

PERSPECTIVE: The dangers of over-reliance on risk models

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Intro: The past 20 years of catastrophic events have taught us how important catastrophe models are, but now we rely on them too much. Jayant Khadilkar, partner at TigerRisk, says we should reduce our reliance on the probable maximum loss and develop new, more robust risk measures.

Catastrophe models saw limited usage when they were first introduced in the late 1980s. At the time, many insurers were content to carry on with their rule-of-thumb deterministic approach for calculating potential damage.

But that all changed in 1992 with Hurricane Andrew. Overnight, the value of probabilistic event-based risk evaluation became clear. Since then, the industry has uniformly embraced catastrophe models so much so that we now rely on them too much.

In recent years a spate of catastrophic events — the multiple Florida hurricanes of 2004, Hurricane Katrina in 2005, Hurricane Ike in 2008, the swarm of tornados in 2011 have all demonstrated the fallibility of cat models. In case after case, insurers have found that their models understated loss projections by wide margins. What happened?

Cat models are based on limited data sources and scientific approximations. As such they contain a great deal of built-in uncertainty. For example, we have data on hurricanes going back to 1951. But if you look a little closer, you'll notice we didn't start collecting real data until the advent of weather satellites in the 1960s. Before that, the data was very subjective, uneven and anecdotal.

Knowing that hurricane models are based on this limited historical data, how confident can you be about what a model says is a 1-in-100-year event? Hurricane Katrina, for example, was a less than 100-year event. Yet many insurers suffered losses far in excess of their 100-year simulated losses.

Just as the data is thin, so is the methodology. We all know that hurricanes weaken after making landfall. There are several methods used to predict their behavior over land. Unfortunately, the science is still young and the results are mere approximations. As a result, cat models produce different results because their developers use different (though equally valid) methods.



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Despite their shortcomings, cat models have nevertheless provided the reinsurance and insurance industries a quantum leap in understanding catastrophic risk.

Models provide a common framework for comparing hazard, vulnerability and exposure data. Models also enable users to share information in consistent and recognized formats. Most importantly, they enable risk takers to evaluate potential catastrophe scenarios and roughly estimate the probability and extent of loss. But we should remember an important distinction: Models do not excel in the measurement of risk, but rather in the relative evaluation of risk.

This is where the over-reliance comes in. Virtually all cat models generate a loss distribution curve. A single point on the curve, known as the probable maximum loss, has become the industry's most commonly used measure of risk. However, many practitioners — myself among them — are uncomfortable with reducing a model's entire output down to a single point. The credibility of a model's loss estimates is significantly reduced when the focus is on a single point.

Yet as potentially misleading as it is, the PML remains popular for a variety of reasons. First and foremost, it's a simple way to express the results of a complex model. The models themselves favor making single-point estimates of PML. And regulators and rating agencies use the PML to calculate the financial strength of risk takers.

Then there is disparity about the term PML itself. The definition of PML varies from business unit to business unit and from company to company. Some say it's a 1-in-100 occurrence loss; another may say it's a 1-in-250 aggregate loss.

Using this measure alone in predicting the marginal impact of underwriting new policies is dangerous as it provides very limited information. Because it is a single point on the distribution, a PML is not additive across multiple risks. Unless a portfolio's PML is refreshed every time a new risk is added, even a minor change could result in a radically different portfolio. Unfortunately, few of us are that diligent. Common industry practice is to refresh a portfolio once a month.

Another unfortunate industry practice is to overemphasize the PML in the process of optimizing portfolios. The end result can be a hypothetical portfolio that performs well in theory, but is a disaster in practice.

Because the PML has so much uncertainty around it and is of questionable value for measuring changes in a portfolio, we as an industry should become less reliant on it. I'm not suggesting that we abandon cat models altogether. Far from it. I'm just saying we should develop a new, better risk measure than the PML.

When thinking about creating a more meaningful risk measure, there are a number of features it should include. It should be:

- Transparent;
- Easy to understand;
- Relatively stable;
- Provide a consistent “yardstick” to measure risk across the entire organization;
- Be able to support day-to-day risk selection decisions, as well as corporate decisions; and
- Be able to take into account the relevant or “right” parts of the cat loss distribution.

The “right” part of a cat loss distribution depends on a company's risk tolerance and risk appetite. A mutual insurance company, for example, might be concerned about severe surplus erosion from a single event. So, for that company a measure capturing the extreme tail might be appropriate. On the other hand, a publicly traded company for which quarterly earnings are a concern, might want to adopt a measure that captures the near-term volatility of risk as well as the tail.

In general, the insurance industry needs to begin migrating from its dependence on the PML and adopt new risk measures tailored for individual companies. For this to happen, stakeholders including risk takers, regulators, rating agencies and brokers, need to accept the fact that no two companies are the same when it comes to cat risk. Every company is unique with a unique and complex set of risks.

For the time being, cat models will remain the primary tool for understanding, measuring and pricing catastrophe risk. However, we must resist the trend for over-reliance and over-simplification of model results.

We should understand their strengths and weaknesses.

One way we can improve the quality of our decision-making is to reduce our reliance on the PML and develop new, more robust risk measures.

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