STORM EVENTS DATA ANALYSIS PROJECT

By Team: CSV- Pitchers

Chandra Tara Lama

Shravya Shruthi Pathala

Vaibhav Rahangdale

Pradeep Pal

Audience Analysis

Property and Casualty Actuarial Managers are the target audience for our analysis. The responsibilities of these managers in general are:

- Obtain premium and loss data using predefined or user created database procedures.
- Calculate company loss and expense reserves.
- Provides actuarial support in evaluating new product or product enhancement recommendations.
- Recommends and prepares experience, expense or rate effect exhibits to support product recommendations.
- Develops, recommends and implements operational plans and procedures.
- Prepare the annual Permissible Loss Ratio Analysis.
- Provide actuarial recommendations on corporate issues such as internal rate of return.
- Conducting other risk-analysis related-projects in at least one of the following areas: Loss control, standard industry practices regarding claim reviews, claim evaluations, strategic planning and analysis; merger and acquisition valuations; reinsurance program review and expert witness testimony.

Decisions based on Target Audience

Our analysis on the storm events will help the actuarial managers to perform their job at their best. It helps in making decisions regarding

- Risk Analysis their own company during/after occurrence of natural disasters.
- Evaluation of new products or enhancements in existing products provided by the company based on the previous observations/ analysis on various events including natural calamities.
- Operational/ strategic plans required to be put in place.
- Evaluate the annual Permissible Loss Ratio Analysis.
- Claims raised during or after a natural calamity has occurred.

Description of Storm Events Dataset

We have retrieved our data from NOAA's National Weather Service. The National Centers for Environmental Information (NCEI) regularly receives Storm Data from the National Weather Service (NWS). This data set consists of state wise occurrence of Event type in USA like Tornado, Thunderstorm Wind and Hail, Marine strong wind, Flash flood, Heavy rain, Heavy snow, Funnel Cloud, Extensive Heat and also contains data regarding locations, fatalities, injuries, damage, narratives and any other event specific information which can be used for information and analysis by business sectors, insurance companies, hazard mitigation, policy makers etc. (NCDC, 2017).
Data Sources:- https://www.ncdc.noaa.gov/stormevents/

**Processing/ Data cleaning of Storm Events Dataset**

We have used different set of columns for each of the research questions so that our analysis is oriented towards the target audience. For our analysis we have removed the 'none' values as R excludes all cases in which any of the inputs are missing by default; this can limit the amount of information available in the analysis. To represent results in better level of granularity, we have dropped the columns which have redundant data such as 'BEGIN_YEARMONTH', 'BEGIN_YEARMONTH', 'BEGIN_DATE_TIME', 'END_DATE_TIME', 'state_fips' as these values are combination of columns present in the data set. We also removed the columns 'EPISODE_NARRATIVE', 'event_narrative' and 'DATA_SOURCE' as these are nominal data and difficult to analyze them in R. We have checked for the duplicate values and removed the duplicate values for each question.

During the process, we encounter few issues with the data set:-

- Data validation.
- Missing values and inconsistencies in most of the storm events dataset.
- Encounter irrelevant data while doing data cleaning.

