AIRCURRENTS

THE EVOLVING REGULATORY PROFILE OF CATASTROPHE MODELS

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EDITOR'S NOTE: In this first of a two-part series on catastrophe models and regulation, AIR vice president John Rollins discusses the role of models in ratemaking.

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The evolving market equilibrium in the financing, pricing and underwriting of U.S. coastal residential property insurance has precipitated a degree of unrest from Texas to Massachusetts. Availability and affordability concerns have spurred political leaders in many states to examine root causes—often for the first time. This has led them to investigate the use of catastrophe models, given their status as an important source of information in developing insurance rates and underwriting guidelines. In many cases, the results involve a call for greater regulation of the use of models or even of the modeling firms.

This article is the first of a two-part series. Part 1 briefly discusses the actuarial principles underpinning regulated ratemaking for catastrophic perils, the limitations of historical data and consequent role of catastrophe models in ratemaking. In Part 2, to be published in April, we will trace the history and current state of model regulation and its implications for the future.

PART 1: THE ACTUARIAL RATIONALE FOR USING CATASTROPHE MODELS IN DEVELOPING REGULATED RATES

The final responsibility for proposed rates in regulated environments rests with the insurer filing the rates and, by extension, its actuaries developing the indicated rates. Regulations in most states specify that rates should be "not excessive, not inadequate, and not unfairly discriminatory." In parallel, actuarial principles specify that rates are "reasonable," as well as meeting the regulatory standards above, if they are "estimates of the expected value of all future costs associated with an individual risk transfer".[1]

Actuaries usually deploy these principles through a cost-based premium formula comprising various components. In lines of business exposed to catastrophe losses, two provisions in particular are often influenced by the results of catastrophe models:

>> Expected loss costs are often based on modeled average annual losses per unit of exposure—a standard model output;

>> Costs of capital reflect the need to access large amounts of liquid funds at any time to pay event claims, which may total many multiples of annual premium. Such access is not free, and is provided largely—though not exclusively—through reinsurance.[2] Again, such large loss scenarios are a standard part of catastrophe model output.

The actuarial standards of practice (ASOPs) that are generally binding on U.S. practicing actuaries explicitly allow the use of model results as a substitute for historical claim amounts in ratemaking.[3] Why? Because catastrophe events have several attributes that make the use of historical claims data for purposes of pricing problematic. Catastrophe events, by their nature, are:

>> Infrequent—producing historical data of insufficient volume and stability for ratemaking;
>> Severe—potentially causing event losses many times total annual premium in a single state and line of business, the usual scope of a regulated rate filing;
>> Unpredictable—making it impossible to determine when and where they will occur within the short time and space horizons used for ratemaking (e.g. rates effective for one year in one state and line).

The infrequency, high severity and randomness of catastrophe events makes actual catastrophe claim costs so volatile that they are of limited use in ratemaking. For example, the preceding ten years of hurricane claims data (1993-2003) applied to an early 2004 Florida homeowners rate filing would have resulted in a minimal provision for catastrophes and very low indicated rates. A parallel data set (1995-2005) applied to a 2006 rate filing would have revealed massive loss costs and indicated rate increases untenable for both regulators and consumers.

Further limiting their usefulness, claims data used in ratemaking must be adjusted to reflect current conditions. This is very difficult to do with catastrophe event data due to several significant trends that are significant in areas prone to catastrophes, yet unevenly distributed by rating territory and class. Such trends include population growth, growth in the replacement value of insured properties, expansion in policy conditions (with more generous loss settlement bases and more optional coverages in use), and changes in building practices, codes and their enforcement.

