

Recent Cats and their Effects on Cat Modeling

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Recent Cats and their Effects on Modeling

- Historical perspective
 - First Twelve Years
 - Next Thirteen Years
- Vendor Response to Recent Hurricanes
- Findings from Earthquakes
- Future of Cat Modeling

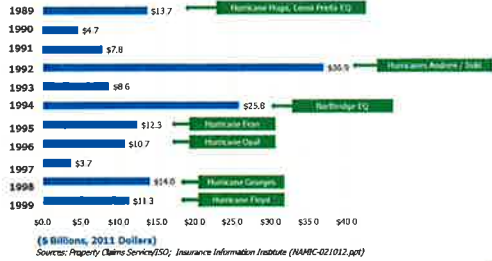
Historical Perspective

- Cat models were developed in the late 1980's for the purpose of creating a hypothetical listing of cat losses to project portfolio catastrophe loss potential
- Hurricane Hugo and the Loma Prieta EQ (both 1989) piqued carriers' interest in cat models
- Widespread use occurred following Hurricane Andrew (1992)
- By the mid-1990's cat models were widely adopted as the key method for quantifying large loss potential
- This ushered in a new era of risk assessment techniques and products

First 13 Years (1987-1999)



- Characterized by a major hurricane and earthquake and moderate sized cat events
- Reinforced the development and use of cat models



First 13 Years (1987-1999)

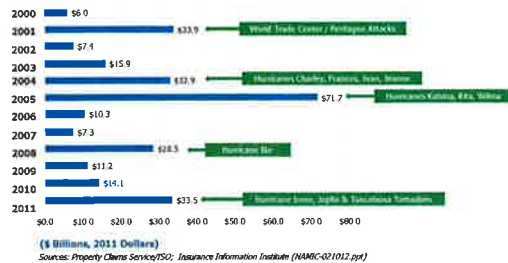


- Significant growth in understanding of the effects of cats and birth of new applications of risk management
- 1st class of Bermuda reinsurers (Tempest Re, CAT Ltd, Renaissance Re, Mid-Ocean Re, Global Capital Re)
 - Embraced portfolio management and refined reinsurance pricing
- Risk Transfer products
 - Introduction of Cat Bonds (AIG, Hannover Re, St. Paul Re, USAA)
 - Industry Loss Warranties
- FHCF (1995), CEA (1996), HHRF (1995) created to manage cat risk
- Risk management techniques
 - Portfolio optimization
 - Depopulation of wind pools
 - More robust pricing
- Florida Commission on Hurricane Loss Projection Methodology created to verify the scientific underpinnings of the models (1995)

Next 12 Years (2000-2011)



- Characterized by major cat events with unique characteristics
- Gave way to new understanding and new insights on cat risk



Next 12 Years (2000-2011)



- Gave rise to concepts of
 - Correlation across lines (property, life, workers' comp)
 - Impact of converging weather systems and inland wind risk
 - Rising S&T's and questions about future risk from climate change
- Fueled long-standing issues of flooding, levee risk, and wind vs. water debate
- Two more classes of Bermuda reinsurers
 - 2001 – following the World Trade Center attacks
 - 2005 – following Hurricane Katrina
- Cat Bonds and ILWs accepted as alternative risk transfer products
- Coastal states struggle with addressing catastrophe exposure in the wake of ever increasing population growth and density
- Insurers closely monitor catastrophe risk through
 - Attention to capital management
 - More efficient reinsurance purchasing
 - Attempts at catastrophe price adequacy
 - Portfolio distribution optimization
 - Timely and thorough claims handling

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Vendor Response to Recent Hurricanes



