Model Completeness: Claims and the Impact on Cat Models

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Executive Summary

• Models are judged by how they perform in relation to actual events despite the relative sparseness of such experience

• Given the prominence and importance of post-event estimates, it’s important to understand all components of the models that can influence their completeness

• Deriving insights from claims data is complex and requires expertise to be useful
Agenda

• An overview of the relevance of claims data (TransRe)
• Observations of claims handling and best practice (Aon)
• Discussion of claims from major industry losses
  • 2017 Hurricanes (RMS)
  • New Zealand Earthquakes (AIR)
  • Northridge Earthquake (CoreLogic)
• Wrap-up
Overview: Anatomy of a Cat Model

Event Set
- Regional Stochastic tracks
- Calibrated with History
- Realistic lifetime

Hazard
- Time-stepping Windfield
- 3 sec Peak Gust
- Surface Roughness
- VRG Windfield

Vulnerability
- Vulnerability Curve by Construction/Occupancy etc.
- MDR + Std Deviation

Financial Module
- Loss = MDR*Exposure Value
- Various loss Perspective
- AAL(Pure Premium) and PML

Source: Oasis LMF
Overview: Opportunities

• Ground-truth on damage
  • Actual damage data are scarce
  • Component damage observations
  • Local characteristics
  • Modes of loss

• Non-modeled influences
  • Claims-making behavior
  • Terms and conditions, exclusions
  • Secondary perils: debris removal, contamination
  • BI & CBI
Claims

• The hurricane events of 2017 and 2018 proved to bring some extraordinary challenges to the industry with respect to claims handling
  • Multiple events in 2017 created a shortage of adjusters, especially experienced adjusters
  • Higher than average Loss Adjustment Expense was observed in Hurricane Irma
    • Public vs Independent vs Company Adjusters
    • The impact of seasonal aggregate deductible
  • Assignment of Benefits
  • Drive towards claims efficiency
Claims Handling

- Multiple events in 2017 created a shortage of adjusters, especially experienced adjusters
Claims Handling

- Higher than average Loss Adjustment Expense was observed in Hurricane Irma
  - Company vs Independent vs Public Adjusters
  - The impact of seasonal aggregate deductible

- Harvey: LAE ~15%, as high as mid-30’s
- Irma: LAE ~18.5, as high as low-30’s
- Michael LAE < 8%
Claims Handling

• Assignment of Benefits
  • Contractual agreement between a policyholder and a business, where the policyholder gives over (“assigns”) to the business some of the policyholder’s rights and benefits under the policy
  • The business might require this assignment before it will repair or replace a policyholder’s property, or to conduct other services the insurance policy covers
  • Biggest benefit is that the business can do its job and bill the insurer so that the policyholder does not have to pursue the insurer for payment
  • All states have AOB in place for years so what’s the issue in Florida?
Why AOB is Being Abused in Florida

- One way attorney fees
  - If plaintiff wins their case, defense has to pay all plaintiff legal costs but if they lose, defense’s costs are not paid
- Insurer consent is not needed for a policyholder to sign an agreement
  - Impacts insurer’s ability to monitor the business activity on a claim leading to excessive charges or services on uncovered losses
Changes in the Florida AOB law

• New AOB legislation in July of 2019
  • Rescission period from when insured signs the AOB
  • AOB needs to be received by insurer within 3 days after signing
  • Conditions for making offers prior to and while in suit
  • Plaintiffs can be forced to pay defense cost (under conditions)

• Resulting Trend
  • AOB legislation will curtail AOB abuse but trend will be for plaintiff attorneys to market themselves directly to policyholders to control entire process
  • Expect an increase in claims expense costs as claims organizations begin to outsource CAT litigation handling
Impact of AOB

• “What-if” Scenario: reduction in Irma incurred losses from AOB restrictions:
  • Between 12% and 32%
Impact of Claims on Cat Models

• Every event has unique claim settlement properties
• Loss Adjustment Expense is not a fixed percentage
• Claims handling practices inherently show up in the loss numbers provided to modeling firms
• How do modeling firms reverse out the impact of different claims handling techniques to arrive at an appropriate vulnerability curve?
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2017 Hurricanes
New Zealand EQ
Northridge EQ
Wrap-up

2017 Hurricanes

Hurricane Harvey
Hurricane Irma
Hurricane Maria
Wind damage modes

- Minor roof damage
- Major roof damage
- Cladding and wall damage
- Severe structural damage from wind loading
- Severe damage from tree fall

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RMS recon photos
Wind vulnerability modeling process

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Pinelli et al., 2004

Insurance Claims → Adjustment for post-event behaviour → Vulnerability model validation

Engineering based modeling

Component based damage model

Component based cost model

Illustration only

International Society of Catastrophe Managers

10/31/2019

Webinar – Model Completeness

Illustration only
From damage to an insurance claim

• Understanding damage and loss differentiation
• Accounting for the loss impact by claims handling and post-event behaviors
2017 Hurricanes – damage/loss differentiation

- Tornado damage in St Augustine in a zone of 50-70mph peak gust
- Challenge in understanding the cause of high loss in a low loss environment

Hurricane Irma, St Augustine, RMS recon photos
2017 Hurricanes - damage/loss differentiation

- Variability in the roofing material affects vulnerability
- Standing seam metal roofs performed better than tiled or shingle roofs in 125mph+ peak gust
2017 Hurricanes – claims handling and post-event behaviors

- Demand surge
  - Shortage of labor and material due to the number of repairs needed to carry out
  - Florida has strict laws on roofing contractor licensing

