DETAIL WILL BE AVAILABLE IN SPRING 2009.

DISTRIBUTION OF EXPECTED LOSS



Percentage of expected total loss to a portfolio of catastrophe risk from modelled and non/poorly modelled perils. *Source: PartnerRe*

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