Plots for Analysis
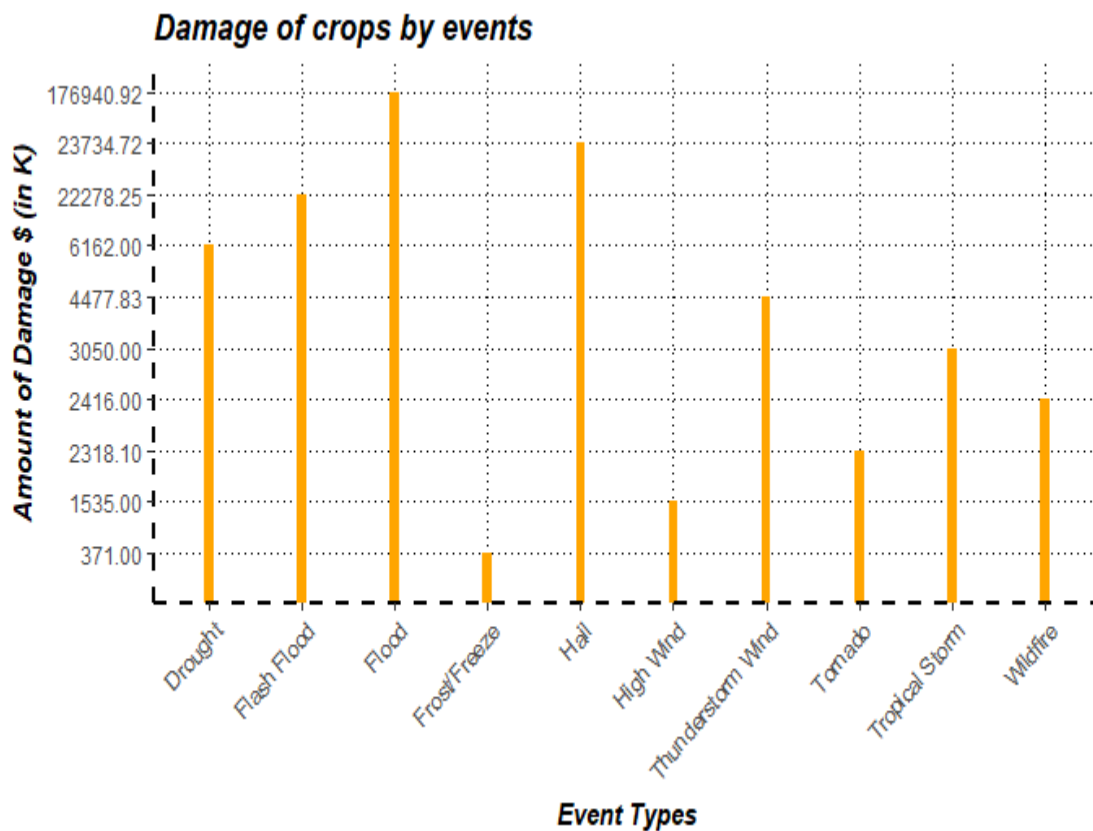
1. Plot Analysis and Interpretation- Region wise
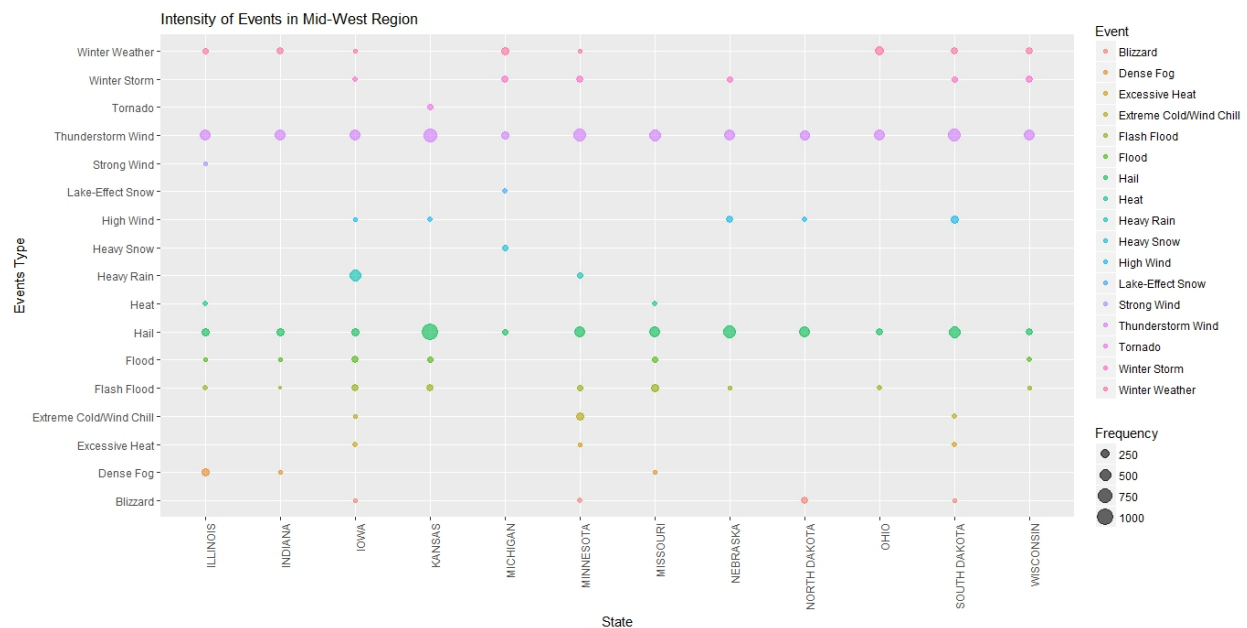
The above plot intends to provide a visualization in which we can easily identity that the storm events intensities in the various united states in region wise. Here we are going to interpret mid-west region. In Mid-West region, it can be seen that state like Kansas, Minnesota and South Dakota is highly affected by Thunderstorm with the frequency of 500.And also we can see that one states like Kansas is highly affected by Hail with the frequency of 750. From the visualization plot we can also say that Michigan and Ohio is the best place to live in mid-west because the occurrence of storm events is few compare to other states and the frequency is also low (approx. 250).

