Severe Convective Storm

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Today’s talk

- What is SCS
- Why is it important
- Pricing implications
- Reinsurance
- Modeling

Natural Disasters

- Earthquake
- Tsunami
  - Associated with Earthquakes in or near the Ocean
- Flood
- Hurricane
  - Forms over the Ocean
- Severe Convective Storm (SCS)
  - Forms over land

Severe Convective Storm (SCS) Overview

- Insured Damage from Hail, Tornado, Straight line winds
    - Flood often uninsured
- Large weather patterns
- Extreme variation in storm size and in yearly aggregations
- Reinsurance and risk sharing are key!
- Seasonal Peril – Summertime
- Largest insured events are US
    - Europe, Australia, Asia and others have events as well

SCS Damages

- Tornado - Narrow path of Substantial Destruction
- Hail is the Costliest loss cause
  - Roof and Siding damage to homes, farms and commercial structures
  - Glass and cosmetic damage to Autos
- Straight Line Winds
  - Knock trees into buildings and other structures
  - Roof and awning damage
- Lightning Damage
- Flood damage from accompanying rains

Science of SCS

- Instability where high pressure and low pressure systems meet
- Key Elements
  - Vertical wind shear
  - High surface Water Vapor mixing ratios
  - Directional change in Low Tropospheric wind
  - Low Static Stability

SCS – How I Think of it

- Large systems of high pressure and low pressure meet
  - Moving dual systems
  - Hot below and Cold above
- Instability at the edges
- Water Vapor blown up and down in freezing high atmosphere
  - Creating Hail
- Tornados and winds at the edges where systems rub against each other
  - Vertical Shear

Derechos – Quasi Linear Convective Storms

Derechos – Particularly Destructive SCS's

- Widespread, Long Lived Windstorm
  - Bands of fast moving showers or Thunderstorms – Bow Echoes or Squall Lines
- Characterized by Straight Line Winds
  - At least 58 MPH and often over 100 MPH
- Can also have Downbursts and Microbursts
- Rotating Bands of Storms (Bookend Vortex)
- Embedded Supercells (Rotating Thunderstorms)
- And Other smaller Tornadoes and Other Circulations

SCS – Why is it Important

- According to Gallagher Re's Natural Catastrophe and Climate Report
    - For H1 2024
  - US SCS Insured Losses Surpass Record $100 Billion
    - Past 18 Months (2023-6/2024)
  - Worldwide H1 losses had $128 Bn Economic Loss
    - Estimated $61 Billion of that was insured
    - Six of the Top Ten Insured Events were SCS – All US
    - In total US SCS accounted for 61% of all global insured losses
  - Context – H1 accounted for 37% of Annual Total 2014-2023
  - Warmest H1 for the world on record dating to 1850

SCS - Pricing Implications - 1

- Large SCS storms don’t happen every year
  - Those are the ones where reinsurance/ risk sharing is critical
  - Some years have several and others only smaller storms
  - There seems to be a cycle over 10+ years
    - Some cycles are worse than others
- Historical experience should reflect Long-term Variation and Patterns
- Competition reacts to Short Term but Pricing needs are Long Term
- Reinsurance costs reflect more Long-Term thinking

SCS - Pricing Implications - 2

- Events Aggregate across Many Insureds and Products
  - Cat events will hit many lines of business
    - Homeowners, Farm, Commercial, Auto, etc..
- Profit/risk factors should reflect Interstate and inter-product risks
  - SCS storms don’t stop at political boundaries
  - Think of splitting premiums and losses between Cat and Non-Cat
    - Analyze variations in aggregate loss ratios across the entity for Cat
    - Use more traditional pricing methods for the Non-Cat portions for each line
- Models may help in understanding underlying Cat Risk

SCS - Reinsurance

- For us, Reinsurance is Annual and Based on 4 day Cat Aggregations
  - Across all states and determined based on company aggregations
    - Not consistent across companies – even in the same region.
- Reinsurance is Bought in Layers with Different Terms
  - Different Reinsurers have Preferences for Different Layers
  - Annual Aggregate Deductibles are Common
  - Limited Reinstatements in the Upper Layers
    - Terms for the Reinstatements Vary
- A Large Cat can Trigger Need for Additional Reinstatements
  - Sometimes available but Usually More Expensive

SCS – Models of Storms and Damage

- Scholarly study modeling weather patterns and probability of convection
  - Can we make a mathematical model?
  - Theoretically intuitive but not specific to location.
- Engineered Models matching Storm Patterns and Insured Buildings
- ERM Models based on Output of Engineered Models, Company Considerations and Concerns
- Predictive Models to Assist in Strategy and Ratemaking
  - Bridging Engineered Model Output and Company Loss History

SCS – Engineered Models

- Engineered Models matching Storm Patterns and Insured Buildings
  - Portfolio of Historical Storms and simulated storms
    - Historical storms
    - Augmented with simulated storms
  - Detailed study of Building Damages when Storms Occur
    - Hurricane model inspired
  - Randomizing thousands of iterations
  - RMS, Verisk (formerly AIR) and several other models

  - Applied to Specific Portfolios of Insured Structures
- Helps Inform Needed Risk Sharing and Management of the Exposure

SCS – ERM/ORSA Models

- ERM Models for Own Risk and Solvency Assessment (ORSA)
  - Addresses major Enterprise Risks including Catastrophes (Cats)
  - SCS Risk Informed by Engineered Model
    - Adjusted for Company Bias – Perceived or Measured
    - Curve of Cats by size – for Large Cats
    - Annual Frequency Distribution and Random Cat Size Selections from Curve
  - Reinsurance/ Risk sharing
    - Possible impact on Cost, Structure and Availability in Following Years

SCS - Predictive Models

- Outputs of Engineered Models matched to Individual Policy Experience
- Engineered Models are Constantly Being Refined
  - Using the Latest Model is my Preference
- Company Data is Highly Skewed by Historical Cats
  - Year and County Variables are used to Make Comparables
- For us – Still in the Testing Stage
- Results meant to Inform Underwriting and Pricing