Severe Weather Ratemaking

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Outline

- Overview of Change
- Catastrophe Threshold
- Peril Mix
- Severity Analysis
- Frequency Analysis
- Summary

Overview of Change

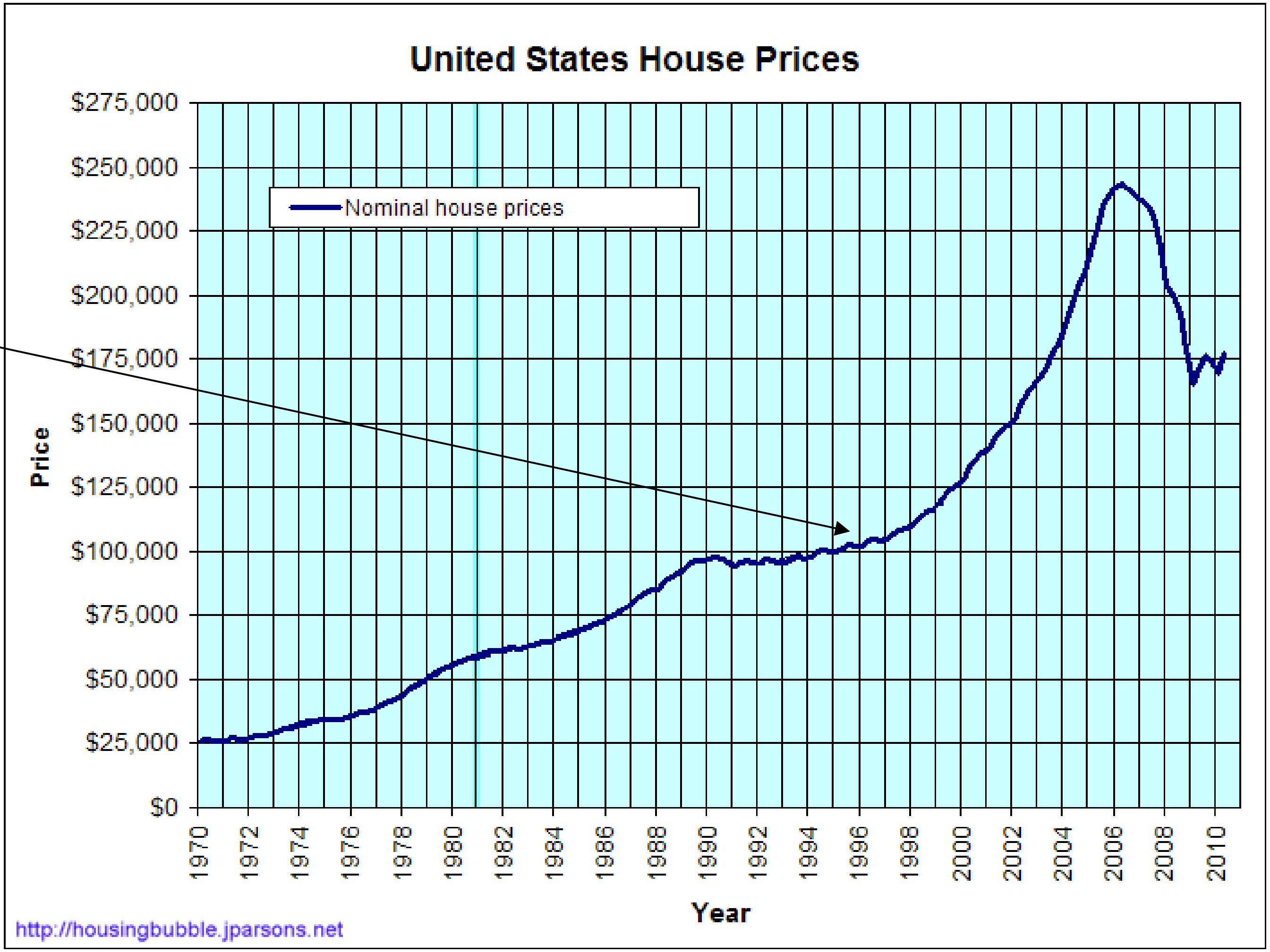
- Recent severe weather activity has put pressure on the profitability of the property lines of business across the insurance industry

- In order to understand the drivers of this recent experience, it is necessary to break down the losses:

  - Is a fixed dollar or claim count catastrophe threshold an appropriate definition of extreme events for ratemaking purposes?
  - Is the rise in severe weather losses caused by an increase in frequency, severity, or both?

