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Celebrating our 15th Anniversary

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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. While many "Catastrophe" topics published today focus on perils in the United States, our mission is to provide our readers with information for perils on a worldwide basis, ranging from Australian Flooding to Chilean Earthquake. Please feel free to contact the editors if you have any questions or comments regarding any of our publications.

Modeling Historical Events - Can History Repeat Itself?

Catastrophe Modeling has become a critical part of every Property and Casualty Insurer's Risk Management process. The Models now estimate loss potential worldwide, and have become more complex over the years, while at the same time the quantity and quality of data has improved. One analysis that has changed little since the introduction of Catastrophe Analysis is the Historical Event Analysis. A favorite of early adopters of this technology, this analysis is fast and can easily be related to a company's portfolio. However, historical event analysis is only a small piece of the puzzle, and cannot be relied upon for complete Catastrophe Management.

As an example, prior to 2004, Orlando, Florida had only been directly impacted once by a major storm (Hurricane Donna, 1960) since 1928. As a predictor for future losses, an assessment using only historical events would have produced relatively low losses to exposed structures. Fast forward to 2004, and Orlando gets belted by Charley, Frances, and Jeanne in a single hurricane season, experiencing hurricane force wind speeds for all three events, causing significant damage to structures, all of which would have been missed in the historical loss analysis. However, there is still significant value in modeling historical storms if viewed in the proper context.

Advantages of the Historical Event Analysis

A staple in the Catastrophe Analysis Assessment suite, the Historical Event Analysis can provide you with an immediate view on the magnitude of loss to a portfolio given discrete event characteristics.

Fast Analysis Times – Running a single scenario analysis is very fast. A portfolio with 100,000 locations can take only minutes to run, compared to an Exceeding Probability analysis which could take hours (or days) to complete. When time is of the essence, historical event assessments will give you a glimpse at understanding the exposure at risk.

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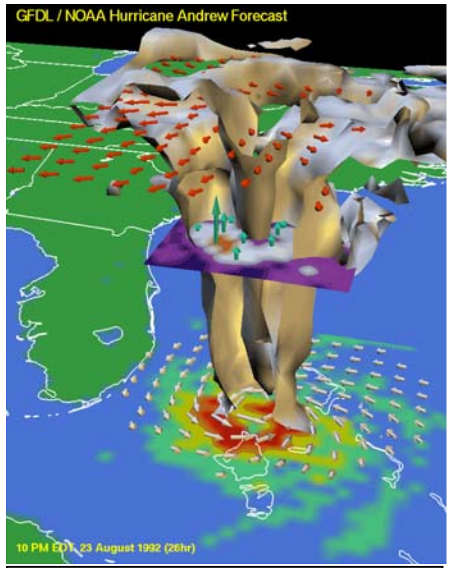
Easily Understood – The most frequently asked question when Catastrophe Management was first implemented was "What would our loss be if Andrew occurred again?" For non-actuaries, the concept of a 100 year or 250 year loss is much harder to digest compared to "what if" scenarios using actual losses experienced in recent history. Although not a complete picture, running windstorm Lothar and Martin against your portfolio will provide a sense of your exposure in France for instance. It may also provide some insight on the effects of any portfolio management that has been undertaken since the time of the event (e.g. Our Lothar/Martin loss would be $X now vs. $Y in 1999 given reductions in exposures).



Hurricane Andrew - One of the most frequently modeled events. Graphic Courtesy of NOAA/NCH

Calibrating Your Portfolio

A post event retrospective analysis can provide insight into how well the models may or may not perform for your portfolio. Suppose your loss to Windstorm Daria (UK/Europe) was $180M, and the Historical Event Analysis estimated a loss of $190M, then you might be fairly comfortable that the model performed well against your portfolio. Conversely, if the model grossly understated your loss, you may question the validity of the model. In either case, dissecting the results of a Historical Event Analysis to understand the "match" or "miss" factor is a much more manageable process than using a stochastic run that includes loss results from thousands of events. Going through this type of exercise can help you determine if data improvements should be a focus or if model adjustments or loads are necessary to close the gap in any stochastic modeling.