2004 Hurricanes Charley, Frances, Ivan and Jeanne

2005 Katrina, Rita and Wilma

2008 Hurricane Ike

ATR

- 2006
 - Revised radius of maximum winds for intense hurricanes
 - Storm surge update: enhanced elevation, modified peak surge levels for intense storms, new attenuation relationships to reflect effects of local terrain, enhanced modeling for bays and estuaries
 - Commercial vulnerability updates: light metal, wood frame and unreinforced masonry, six new commercial occupancies
 - Update to demand surge functions
 - Developed alternative near-term sensitivity catalog (WSST catalog)
- 2007
 - Contents damage relationship to building damage updated for SFD and MH
 - Updates to BI function for commercial properties
- 2008
 - Inland decay rates updated from stochastic filling rates following HURDAT update
- 2010
 - Updated meteorological parameters (CP, RMax, FS, IA) Filling equations updated to allow for re-intensification
 - Expanded coverage to include 3 island states
 - Vulnerability component updates for regional variations and significant enhancement to secondary modifiers

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Vendor Response to Recent Hurricanes



2004 Hurricanes Charley, Frances, Ivan and Jeanne


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EQECAT

- 2006
 - Commercial residential high-rise vulnerability function improvements
 - Modifications to glazing quality secondary structural modifiers
 - Development of Warm AMO conditional frequencies
- 2007
 - Texas residential vulnerability update, inland vulnerability to tree damage
- 2008
 - Directional friction factors included in wind field modeling

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Vendor Response to Recent Hurricanes 

2004 Hurricanes Charley, Frances, Ivan and Jeanne


2005 Hurricanes Katrina, Rita and Wilma

2008 Hurricane Ike

RMS


- 2006
 - Medium-term view of hurricane activity introduced
 - Vulnerability updates
 - Demand surge updated to Post Event Loss Amplification
- 2011
 - Updated stochastic and hazard model components
 - Updated vulnerability functions from claims data in Texas and further investigation of building stock and construction practices by region
 - Update to storm surge model
 - Update to medium-term rates

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Findings from Earthquakes 

- **1989 Loma Prieta Earthquake**
 - Liquefaction vulnerability
- **1994 Northridge Earthquake**
 - Claims data call lead to new insights into damage from low and high shaking intensities
 - Steel building defects cause significant damage in areas of modest shaking
 - Spectral acceleration research lead to enhancement in damage parameter from PGA-based MMI damage
- **1996 USGS National Seismic Hazard Maps**
 - New spatial and temporal features of characteristic EQs in Cascadia Subduction Zone
 - Crustal strain data introduced in addition to seismological data as method to infer rate of occurrence
- **2002 USGS National Seismic Hazard Maps**
 - Central and Eastern US updated recurrence rates, characteristic magnitudes and spatial concentrations of seismic sources, and new attenuation relationships
 - Western US recurrence rate updates for time in/dependent faults, background seismicity
- **2008 USGS National Seismic Hazard Maps**
 - Next Generation Attenuation (NGA) for WUS; updated ground motion and updated soil maps

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Future of Cat Modeling 

- **Earthquake**
 - Incorporate findings from 2011 Tohoku EQ
 - Tsunami following EQ models
 - Maximum magnitude estimation on faults
 - Stress-transfer modeling and improvements to after-shock and time-dependent EQ frequencies
 - Liquefaction mitigation performance
- **Hurricane**
 - Improvements in modeling building mitigation techniques
 - Impact of climate change and incorporation of frequency and severity findings from Global Circulation Models
 - Development of calibration techniques to further fine-tune vulnerability to carrier underwriting and claims experience
- **Other**
 - Enhanced understanding of loss amplification effects
 - More robust Severe Storm modeling
 - Enhancements to Winter Storm and Flood modeling
 - Modeling contingent business interruption

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Future of Cat Modeling



- Each catastrophe event has its own unique set of characteristics which influence the loss potential
- Each event provides an opportunity to learn more about how best to model the event
 - Wind field characteristics
 - Ground motion characteristics
 - Vulnerability of structures
 - Range of damage potential – measure of uncertainty
 - Economic impact
 - Regulatory impact
- Models are not perfect, they do not provide “the answer”
- But certainly more robust than 25 years ago

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Thank you.
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