Catastrophe Threshold

PCS Catastrophe Threshold last revised in 1997



Catastrophe Threshold

- Not revised since January 1, 1997
- More and more losses are being defined as catastrophic
- Catastrophe is a business-defined definition
- Instead of categorizing losses as catastrophic vs. non-catastrophic, is there a way we can look at losses that is more homogeneous and gives us an accurate answer?

Peril Mix

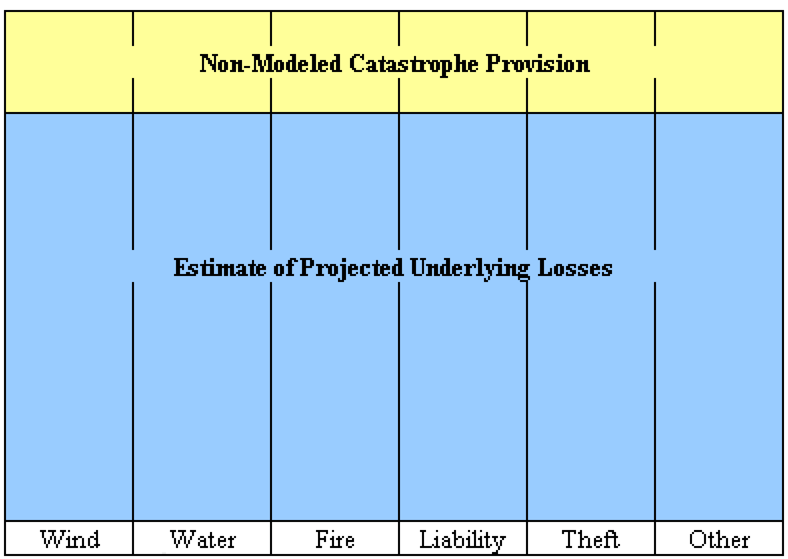
- Current perils accounted for in a typical property indication:
  - Wind, Water, Fire, Liability, Theft, Other
- Most companies combine all perils for their underlying indication and incorporate a catastrophe provision for higher layered loss events
  - Catastrophe provision may be separated into modeled and non-modeled components; this presentation deals strictly with non-modeled catastrophe pricing
- If homogeneity of data is a key goal, all losses attributable to weather should be combined

