Current Challenges and Trends in Catastrophe Risk Management

Willis Real Estate and Hotel Symposium

June 14, 2012
Agenda

- Why is there so much uncertainty in the CAT models?
- What happened with the RMS version 11 update?
- What are companies doing in light of recent model changes?
- What does the future hold?
US Hurricane Landfalls 1900 to 2007

Northeast
9 hurricane landfalls since 1900
Last hurricane was 1991
Last major hurricane was 1938

Florida
63 hurricane landfalls since 1900
6 significant hurricanes over 2004 and 05 seasons
Approximately $35 billion in claims data in 04 and 05

Uncertainty in Models is Due to Paucity of Data
Much of the Volatility in Model Loss Estimates is Due to “Noise” and Not New Scientific Knowledge

Florida Statewide (Weighted Average) Loss Cost

Loss Costs per $1000

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009

AIR Wtd Avg  RMS Wtd Avg  EQE Wtd Avg
Uncertainty and Noise Are Greater at Higher Resolution

Monroe County

Loss Costs per $1000

- AIR Low
- RMS Low
- EQE Low
- AIR High
- RMS High
- EQE High
- AIR Wtd Avg
- RMS Wtd Avg
- EQE Wtd Avg

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
What Happened in the RMS v11 Update?

RMS V11 Changes by County

All Changes Combined Percent Difference

-55% to -40%
-40% to -20%
-20% to -10%
-10% to 0.0%
0.0% to 10%
10% to 20%
20% to 40%
40% to 100%
100% to 220%
Inland Versus Coastal Risk Driven Largely by Hurricane Filling Rates Which Are Available for Storms Since 1900
Hurricane Ike Was an Unusual Storm and Most Future Storms Will Not Be Similar to Ike

Ike merged with a pre-existing storm system in the Midwest
Figure 12: Modeled Wind Speed Degradation Rates Compared to the Kaplan-DeMaria (K&DM) Curve
Figure 24: Normalized central pressure time series as a function of time from landfall. The dashed black lines give the stochastic model envelope (1st and 99th percentiles). Colored time series correspond to historical central pressure time series.
### Top 10 Florida Loss Cost Counties in Descending Order for Wood Frame SFH

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<th>AIR v12</th>
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V11 Helped to Dispel the Myths Surrounding Catastrophe Models

- The models are not getting more accurate over time
  - Not enough reliable data for any degree of accuracy
  - Much of the volatility in the loss estimates is due to scientific “unknowns” versus new scientific knowledge
  - Models are less accurate at finer resolutions. Model updates exhibit the most volatility for small portfolios with a small number of locations.

- An updated model is not necessarily a better, more credible model
  - Over specification combined with high sensitivity of loss estimates to small changes in model assumptions
  - Over calibration to most recent event(s)

- The catastrophe models are not objective tools
  - Most model assumptions are based on the subjective judgments of scientists and engineers rather than objective data
  - Different scientists have their own opinions and biases
  - Scientists can change their minds
How are Companies Reacting to the Recent Model Updates?

- Changing model vendor
  - Short term fix, as all catastrophe models use the same probabilistic approach and consequently have the same challenges

- Blending models
  - Blending reduces the dependence on one model and the volatility in model results
  - However, there are several disadvantages of model blending
    - Ideally model weights would differ by peril region, by occupancy type and possible other factors, but individual accounts span multiple regions and occupancies so very difficult to apply consistently at an account level
    - Significant ongoing resources as all of the blending weights require adjustment every model update
    - Very expensive and time-consuming to run every account through multiple models
    - No model may be credible for some accounts
    - Marginal impact pricing not robust/efficient with multiple models
    - “The average of multiple wrong numbers still gives a wrong number”

- Using new tools and/or developing independent views of catastrophe risk
  - Proprietary frameworks
  - Different methods of accessing catastrophe risk
What Companies Want from the New Generation of Catastrophe Risk Management

- Stable and operational risk metrics that allow effective risk management strategies to be implemented and monitored over time

- Consistent and comprehensible information – while we cannot eliminate the uncertainty in catastrophe loss estimation, we can eliminate the volatility in the loss estimates caused by “noise” and lack of data

- Fully transparent

- Flexible and customizable

- More interactive and less resource intensive
Scientifically-derived, Model-Independent Characteristic Events (CEs) Provide an Additional Tool

- CEs are defined-probability scenario events

- CEs are defined for different regions for return periods of interest such as 100, 250, and 500 year

- Wind footprints for the CEs are “floated” along the coast to estimate a range of loss estimates for each return period

- CEs are comparable to model-generated events and have additional benefits
  - They are based on same scientific data but eliminate the fluctuations in loss estimates due to noise in the hazard component of the models
  - They are transparent and easily peer-reviewed by independent, external experts
  - They provide a set of scenario losses that can be monitored at the corporate level and drilled down to individual policies if desired
  - The expected CE loss for each region can be compared to model-generated PMLs
1. Losses are calculated by floating the Characteristic Event wind field over the company’s exposures.

2. CE losses are estimated at ten mile landfall points and summarized for each event. The resulting regional loss summary identifies the range of potential losses and identifies peak loss scenarios. The expected losses for the region can be compared to model PMLs.

- Expected CE Loss $280M
Differences from Catastrophe Models – Defined Probability versus Randomly Generated Events

**Catastrophe Models – Random Events**

- **Wind speed**
  - Random Event 1: Wind speed = 75 (SS1), Rmax = 40
  - Random Event 2: Wind speed = 152 (SS4), Rmax = 13

- **Forward speed**
- **Landfall direction**
- **Radius of max. winds**

**CEs – Defined Probability Events**

- **Characteristic Event 1, 2, …**
  - Wind speed = 122 (SS3), Rmax = 40

- Historical hurricane data from National Hurricane Center…

Events are generated by random sampling from parametric distributions.

Events are generated by identifying the characteristics with a specific return period.
Questions CEs Can Answer

- Where are you exposed to the largest 100 year event losses?
- How does your current insurance program cover your 100 year event losses?
- What is the range of your 100 year event losses by region?
- What is your expected loss from the 100 year event by region?
- What are the chances your losses will exceed $X from the 100 year event?
- What are the chances your losses will exceed $X for the 100 year and lower probability events?
How Companies Are Using CEs

- To better understand cat risk and develop a model-independent view of the risk
  - What kind of events can impair my company’s solvency?
  - Where might I be over-exposed to individual event losses?

- As another source of scientific information to benchmark and test the models
  - How do the mean and median CE losses compare to the model-generated PMLs?
  - Are there any models that are outliers for my book of business?
  - Which models am I most comfortable with?
  - How should I weight the different models?

- Fixed event set for operational risk metric
  - Since the CE losses are consistent with model loss estimates, the CE sets can be used for operational decisions
  - PMLs, TVaRs, etc. can be monitored to make sure they stay on track with the CEs

- Key component of proprietary model and risk management framework
  - Transparent and customizable damage functions provide foundation for proprietary model
  - Analytical tools help inform targeted growth and contraction strategies