2. Plot Analysis and Interpretations- Cluster Graph shows High Frequency Storm events month wise.
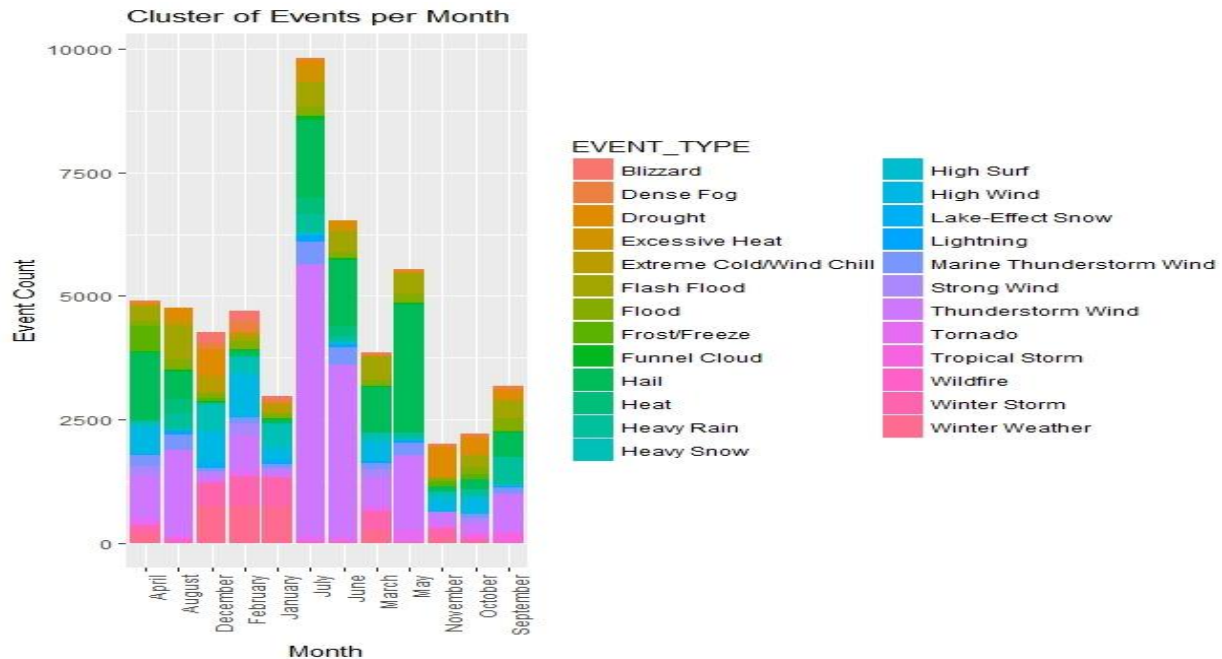

From the bar graph we can seen that in the month of July only the occurrence of events is very high which is close to 10000. In which the most occurring events is thunderstorm. Whereas in the month of November we found less occurrence of storm events which includes dense fog, lake affect snow.

3. Plot Analysis and Interpretation- Damages Crop and Property by Storm events.

From the bar graph it is found that the crop is mostly damages by flood and hail. And least affected by frost/freeze and high wind.