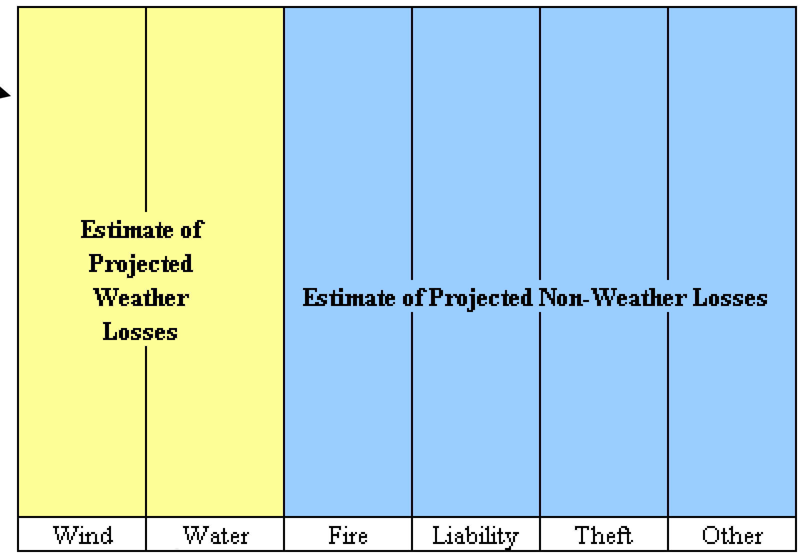
Peril Mix

No catastrophe threshold definition necessary

Losses from events that are $25M or greater

Current Indication Structure





Proposed Indication Structure

Peril Mix

- Catastrophe losses for Non-Weather perils make up less than 1% of total losses

- Examples:
  - Wildfire
  - Sinkhole Collapse
  - Mine Subsidence

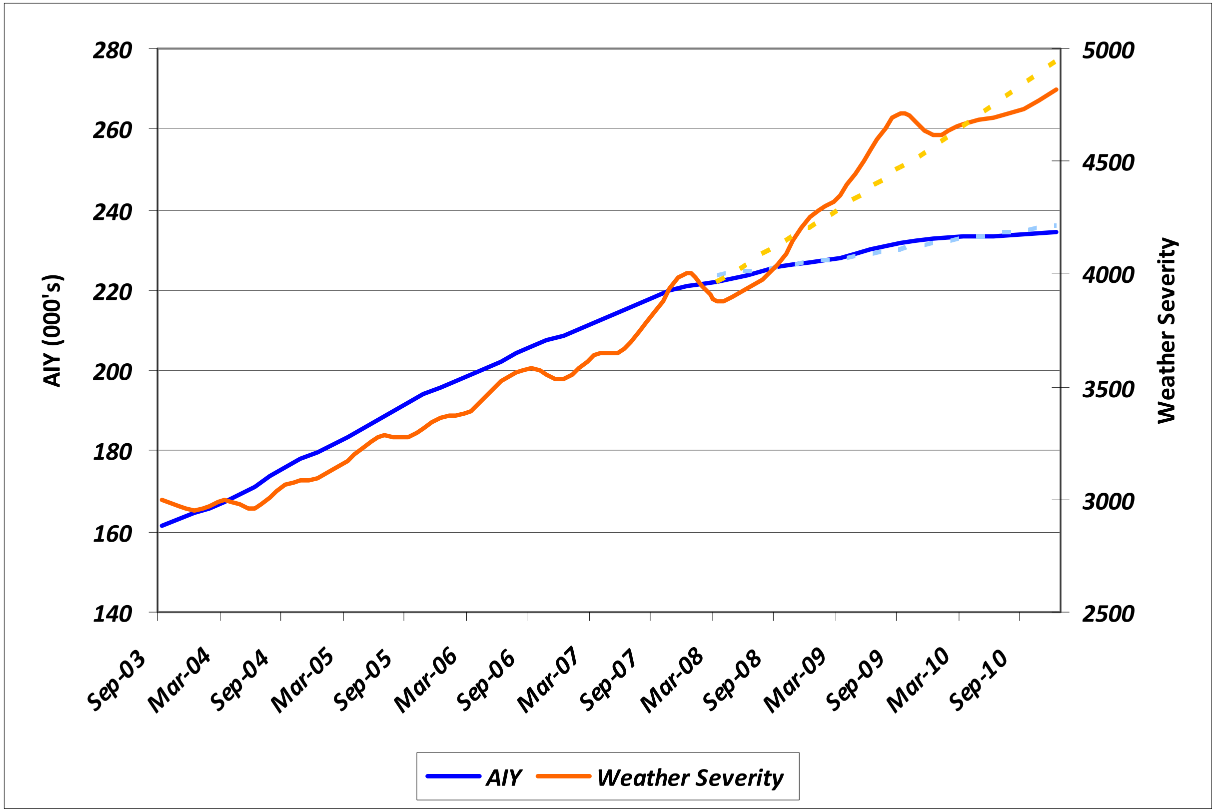
- Two ways to mitigate the effects of adding these losses to the underlying non-weather losses:

  - Excess Loss Factor
    - Would help to stabilize trends and removes effects of shock losses
    - Requires definition of shock losses

  - Revise the credibility standards such that more years of data are used when necessary
    - Will not protect states from large fluctuations caused by losses that occur less than once every five years (assuming five years is used in the indication)

Severity Analysis

- Many non-modeled catastrophe ratemaking methodologies rely on a relationship between loss and amount of insurance over a long period of time
- Unless this relationship is carefully developed, it can add more distortion than accuracy into the projected catastrophe loss



