Joint Informational Hearing
Assembly Insurance Committee
&
Assembly Emergency Management Committee
Wednesday, June 14, 2023
9:00am, State Capitol, Room 437
Looking Forward: Insurance and Catastrophe Modeling

Introduction

The Assembly Insurance Committee recently held an informational hearing on the California Fair Plan. At this hearing, a number of reasons were provided as to why the California insurance market is facing a crisis. One of these obstacles was the use (or lack thereof) of catastrophe modeling. This hearing will evaluate catastrophe modeling, entities that use catastrophe modeling, and whether this tool could help improve the availability of insurance in California.

What is catastrophe modeling?

Catastrophe modeling allows insurers and reinsurers, financial institutions, corporations, and public agencies to evaluate and manage natural and man-made catastrophe risk from perils ranging from earthquakes and hurricanes to floods and wildfires.

Catastrophe Modeling Framework

The basic framework for modeling the impacts of natural hazards on building inventories can be broken down into the following four modules:

*Stochastic Event Module***:** The first stage of catastrophe modeling begins with the generation of a stochastic event set, which is a database of scenario events. Each event is defined by a specific strength or size, location or path, and probability of occurring or event rate. Thousands of possible event scenarios are simulated based on realistic parameters and historical data to probabilistically model what could happen over time.

Hazard Event Module: The hazard module assesses the level of physical hazard across a geographical area at risk. For example, an earthquake model estimates the level of ground motion across the region for each earthquake in the event set, considering the propagation of seismic energy. For hurricanes, a model calculates the strength of the winds around a storm, considering the region's terrain and built environment.

Vulnerability Module: The vulnerability module assesses the degree to which structures, their contents, and other insured properties are likely to be damaged by the hazard. Because of the inherent uncertainty in how buildings respond to hazards, damage is

described as an average. The vulnerability module offers unique damage curves for different areas, accounting for local architectural styles and building codes.

Financial Module: The financial module translates the expected physical damage into monetary loss. It takes the damage to a building and its contents and estimates who is responsible for paying. The results of that determination are then interpreted by the model user and applied to business decisions.

Catastrophe modelers use a number of loss metrics to analyze catastrophe losses, these metrics include:

Exceedance Probability (EP): EP is the probability that a loss will exceed a certain amount in a year. It is displayed as a curve, to illustrate the probability of exceeding a range of losses, with the losses (often in millions) running along the X-axis, and the exceedance probability running along the Y-axis.

Return Period Loss: Return periods are another way to express potential for loss and are the inverse of the exceedance probability, usually expressed in years (1% probability = 100 years). While this can be thought of as the average rate of exceedance over the long term, it is more accurate to say "this loss has a 1 in 100 chance of being exceeded this year."

Annual Average Loss (AAL): AAL is the average loss of all modeled events or periods, weighted by the probability of their occurrence. In an EP curve, AAL corresponds to the area underneath the curve, or the average expected losses that do not exceed the norm. Because of this, the AAL of two EP curves can be compared visually. AAL is additive, so it can be calculated based on a single damage curve, a group of damage curves, or the entire event set for a sub-peril or peril. It also provides a useful, normalized metric for comparing the risks of two or more perils, despite the fact that peril hazards are quantified using different metrics.

Coefficient of Variation (CV): The CV measures the size, or degree of variation, of each set of damage outcomes. This is important because damage estimates with high variation, and therefore a high CV, will be more volatile than an estimate with a low CV. Mathematically, the CV is the ratio of the standard deviation of the losses (or the "breadth" of variation in a set of possible damage outcomes) over the mean (or average) of the possible losses.

California Department of Insurance (CDI) & Catastrophe Modeling:

The CDI does not allow admitted insurers to use wildfire catastrophe models for ratemaking. California requires (under CA Code of Regulations 2644.5) that insurers use a minimum 20-year average of *historical* catastrophe losses to calculate catastrophe loads for the CDI ratemaking process.