Exposure Data Quality – Data quality has been touted as the largest issue facing a catastrophe analysis. Since all Catastrophe Models rely on having an accurate representation of the exposures to develop a loss estimate, data quality (including proper valuation, capture of all locations, etc.) is essential. Performing a Historical Event Analysis at varying levels of granularity (by line of business, by zip code, etc.) and comparing the modeled results to actual losses is a good first step in revealing any potential disconnects.

Policy Financial Features – Does the model handle policy features properly? Deductibles and limits are common to insurance policies, but sometimes data manipulation needs to occur when importing data into a model. Make sure deductibles and limits are entered using the model's best practices. Also, try to simplify your data record whenever possible. For instance, for single location polices, having the deductible and limit information at the policy level will simplify the review of information within the overall data scheme.

Business Interruption – Just as Hurricane Andrew is known for revealing significant issues with building code enforcement, Hurricane Katrina will be known in changing the way we look at business interruption. Business interruption became a significant issue for this event due to the catastrophic flooding that accompanied the storm. Because of Katrina, the model vendors revamped their models to have a more sophisticated approach in modeling this coverage. Make sure that your Business Interruption values are on the same basis as the model defaults, usually one year's income. Also, a review of loss scenarios may help you understand a model's method of allocating loss to business interruption, or other coverage types, for various Catastrophe events (i.e. CAT 2 vs CAT 4 hurricanes).

Ancillary Perils (Storm Surge, Demand Surge, etc.) – The storm surge created by a hurricane can have devastating effects on coastal structures. A building can be built to resist the wind, but a significant storm surge can quickly bring down a well built structure in a matter of minutes. Be sure to look at results with and without some of the "add-ons," namely storm surge, demand surge and other related losses, in reviewing your range of results.

Non-Modeled Perils – Losses from Hurricane Opal in 1995 were greater than anticipated despite the fact that the storm quickly dissipated as it traveled inland. While wind related losses were notable close to the point of landfall, significant loss occurred well inland due to flooding and tree damage (caused by 2 days of rain prior to the storm). These related causes of loss are not specifically included in the model, but can generate significant losses during an event. When comparing actual losses to a historical event analysis, you need to isolate claims associated with these non-modeled losses in order to get an apples-to-apples comparison for the perils that the models do capture.

The degree to which any of these issues contribute to total actual losses can then be a separate component of the modeling exercise that is best handled through manual adjustments to your modeled results.