Severity Analysis

- The severity of weather claims appears to be relatively stable across different event sizes (excluding hurricanes/earthquakes/flooding)

- Ideal approach is to use as few years as possible to calculate an appropriate estimate for severity
  - Increases responsiveness to new trends in the prices of housing materials
  - Estimate will be less dependent on and leveraged by the trend selection

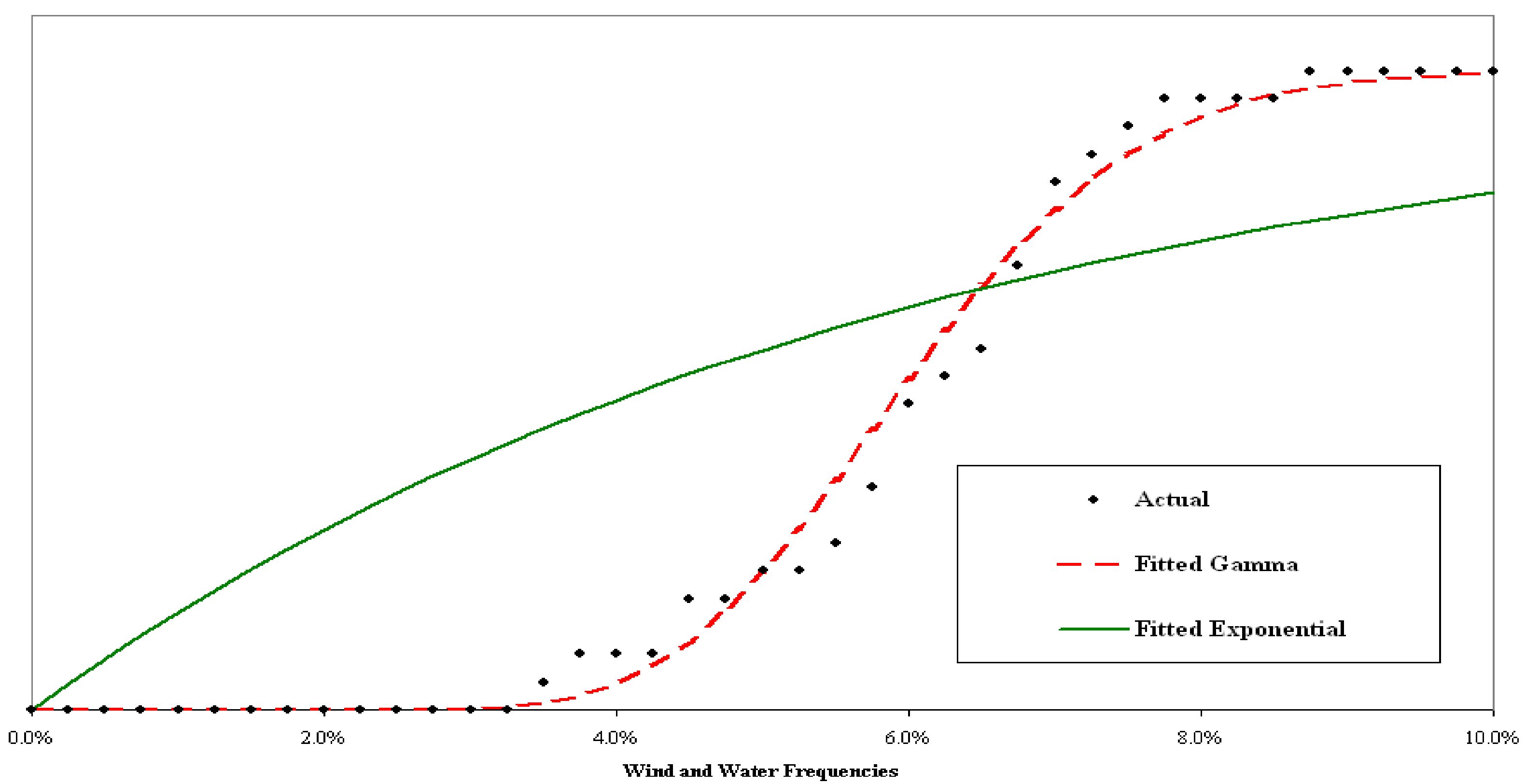
Frequency Analysis

- Since severity is generally stable from year to year, the main driver of the severity of weather events in total is frequency
- First step was to fit historical data to a frequency distribution
- Weather claims are **not** independent and therefore can not be fit to any of the most commonly used discrete frequency distributions
- However, if the average frequency is independent from year to year, we can fit this to a continuous distribution using each year's frequency as a sample data point

