CAT 360

Catastrophe Risk from Every Perspective

The CAT 360 is a quarterly newsletter that features articles developed by our Research and Development Team and covers topics that relate to Catastrophe Modeling, Natural Perils and Information Technology on a global basis. Please feel free to contact the editors if you have any questions or comments regarding any of our publications.

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Feature Stories

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Assessing the importance of data quality to the accuracy of catastrophe model outcomes

Ever since the first commercial catastrophe models became available (AIR Worldwide - 1987, Risk Management Solutions - 1988, EQECAT - 1994), there have been questions about their reliability. But one thing is certain: the quality of data that goes into the model plays a pivotal role in the quality of results that are generated.

As catastrophe models and their results have become an established part of the insurance and reinsurance landscape, the industry has become more reliant on their results.

Modeled results contribute to rate making, aggregation potential, developing capital contributions and adding risk to the portfolio among other things.

With each new release the modeling companies expand their catalog of available regions and perils, update methodologies based on lessons learned from past events and new science, and improve functionality through the betterment of the design and technology. Similarly, model users have made improvements in data capture and granularity.

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< Challenges to ensuring data quality

Data collection is both difficult and costly. Insurers write many policies and cover many locations within their book of business. It takes a great number of man-hours and dollars to inspect new and renewal business. Insurers' methods of storing data can also be problematic. Some legacy systems do not transfer schema standards to the database as well as others. But with most, if not all, insurers using one or more of the models in house, this should become less of an issue over

- Resolution/geocoding - the ability to model street address as opposed to a lower level resolution (e.g. zip code) can have a dramatic impact on the modeled loss, specifically in coastal regions that are affected by wind events;
- Primary characteristics - construction and occupancy information; and
- Secondary characteristics differing by exposed peril (e.g. roof type, year built, square footage etc. for hurricane models and soil type, number of stories etc. for

time.

There is a need for detailed and accurate data collection by insurers which captures:

- Values - proper insurance-to-value (ITV) is a significant factor in the model's ability to simulate a loss close to what actual loss would be;
- Limits - specifically for commercial/industrial business, the more accurate the business interruption (BI) limits, the closer simulated results are going to be to an actual event;

earthquake models).

Once the data has been collected, care needs to be taken when creating the database so as to ensure the information is interpreted correctly by the model. It is easy to notice information that is missing, but more difficult to identify where something has been entered or coded incorrectly, especially when looking at large datasets.

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< The implications of data quality

Catastrophe modeling results are largely ineffective without quality data collection. For insurers, the key risk is that poor data quality could lead to a misunderstanding regarding what their exposure is to potential catastrophic events. This in turn will have an impact on portfolio management, possibly leading to unwanted exposure distribution and unexpected losses, which will affect both insurers' and their reinsurers' balance sheets.

Cat modeling results are also used by insurers to anticipate the financial effect a catastrophic event may have on its portfolio/balance sheet and to assist with the purchasing of reinsurance limits. If results are skewed as a result of poor data quality, this can lead to incorrect assumptions, inadequate capitalization and the failure to purchase sufficient reinsurance protection.

Figure 1 - Buildings come in many shapes and sizes, old and new. All of these buildings are very different, but can look the same to a cat model if the proper defining data elements are not maintained in a dataset.

While data collection is the responsibility of the insurer, reinsurers place a high level of importance on quality of the exposure data that is provided as it has an effect on their underwriting decisions and portfolio profitability. The higher quality of data an insurer can provide, the greater the credibility a reinsurer will give for a modeled result. Insurers can tap many sources of information (modeling companies, cat management consultants, reinsurers), to improve data quality within their portfolio. An insured's ability to provide a high level of data quality as part of their reinsurance submission, would only enhance their reputation within the reinsurance market place.

Companies like Marshall Swift Boeckh (MSB), ISO and AIR Worldwide have developed products to aid re/insurance companies in determining the value of a structure. The systems utilize databases with structured algorithms and capture the building characteristics in calculating the value (residential and commercial). While these systems are not infallible, they provide a structured and consistent approach in the assessment of value.