- Claims inflation
  - Harvey, Irma and Maria occurred within 2 months thus exhausted capacity of claims adjustment
  - Shortage of public adjusters – those adjusting claims in Texas after Harvey were not available for Florida after Irma and consequently for PR after Maria
  - “Assignment of Benefits” (AOB) claims in Florida leading to higher eventual payouts

- Deterioration vulnerability
  - Puerto Rico buildings experienced higher than expected claims due to increased cost owing deterioration driven by delayed repairs
  - Repair delays due to failed infrastructure particularly the electricity network
Accounting for post-event behavior in vulnerability validation

• Demand surge - estimated from changes in price indices for materials and labor
• Claims inflation - could be estimated using the claims data from multiple events in the same region after adjustment of demand surge
• These two components and other information about the events help quantify the combined effect
Conclusions

• The claims from hurricanes Harvey, Irma and Maria can be challenging to use for vulnerability validation

• Conducting damage surveys post-event help understand the cause of loss, hence the damage and loss differentiation

• Effects of demand surge and claims handling could be quantified using labor and material price indices as well as claims from multiple events to quantify the combined effect
Piecing together the claims puzzle for recent earthquakes in New Zealand
Overlapping damage is a unique issue for these New Zealand earthquakes.
First, **understand** which claims are relevant and useful for development.

- Where is the property located?
- When was the claim filed?
- Has the claim been settled?
- What was the hazard intensity at this location?
- What were the policy conditions?
Next, organize and categorize claims that are useful for developing the model.
Then, *evaluate* claims that are useful for developing components of the model.
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Finally, validate the damage using observed data and model output.
Finally, *validate* the damage using observed data and model output.
Recognize that claims can represent just a small part of the big picture.

2011 Christchurch Earthquake Loss Comparison

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Commercial</th>
<th>Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported</td>
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<tr>
<td>Modeled</td>
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Acknowledge that there is approximately $6bn NZD of replacement value that no longer exists as of 2018.
Northridge (California) Earthquake

Overview

- 6.7 (Mw), occurred on January 17, 1994, in the San Fernando Valley region of the County of Los Angeles
- 57 killed and >8,700 injured

<table>
<thead>
<tr>
<th>Damaged or destroyed buildings</th>
<th>&gt;82,000</th>
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<tbody>
<tr>
<td>Economic Loss (in 1994 values)</td>
<td>$30-$45b</td>
</tr>
<tr>
<td>Insured Loss (in 1994 values)</td>
<td>$12.5b</td>
</tr>
</tbody>
</table>
Common earthquake failure modes

- Soft story
- House over garage
- Soil problems
- Cripple wall foundation
- Building irregularity
- Steel brittle connections
Northridge claims data

- Obtained from California Department of Insurance
- Included significant amount of uncertainty
  - Hazard
    *Ground motion records, soil failure*
  - Insurance and building characteristics
    *Missing TIV, deductibles, under-insurance, maintenance and modifications in the houses*
  - Missing damage / failure mode information

<table>
<thead>
<tr>
<th>Number of Policies</th>
<th>Total Insured Value ($M)</th>
<th>Claims Loss ($M)</th>
</tr>
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<tbody>
<tr>
<td>394,423</td>
<td>121,845</td>
<td>3,231</td>
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A subset of claims for the residential wood-frame houses
Processing claims data

• A multi-step iterative process was followed

• Statistical techniques, such as maximum likelihood estimation was used for the missing regions (e.g. deductibles)

• Important insights were gained (both homogenous and non-homogenous lines)
Evaluating claims: Data quality

- Most buildings (and claims) are residential
  ~ 5 million commercial buildings
  ~140 million residential housing units

- Robust **residential** vulnerability can be produced from data

- Robust **commercial** vulnerability requires more expert review
Homogenous lines

- Residential wood-frame houses
  - Large amount of data
  - 1 or 2 stories
  - Various construction year bands
  - Secondary features, e.g. basements, cripple walls, masonry chimneys

- Hypotheses
  - Newer buildings are better
  - Foundation anchorage and cripple walls are important factors

### Age Groups

<table>
<thead>
<tr>
<th>Pre-1940</th>
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<td>1940-1959</td>
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<td>1960-1972</td>
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<td>1973-1979</td>
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<tr>
<td>1980-1989</td>
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<tr>
<td>Post-1989</td>
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Vulnerability decreases?
Homogenous lines

1940-1959 group buildings performed better than the 1960-1972 buildings.

### Age Groups

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Vulnerability decreases.

- Larger houses and larger rooms
- Lesser shear resistance due to less amount of walls
- Lower wood and construction quality due to economic slowdown

Source: Porter, 2006
Commercial buildings

- Commercial steel frame buildings, especially 8-22 stories, experienced brittle joint failures

- Claims were very expensive, requiring inspection of all beam-to-column joints.

- The data was sporadic, but facilitated important observations
Commercial buildings

- Buildings were inspected and the construction practices were found to be deficient
- New building codes were developed for steel frame buildings
- Newer building vulnerability functions got a credit

Sources: Shipp 1994 (EQE Review)
Conclusion

- Data Quality influenced the vulnerability development
- Engineering assessment was necessary along with statistical techniques
- Findings lead to continually evolving code and practice
Wrap-up

• Estimating damage is difficult but models can do a reasonable job at the portfolio level

• While claims payments are based on physical damage, final claims payments can vary significantly between risks even though damage may be similar

• Asking catastrophe models to estimate claims factors not directly related to damage may not be entirely reasonable due to uncertainty introduced by the human element
Q&A

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Thank you for joining us today

More questions: info@catmanagers.org
ISCM website: http://www.catmanagers.org/
Credentialization: https://www.catriskcredentials.org/
RAA Cat Management 2020 conference is February 25-28: https://www.reinsurance.org/CatModeling/