Frequency Analysis

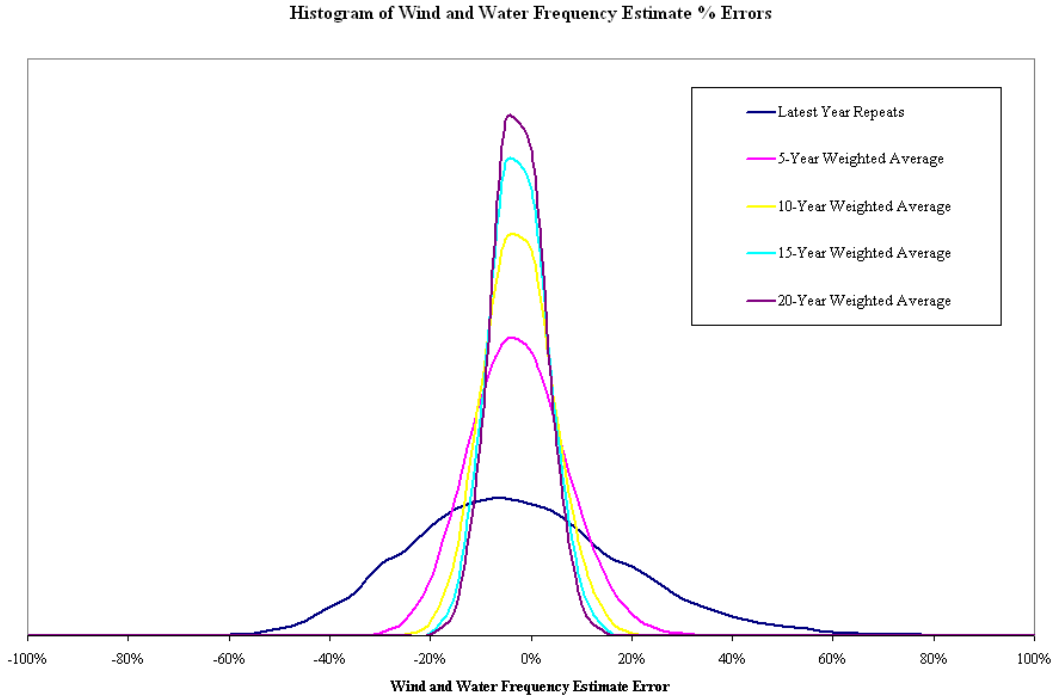
- The Gamma distribution is a reasonable fit to the actual data based on the p-value and Anderson-Darling tests of significance