Standardized data is also an important step towards improving data quality for the industry as a whole. The ability to use standardized data across different platforms will improve the accuracy and simplify the compiling of data. As a result, many re/insurers have adopted or are planning to adopt ACORD (XML) standards. Facilitating this development of standardized data was the main impetus behind the formation of ACORD, a nonprofit standards development organization serving the insurance industry and related financial services industries.

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< Improving the models

While insurer and reinsurer data collection is an essential ingredient in improving the accuracy of modeled results, it is not the only ingredient. Improvements made to the catastrophe models themselves, either through advances in computer power, new scientific knowledge or lessons learned from actual events, will also help elevate accuracy. Modeling companies can influence the industry by setting data standards and guidelines that are important in modeling. Converting from building's fire classification to an actual building type (i.e. non-combustible versus reinforced concrete), is one example of how the quality of data has matured over the last ten years.

There are many lessons to be learned from each catastrophic event that occurs and these opportunities are well utilized by the modeling companies. After every event, teams of scientist and engineers survey the damaged regions to study how structures perform. Post event claims analysis is conducted and combined with the on-site survey results to refine the model's vulnerability functions. Every event is viewed as an opportunity to calibrate the models and improve their ability to simulate perils with greater accuracy.

The modeling companies also work extensively with insurers to increase the understanding of the model capabilities. This includes emphasizing the benefits to be gained from committing time and effort to collecting quality data. The modelers continue to push for detailed (street address if possible) data collection as opposed to aggregated data, which may use the centroid of a region and add significant uncertainty to the hazard assumption.

The collection of detailed exposure data provides insurers with a better knowledge of their portfolio and its risk. This knowledge can be passed along to reinsurers who are then able to use it with other submission details to develop a comfort level and better understanding of the insurer and its business.

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< Understanding uncertainty

For reinsurers, a multi model approach can only improve the analysis as all modeling companies have differing views of catastrophic events. While the analysis results from various models tend to converge for industry-wide portfolios, differences can be significant on a more granular level. A company's comprehensive understanding of the strengths and weaknesses of the models will allow them to appropriately weigh the results of the model that works best for a specific peril and region.

When a specific data attribute is not available, it is often coded as unknown. Examples include: the year a structure was built, the number of stories of a building, the basic construction type and how the building is being occupied. These four primary building attributes were once elusive and often not completed or set to a default value. Now, many organizations can accurately extract this information from their core processing system, making it part of the information value chain.

Nevertheless, when one of these data attributes is not known, a model will utilize an "average" value based on research results for that particular region. The year-built attribute is a field that has become far more important in determining potential loss. The year a structure was built in the state of Florida, for

Drilling past the primary characteristics, cat models also reflect secondary building characteristics to help companies differentiate between the finer features that a risk may have. These include the shape of the roof, architectural elements, parapets and overhangs, and many other fields too numerous to mention. In the past, these fields were rarely used unless they favored results and testing showed that while defaulting certain secondary fields could significantly reduce a loss analysis, it would rarely increase it, thus creating a bias. As a result, modeling companies have now significantly lowered the effect a secondary characteristic can have on a modeled result.

It is important for re/insurers to remember that catastrophe models are just one tool that an underwriter has at his or her disposal when analyzing a policy or portfolio. While a model's stochastic event data set is designed to simulate all events that could take place, a storm, flood or earthquake with characteristics that are not contemplated can occur. While these events, described as "Black Swans", are not part of a model, a disciplined method of risk management, used in conjunction with a cat model, will minimize or eliminate shock losses that could affect a portfolio.

example, has a significant impact on its ability to withstand a hurricane. However, when the year-built is unknown, a catastrophe model will use an average value, which then increases the uncertainty of the result. The difference in the expected loss against the "real" value can be significant (plus or minus), and the uncertainty around that figure can be a factor greater than the known value.

Data quality remains an industry-wide issue and will require continued cooperation from all members (insurers, reinsurers, brokers, and modeling companies) in order to continually improve exposure information. Such efforts should ensure the industry remains robust and able to withstand future catastrophic events, while providing essential cover for those exposed to windstorms, earthquakes and other natural perils.

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