4. Plot Analysis and Interpretation- Bar Graph shows total causalities by Storm events.
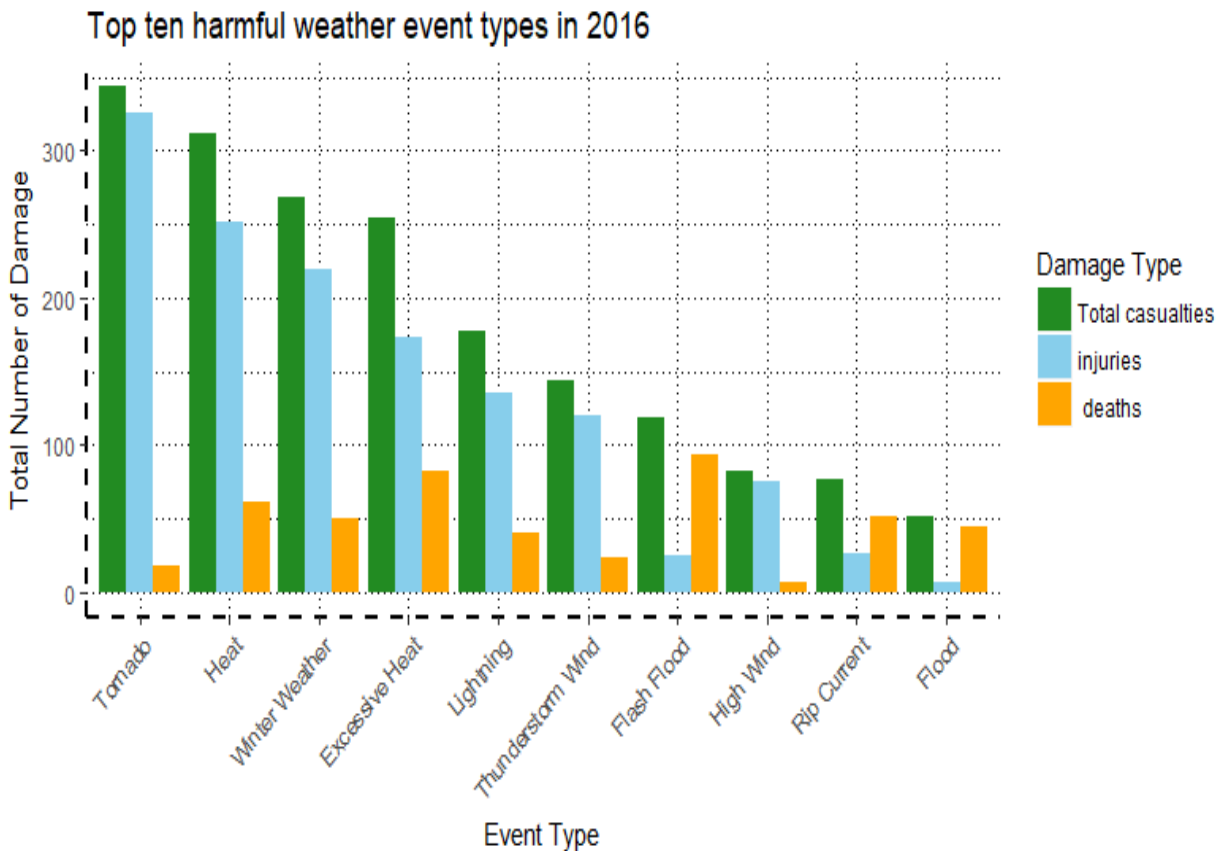
From the above bar graph, we can see that Tornado is responsible for greater number of injuries whereas flood injured lesser in number, but it causes significant number of deaths. Furthermore only high wind causes less number of death among other events.

Persuasive Argument

Based on the results from our analysis on the storm events data, the actuarial managers need recommend changes to the existing products, premiums and their coverages available in the natural calamity prone areas depending on the extent of property damage and frequency of calamity occurrence. Also, encourage their support staff to implement certain operational plans and evaluate the credibility of the claims raised with the tag of natural calamities.

From the data analysis, few takeaways are: -

- Tornado is the most devastating event type based on causalities.
- Flash flood is the major cause of property damage.
- Flood is the major cause for crop damage.

Word Count- 917

Reference

National Centers for Environmental Information. (2017) Strom Event database 2017, from https://www.ncdc.noaa.gov/stormevents/