Clearing the way for regulatory approval of catastrophe models

2020 NAIC Spring Meeting – Catastrophe Working Group

Nancy P. Watkins, FCAS, MAAA
Principal & Consulting Actuary
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Agenda

- Background
- A tale of two markets
  - Florida
  - California
- Cat model overview and benefits
- Regulatory challenges
- Proposal for catastrophe model clearinghouse
Background
Facilitating the use of catastrophe models in ratemaking to aid insurance availability, affordability

Challenge
How can regulators encourage and allow the use of catastrophe models, while maintaining appropriate regulatory oversight to ensure that rates are not excessive, inadequate, or unfairly discriminatory?

- Historical data from natural catastrophes is sparse and volatile, so past experience may not be a sufficient basis for accurate expectations of the future.
- Catastrophe simulation models have been widely adopted in private insurance, along with other areas such as emergency management.
- Catastrophe ratemaking regulation can have an effect on insurance affordability and availability.
- Current regulatory framework presents challenges to regulators, modelers, and insurers.
A tale of two markets:
Florida
## Florida hurricane

<table>
<thead>
<tr>
<th>Situation</th>
<th>Impact</th>
<th>Response</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Andrew (1992) caused over $27 billion in losses</td>
<td>Insurer insolvencies</td>
<td>FRPCJUA established in 1992, 1M policies by 1994</td>
<td>Reduction of risk in state</td>
</tr>
<tr>
<td>Insurers learned how seriously they had underestimated exposure</td>
<td>Spike in reinsurance costs</td>
<td>FCHLPM created in 1995 to review/approve hurricane models</td>
<td>Reduced premiums</td>
</tr>
<tr>
<td>Losses could have been much higher</td>
<td>Cancellation and nonrenewal of policies</td>
<td>Strengthened building codes, mandatory insurance mitigation discounts incentivized home hardening</td>
<td>More capital, formation of new domestics</td>
</tr>
<tr>
<td></td>
<td>Requests for large rate increases</td>
<td></td>
<td>More price and product competition</td>
</tr>
<tr>
<td></td>
<td>Availability and affordability crisis</td>
<td></td>
<td>Better consumer choices</td>
</tr>
<tr>
<td></td>
<td>Deterioration in real estate market</td>
<td></td>
<td>Stabilization of real estate market as insurance availability and affordability improved</td>
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</tbody>
</table>
## Florida flood

### Situation
- NFIP $18 billion in debt in 2012
- Biggert Waters (2012) required flood premiums to reflect the true cost of risk
- Subsidies and discounts on flood insurance premiums would be phased out
- Significant flood rate increases for many NFIP policyholders

### Impact
- Rate increases shocked the real estate market
- Florida particularly impacted, with over 2 million NFIP policies
- Biggert Waters partially rolled back in 2014
- Concerns over NFIP affordability remained

### Response
- FL SB 542 passed in 2014
- Provided private flood alternative to the NFIP
- Allowed additional freedom in flood rating
- Allowed open use of catastrophe models until FCHLPM developed review standards
- Freedom to experiment for multiple years, extended to 2025

### Results
- Rapid growth in private flood insurance writers, currently:
  - 32 Primary
  - 6 Excess of NFIP
  - 2 Excess & Surplus
- Generally underwritten and/or rated based on cat models
- Increased availability, consumer choice
- Better coverage options
- Often more affordable than NFIP
- Closing protection gap
A tale of two markets: California
California catastrophe ratemaking
Total premium for wildfire must be based on experience and not catastrophe models

- According to the California Code of Regulations (2644.5):
  - Catastrophe losses are based on a multi-year long-term average of catastrophe claims
  - Minimum 20-year average is required for homeowners multiple peril fire
  - Adjustments for changes in historical and prospective exposure to catastrophes due to mix of business changes are required

- Current ratemaking rules for catastrophe models:
  - Not allowed for setting overall wildfire rate levels (except for Fire Following Earthquake)
  - Allowed for setting rate relativities
  - Allowed for granular territory definitions
  - Allowed for underwriting and tiering
Historical experience is not sufficient for wildfire ratemaking

Recent wildfire losses have not followed historical experience

- Prior to 2017, 1991 Oakland Hills Fire was the most destructive event in state history.
- If past experience is assumed to be the best basis to predict the future, how could this happen?

## Weaknesses of CA reliance on historical data

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-CAT Loss</th>
<th>CAT Loss</th>
<th>CAT / Non-CAT Ratio</th>
<th>Selected Catastrophe Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>101</td>
<td>5</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>123</td>
<td>14</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>131</td>
<td>7</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>179</td>
<td>(0)</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>216</td>
<td>1</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>236</td>
<td>8</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>159</td>
<td>78</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>183</td>
<td>5</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>197</td>
<td>12</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>230</td>
<td>7</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>251</td>
<td>120</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>320</td>
<td>75</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>334</td>
<td>3</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>332</td>
<td>3</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>396</td>
<td>17</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>345</td>
<td>2</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>386</td>
<td>0</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>350</td>
<td>22</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>394</td>
<td>145</td>
<td>37%</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>403</td>
<td>14</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

### Actual averages based on filings from three large California insurers

- Creates huge volatility in catastrophe rates from year to year
- Only supports rate changes once events have been experienced
- Does not necessarily reflect changes in exposure
- Will tend to understate exposure in times of increasing risk, possibly materially
Homeowners insurance profitability