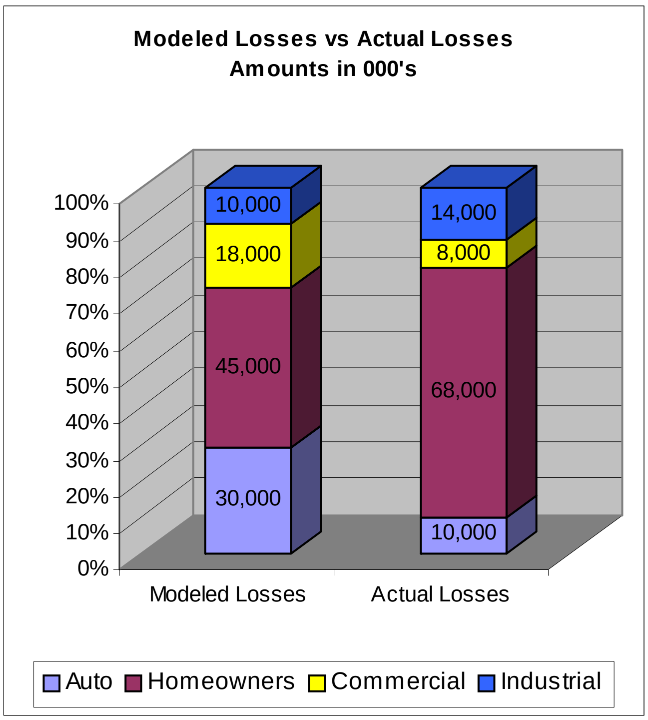
Proceed With Caution

Getting numbers that make sense for a historical event may give you confidence with a model, but this can also provide you with a false sense of security. You may also be getting the right results for the wrong reasons. The following are factors that need to be reviewed when looking at both historical and probabilistic loss analysis in gaining confidence in a modeled result.

Model Foot Print – The modeled foot print for historical hurricane events can vary from model to model. Since the industry standard HURDAT (Historical Atlantic Hurricane Database) only provides the storms track and central pressure information, forward velocity and R_{max} (the storm's radius) needs to be developed by the modeling vendors. For instance, the 1938 storm that hit Long Island, New York may have an R_{max} of 50 miles for one model and 75 miles for another. While both of these figures are reasonable estimates for that storm, different loss results would arise when comparing models. Understanding the event's characteristics (by having direct discussions with your model vendor) can foster more accurate analysis.

Reclassification of a Historical Event – When Hurricane Andrew first hit the Florida Coast, it was classified as a CAT 4 event. Almost ten years later, in May 2002, NOAA reclassified Andrew to a CAT 5 event, the strongest rating on the Saffir/Simpson scale. While this reclassification would not affect incurred losses to your portfolio, incurred modeled losses would increase, perhaps changing your view of the event in this model.

Misleading Return Periods – From various sources, the industry loss associated with Windstorm Lothar (December 1999) has an approximate return period of 15 years for Europe and 70 years for France. However, your portfolio may show that this event more closely matches a 110 year return period on your EP curve for France. Is the industry figure wrong, is the model too conservative, and are your results out of line? The actual answer is probably a combination of all of those factors. The important thing to keep in mind when considering the return period for an historical event is that the return period represents the likelihood of those exact characteristics occurring from an industry perspective, whereas your EP curve gives you the return period for a specific loss threshold taking into account your portfolio with its own unique characteristics. Don't be misled into thinking that the likelihood of another "loss" like Lothar won't happen in France for another 70 years – a similar sized loss can occur more or less frequently.



The above chart shows an example where total modeled losses compare with the actual loss incurred. However, the components of loss vary greatly. In this example, Homeowners and Industrial Modeled Losses are underestimated, while Auto and Commercial Modeled losses are over estimated. Additional detailed analysis is required to understand why the right answer was estimated for the wrong reason.

Right Answer, Wrong Reason – Let's say you run Hurricane Charley against your Florida portfolio, and the overall numbers match within 10% of your actual losses. However, on closer inspection you see that the balance of losses between Homeowners, Auto and Commercial are far different compared to your actual losses. Then when you run Hurricane Jeanne, your loss distributions are inline with your exposures by LOB, but your overall modeled losses are understated by 30%.

There are several reasons why this could have occurred: 1) Different geographic regions modeled 2) Inconsistent data quality within the portfolio, 3) Different levels of exposure density or 4) A better modeled footprint for Charley, compared to Jeanne. Don't fall into the trap of using just one historical event scenario to draw any conclusions about your results. Instead, perform a detailed analysis of multiple historical event scenarios to best understand the range of outcomes.

Summary

The review of historical loss assessments on a portfolio is an effective tool in understanding exposure, geographic distribution and approximate industry market share. This analysis is also one of the best methods in calibrating a model to a portfolio, especially for more recent events where there is a higher credibility in both the exposure data and the parameters of the event. However, care must be taken in using this analysis, making sure that your results balance and make sense to the characteristics of your portfolio. Employing these best practices will help to ensure that you have the high degree of certainty, stability and reliability with your catastrophe risk management practices.