Catastrophe models consist of software applications embodying scientific relationships among physical events, the vulnerability of structures, and economic and insurance conditions. They use computing power to generate tens of thousands of simulated years of loss experience for any property data set presented to the models, essentially eliminating pure randomness caused by insufficient sample sizes. Beyond the "convergence" argument, there are other actuarial advantages to using modeled loss data:

>> Current inventories of properties, replacement values, and policy conditions are inherently reflected in the model results to the extent they are reflected in the exposure data;
>> The full statistical distribution of potential losses is returned by the model, not simply a "best estimate" based on a combination of historical data and selected adjustment factors;
>> Sensitivity testing of the modeled losses to various assumptions about exposures, property attributes, and characteristics of the events is straightforward and transparent.

While catastrophe models offer a "better mousetrap" for generating ratemaking data, modeled losses and actuarially sound rates do not move in lockstep, for many reasons. The premium dollar comprises many other significant components, such as loss adjustment expenses (LAE), overhead and acquisition expenses, and reinsurance costs, all of which vary according to insurer capital structures and business practices. And while reinsurance costs are implicitly dependent on the "technical prices" indicated by models, they are in fact also driven from year to year by economic fundamentals of the supply and demand for capital in a free market.

In addition, reasonable actuarial assumptions and methods are wide-ranging; two actuaries could apply accepted formulae and professional judgment to the same data (including cat model results) and determine very different rates. And notwithstanding actuarial indications, insurer management often sets rates and schedules rate filings in accordance with competitive, operational, and regulatory factors. Finally, though models are carefully validated against historical claims data, there may not be a perfect correspondence between coverage assumptions in models and the actual coverages available after events in an insurance policy.

ASOPs, which apply to actuaries rather than models, allow the use of models only if the actuary carries out certain responsibilities intended to optimize professional judgment. One standard in particular[4] enumerates five basic responsibilities:

1. Determine the appropriate reliance on experts;
2. Have a basic understanding of the model;
3. Evaluate whether the model is appropriate for the intended application;
4. Determine that appropriate validation has occurred;
5. Determine the appropriate use of the model

Together, these dictums clearly imply that the actuary must do a fair amount of homework when relying on model results to support rate filings. Justifying filed rates to regulators and the public solely with "the model said so" meets neither actuarial standards of practice nor regulatory rules in most states.

ASOPs encourage the use of multiple models or methods, when available, to develop indicated rates. Thus it is not unreasonable to also consider alternative models—such as the one developed by AIR to test the sensitivity of modeled losses to warm sea surface temperatures. More broadly, catastrophe models are far from monolithic; several models are offered by both private and public entities, and their results differ, sometimes substantially, across perils, regions and construction types. Rate indications "based on the models" for a given line and state may lie in a wide range, depending upon which models are used and how the results are blended.

IN CONCLUSION

In this article, we have touched on the theoretical and practical motivations, as well as the complexities associated with using catastrophe model results in regulated ratemaking. In the next article, we will springboard from this context to the history and current landscape of legislative and regulatory activities regarding models, the policy choices facing governments in the near future, and the impact of those choices on the hazard risk marketplace.

1 CASUALTY ACTUARIAL SOCIETY STATEMENT OF PRINCIPLES REGARDING PROPERTY AND CASUALTY INSURANCE RATEMAKING.
2 EVERY INSURER RETAINS PART OF ITS EVENT RISK, AND OPPORTUNITY COSTS OF INTERNAL CAPITAL, AS WELL AS ANY OTHER SOURCES OF CAPITAL SUPPORTING CATASTROPHE RISK (SUCH AS CAT BONDS, MUNICIPAL OR CORPORATE DEBT) SHOULD BE CONSIDERED IN RATES.
3 ASOP #39, "TREATMENT OF CATASTROPHE LOSSES IN PROPERTY & CASUALTY INSURANCE RATEMAKING".
4 ASOP #38, "USING MODELS OUTSIDE THE ACTUARY'S AREA OF EXPERTISE (PROPERTY & CASUALTY)" AND #39, "TREATMENT OF CATASTROPHE LOSSES IN PROPERTY & CASUALTY INSURANCE RATEMAKING", SEE WWW.ACTUARIALSTANDARDSBOARD.ORG

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