CA Homeowner Estimated Industry Underwriting Profits Since 1991

Yearly Profit  Cumulative Profit

1991-2016 Cumulative profits: $10.2 billion

Loss for 2017 and 2018 combined equals $20 billion

Drought from 2011-2017 reduced water and wind losses

Source: Milliman Estimates, based on P&C Combined Industry Annual Statement data from SNL and data from the California Department of Insurance
Potential prognosis for California under status quo

- Reduction in admitted insurance availability, especially in most risky markets
- Fewer options for consumers in admitted market, transfer of risk to residual and E&S markets
- Reduced ability to promote affordability through risk mitigation
- Adverse impact on real estate market

Potentially severe economic consequences
Disadvantages of E&S and residual market solutions

- E&S and residual market (FAIR plan) growing rapidly
- Residual and E&S insurers permitted to use catastrophe models
- Implications for consumers:
  - Higher costs
  - Potentially reduced coverage
  - Less guarantee fund protection
  - Lack of regulatory oversight of rates, market conduct, solvency monitoring

Cat model overview and benefits
Models separate catastrophe risk into component parts

- Individual exposed risks (e.g. homes, businesses)
- Insurance purchased (e.g. limits, deductibles, coverages)
- Range of events (e.g. hurricanes, floods, wildfires)
- Intensity (physical hazard to specific geography at risk)
- Vulnerability (damage to exposed risks)
- Financial (monetary loss from the damage)

Paths of hurricanes from 1851 through 2015 (NOAA)
## Limitations of historical experience vs. catastrophe models

<table>
<thead>
<tr>
<th></th>
<th>Historical experience</th>
<th>Catastrophe models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Possible events</strong></td>
<td>Reflects only events that actually occurred</td>
<td>Reflect the range of possible events and their likelihood; calibrated to reproduce historical events</td>
</tr>
<tr>
<td><strong>Time horizon</strong></td>
<td>Choice of years to include can result in materially different outcomes</td>
<td>Not sensitive to choice of years</td>
</tr>
<tr>
<td><strong>Exposure catalog</strong></td>
<td>Reflect historical exposures (location, home materials, building codes)</td>
<td>Reflect current or prospective exposures as inputs to model</td>
</tr>
<tr>
<td><strong>Mitigation</strong></td>
<td>Difficult to adjust data in a meaningful way to show effects of mitigation</td>
<td>Can be built to show change in outcomes under mitigation scenarios</td>
</tr>
<tr>
<td><strong>Scenario testing</strong></td>
<td>Difficult to adjust data in a meaningful way to show effects of climate change</td>
<td>Can be built to show range of outcomes under climate change scenarios</td>
</tr>
</tbody>
</table>
Regulatory challenges
Catastrophe model treatment varies widely among states

- Prohibition of the use of catastrophe models for some or all purposes in establishing rates
- Silent on the use of catastrophe models
- Regulations piggybacking on other state reviews
- Questionnaires and case-by-case model validation
- Statewide body for scientific and technical review of catastrophe models
Challenges for regulators

- Lack of appropriate expertise and/or resources to review models comprehensively
- Balancing needs of affordability, availability, insurance company solvency and consumer protection
- Inability to protect proprietary information of modelers and insurers
Proposal for catastrophe model clearinghouse
Proposal for catastrophe model clearinghouse

Multi-disciplinary panel to develop standards, select expert reviewers and manage model review process

Third-party experts chosen by panel to perform confidential reviews
- Consistent professional review team for all models for a given peril
- Expert team would depend on nature of model but could include engineers, scientists, technologists, actuaries, claims experts, other professionals

Voluntary participation by states who wish to rely on expert model review

Potential clearinghouse deliverables
- Standardized modeler disclosures
- Market basket output for state level regulatory analysis, comparison
- Third-party expert reports reviewing model compliance with standards
- Model acceptability for specific purposes
Key considerations

- **Ownership/structure:** What organizational/control structure will be mutually acceptable to regulators, insurers and cat modelers?
  - Needs to be able to administer an independent, centralized, rigorous review process
  - One idea: Insurance Institute for Business & Home Safety (independent, nonprofit, scientific research and communications organization funded by the insurance industry)

- **Funding:** How should costs of the clearinghouse reviews be shared among the parties that benefit (states, insurers, cat modelers, others)?

- **Trade secret protection:** How will the clearinghouse ensure intellectual property and proprietary information of modelers and insurers will be protected?
Vision

- Rigorous, sound framework to evaluate complex and constantly evolving models
- Better information from clearinghouse improving ability of state regulators to fulfill oversight responsibilities without expending significant cost and resources
- Stabilization of rate indications by reducing impact of large events
- Catastrophic risk priced at actuarially sound rates that are not excessive, inadequate or unfairly discriminatory
- Competition and investment in science, data, modeling related to catastrophic risk
- Integration of community and home mitigation impacts allowing better cost-benefit analysis, incentives to reduce risk
- Greater insurance availability improving consumer choice
- Risk reduction and competition leading to more affordable insurance premiums
Thank you!

Nancy Watkins, FCAS, MAAA
Principal & Consulting Actuary
nancy.watkins@milliman.com
(415) 394 3733