Proponents of catastrophe modeling note that a ratemaking process that uses a historical average does not consider the "new normal" of California's wildfire reality. Allowing the use of catastrophe models in ratemaking would give insurers more information to use when they are determining risk. Catastrophe models simulate real world events using data such as, topography, vegetation type, and the wind conditions of a certain area. Having this information gives insurers a better picture when they are setting rates for their customers, allowing them to use a more precise approach when determining how much risk they are willing to take on.

Those who have voiced concerns about the use of catastrophe modeling by insurers in California are worried that catastrophe modeling and rate increases go hand in hand. While it's very likely rates will increase, those concerned don't want to see extreme increases and want all involved to proceed with caution.

Wildfires & Catastrophe Modeling

Catastrophe models may help predict wildfire risk when rating in high-risk areas. Allowing the use of catastrophe models in ratemaking would give insurers more information to use when they are determining risk. Catastrophe models simulate real world events using data such as, topography, vegetation type, and the wind conditions of a certain area.

Eight of California's top 20 wildfires have occurred in the last half-dozen years, burning 8,512 structures, according to the Western Fire Chiefs Association. The top three largest fires – the August Complex fire in 2020, the Dixie fire in 2021, and the Mendocino Complex fire in 2018 – burned a collective 2.45 million acres and destroyed 2,526 structures.

Those losses do not reflect the destruction from the Camp Fire in 2018, because the 153,336-acre blaze doesn't rank among the state's largest. However, it was the state's most destructive and its deadliest. The Butte County fire destroyed 18,804 structures, caused 85 deaths and was considered the year's costliest natural disaster at over $16.5 billion.

California's increased annual burned area in recent years can be linked to many factors, including factors relating to changes in forest health and management, fire management, and human interactions. Over the last century, for example, forest stand density (number of trees per unit area) has increased due to fire suppression and management practices over recent decades – this has reduced forest resilience.

Climate variability and climate change also play an important role; climate variability is leading to significant fluctuations of the wildfire hazard. Consecutive drought years have a higher likelihood of severe wildfires and wind conditions significantly alter the risk. In California, the last decade has been abnormally dry – leading to the death of an estimated 147 million trees in California's national forests between 2010 and 2018,

adding significant fuel to fires. Increased tree density combined with extreme drought conditions have all contributed to the extreme fire risk in recent years. Climate change will likely continue to contribute to increasing fire severity as well.

It's important to point out that catastrophe modeling can be used to create pricing and underwriting plans that can recognize mitigation measures. This can be accomplished because catastrophe modeling simulates expected losses for individual risks. Insurers are then able to calculate discounts for those who mitigate risk.

In 2022, CDI announced the "Safer from Wildfires" framework, which directs insurers to provide discounts to consumers and businesses if they take specified mitigation measures. In crafting this regulation, CDI worked with emergency preparedness agencies in the Governor's Administration, including the California Department of Forestry and Fire Protection (CAL FIRE), California Office of Emergency Services, the Governor's Office of Planning and Research, and the California Public Utilities Commission.

Conclusion: The Elephant in the Room

If California allowed the use of catastrophe modeling, would this prevent insurers from pressing pause on issuing new policies?

This isn't a simple answer. Based on recent reports a number of factors are going into insurers pausing, non-renewing, or cancelling policies. One factor discussed at this hearing is the inability to use wildfire catastrophe models but that's not the only issue. Another issue is the inability to consider the net cost of reinsurance into the ratemaking process. California is the only state to not allow the use of wildfire catastrophe models to be allowed in the ratemaking process, as well as not allowing insurers' rates to be based on the actual cost of reinsurance. Other factors include construction costs/inflation and climate change.

The hearing today focused on one factor. Clearly, many elements attribute to recent decisions but perhaps it's time to look forward and not backwards. Status quo is unsustainable.

UPDATE:

Following the announcement of this Legislative informational hearing, CDI announced on June 7, 2023, a public workshop focusing on exploring insurers' use of risk assessment tools aka catastrophe modeling. This workshop will take place on July 13, 2023. Historically, these type of workshops are an opportunity for CDI to gather input and information to potentially adjust/change state regulations. Something to look forward to.