Updates in RMS Modeled
Hurricane risk costs

Robert Muir Wood PhD
Chief Research Officer

Who is RMS?

- Leading & largest Catastrophe modeler
- Global reach – offices in California, NJ, London, Zurich, Paris, New Delhi, Beijing and Tokyo
  - 1000 employees
- Undertakes significant research on how to improve catastrophe loss modeling
  - Partners with leading university researchers & government science agencies
  - Issues many open technical reports (87 in the past decade) and publishes in peer reviewed science journals
- Provides models and data to insurers
  - Primary use for insurer solvency testing
  - Informs – but does not set - rates

* http://www.rms.com/Publications
How do Catastrophe models work?

- Historical experience of extremes is an insufficient basis on which to price risk
- Stochastic simulation model generates a very large set (typically 500,000) of potential events – each with a weighted probability
- Each event becomes a wind and flood hazard footprint
- At each location, according to the nature of the building, vulnerability functions turn hazard into % loss

Modeled outputs:
- Loss exceedance probability (EP)
  eg 4% = 1 in 25 year loss
- Average annualized loss
  (AAL = ‘risk cost’ or ‘burn cost’)

Risk Neutrality

- RMS’s business is founded on providing a neutral & objective perspective on risk
- Same catastrophe model and results are employed for both sides of every risk transaction:
How models learn and improve

- Catastrophe modeling methodologies continue to advance along with a rapid expansion of calibration data
- Adding elements of risk costs not previously modeled
- Replacing judgements with actual experience data
  - eg. building code performance assumptions are superseded by real claims data
- Change is painful! – however once we know that a model can be improved scientifically - we need to implement the revision
- Revised model results can both rise and fall
  - Release of 2009 RiskLink9 California Earthquake showed reduced residential risk costs
  - Release of 2011 RiskLink 11 US Hurricane shows a rise in residential risk costs inland – while a fall in some coastal locations

*Events of 2008 in the banking sector highlight the dangers when over-optimistic risk models fail to learn from experience!*

Key drivers of change in the 2011 RiskLink 11 Hurricane risk model
Hurricane filling behavior

- “Inland filling” characterizes how the hurricane behaves after landfall and the pressure rises
  - HU Charley filled 50mb in 6 hrs after landfall,
  - HU Irene intensified 5mb after landfall
- NHC HURDAT catalog holds insufficient high quality data to fully characterize filling
- RMS generated 5000 synthetic hurricanes in WRF (advanced numerical weather prediction) model in collaboration with Prof Dave Nolan (University of Miami)
- Showed previously unrecognized interdependencies of storm size, forward speed, and landfall intensity on filling behavior
- Enabled in new RiskLink11 (2011) model
  - Published in peer reviewed journal Monthly Weather Review 2010 Colette et al, ‘Using Mesoscale Simulations to Train Statistical Models of Tropical Cyclone Intensity over Land’

Claims Data Mining and Vulnerability Research

- Total hurricane claims in house - $18bn across 20 years (principally Florida)
- In 2009-10 RMS mined and analyzed >$2Billion in location-level Hurricane Ike claims for TX and LA:
  - 20%+ of total effort spent on-site to research claims files and interview loss adjustors, claims handlers etc
  - Low wind speeds - inland metropolitan area – Texas – first location level claims
  - Revealed many more low windspeed roof failures than expected from codes
  - Required revisions to relevant vulnerabilities
Comparative risk costs in Florida:

v11 relative to v9 model

For Cat Fund residential exposures overall AAL has increased 6.4% between v9 and v11

40% of the households in Florida are in ZIPCodes where the RMS AAL is decreasing

Medium term (next 5 years) activity rates
Beyond historical averages

Mortgage delinquency

Intense Cat 3-5 Hurricanes

2010 Hurricane season and the long term rise in intense storms


© 2011 Risk Management Solutions, Inc. CONFIDENTIAL
Atlantic hurricane activity has remained high since 1995.
- 2010 year = 2nd highest number of hurricanes
- 2011 is forecast to be another high activity season

2005-2008 RMS used expert elicitation procedures involving 4-7 leading hurricane climatologists (and other experts) weighting alternative forecast models

2009-2010 multiple (9) models (selected by the climatologists) weighted based on their forecasting skill

Methodologies and results all published in scientific journals

Includes recognition that record of basin activity likely to be incomplete before 1950s and that landfalling %s may vary

Methodology updated annually (incorporating an extra year of data & science)

Comparison with 5 year rates since 1900

- 2011-2015 landfall annual forecast 1.24 hurricanes Cat 1-2 and 0.79 Cat 3-5
  - Small reduction in total numbers from previous model
  - If activity reduced back below the long term historical average (as between 1965-1990) medium term rates would follow it down
26 suitcases containing sums from 1 cent to $1,000,000

The ‘Deal’ or ‘No Deal’ Exceedance Probability (EP) Curve

- Median Win $875
- Mean Win $131,477.5
- Chance of winning less than average = 75%
- Chance of winning more than average = 25%
The 5 year Medium Term Hurricane Industry Loss Exceedance Probability (AEP) Curve

Since Atlantic basin activity increased in 1995 – 5 out of 12 (41%) five year periods have had loss higher than the 5 year average.

RMS perspective on what is the ‘current’ (next 5 years) hurricane activity rate – updated annually

- Atlantic hurricane activity has remained high since 1995.
  - 2010 year had =2nd largest number of hurricanes in history
  - 2011 is forecast to be another high activity season
- 2005-2008 RMS used expert elicitation procedures involving 4-7 leading hurricane climatologists weighting alternative forecast models
- 2009-2010 multiple (9) models (selected by the climatologists) weighted based on their forecasting skill
  - 1) The Long-Term mean
  - 2) & 3) A hurricane activity rate shift model (Direct/Indirect)
  - 4) & 5) Predictor-based model: MDR SSTs (Direct/Indirect)
  - 6) & 7) Predictor-based model: MDR+IP SSTs (Direct/Indirect)
  - 8) & 9) Predictor-based model: MDR+IP SST shift (Direct/Indirect)
- ‘Direct’ = modeling landfalls. ‘Indirect’ = modeling numbers in the basin and then using probability of landfall distribution to assess landfalls
- Methodologies and results published in scientific journals and online