Actual vs. Fitted Cumulative Distribution



Frequency Analysis

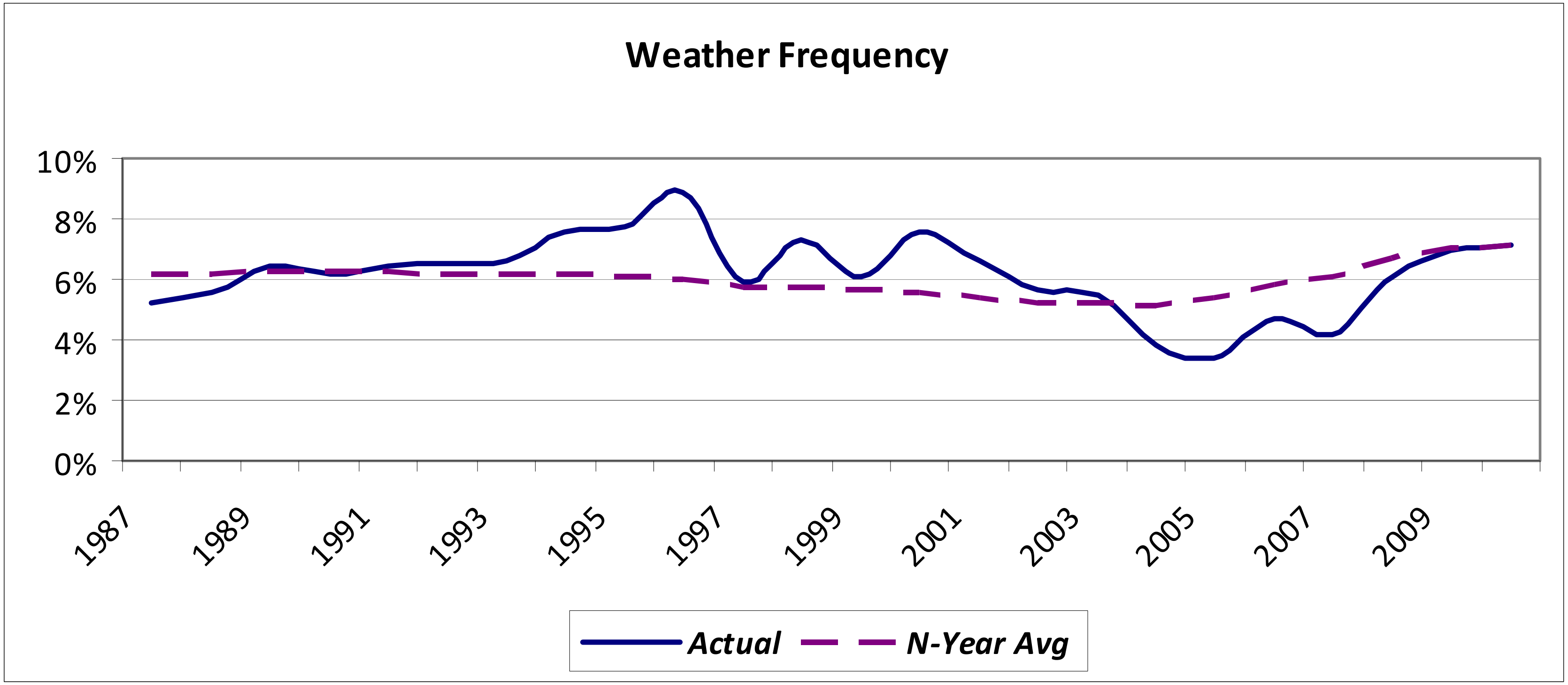
- Two tests were run to determine the optimal number of years to use:
  - Simulation of 30,000 trials assuming a Gamma distribution in order to graph a histogram of errors
  - Correlation testing



Frequency Analysis

- A correlation test takes pairs of years separated by a certain time interval and determines whether or not the experience in those two years are correlated
- The highest correlations appear to be between the pairs of years that are very close together or very far apart
- There are negative correlations between pairs of years that are neither close together nor far apart

Frequency Analysis



- Based on the graph, there is no indicator of a definite trend or cyclicality, but this does help to explain the results of the correlation test
- Given the combination of results from the simulation and correlation testing, using more years of data stabilizes the estimate around the true mean

Summary

- Separating property indications into Weather and Non-Weather components and eliminating the need for a provision for non-modeled catastrophes creates a more homogeneous data set
- Performing a weather severity analysis will account for shifts in replacement value
  - Severities are stable enough to use fewer years of data – even for weather events!
- Frequency analysis requires maximum number of years available in order to capture all historical events that may be possible in the future

Future Considerations

- Demand Surge
  - Separate quantification of frequency and severity assumes independence between these two statistics
- Catastrophic Wildfire Losses
  - Preliminary analysis reveals that wildfire experience is considerably different than that of weather experience
- Weather Frequency Trend
  - Can a rigorous statistical or time series analysis solve the mystery of whether or not there is a trend in long-term weather frequencies?
- Modeled/Historical Loss Hybrid Method
  - Modeled losses can serve as a guide to determine the return time of a particular accident year weather frequency

Questions?