

## Title:

The Financial Correlations of Major Natural Disasters on Insurance Prices

## Abstract:

This project's main question aims to see if there is a relationship between large-scale natural disasters and the cost of insurance, and whether specific insurance, like property insurance, is more likely to be affected.

By combining datasets on natural disaster costs and insurance rate indices, we examined potential correlations between the financial impact of disasters and changes in insurance pricing. To standardize comparison, each disaster's total cost was divided by its duration in months to calculate a "cost-per-month," which was then applied across all datasets to ensure consistency.

The preliminary visualizations of property insurance prices compared to overall insurance prices reveal a clear relationship between major disaster events and property insurance costs. Out of all the disaster types, severe storms are the most frequently occurring major disaster type; however, tropical cyclones drive the highest financial costs. When comparing insurance, property insurance indices increase above all others after 2020. Overall, the analysis suggests a positive correlation between disaster costs and the insurance index, with noticeable increases in insurance prices typically appearing about 6 to 12 months after major catastrophic events.

## Introduction

Our analysis aims to determine whether large natural disasters affect insurance prices and whether certain types, like property insurance, are more strongly affected. The main question is whether higher disaster costs correspond to increases in overall or specific insurance rates. Our project examines the correlations between disaster expenses and insurance indices to determine potential market responses and can offer valuable insight for policymakers, insurance companies, and consumers seeking to understand how natural disasters shape financial risk and insurance affordability.

## Data

We searched online for data relating to insurance prices and the costs of natural disasters. We ended up sources our data on insurance prices from the Bureau of Labor Statistics, which keeps of the relative track of the price index of insurance as a whole, as well as property insurance. Unfortunately, no other information is provided on the data, and only the relative cost is given. Their downloadable data set contains data from 2009 to the present day. The data on natural disasters came from the National Oceanic and Atmospheric Administration, which has a publicly available data set of billion-dollar natural disasters (adjusted for inflation) as far back as 1980. None of the data contained any missing values, and cleaning it was just a matter of removing the headers in the csv files.

## Preliminary visualization

The visualizations illustrate that property insurance generally follows overall insurance trends, though it rises slightly faster in recent years, likely due to severe storms and other disasters. Insurance prices do not react immediately to disaster costs, but tend to increase about six months after major events, increasing more after twelve months. Extreme disasters, particularly tropical cyclones, drive the largest financial impacts.

## Analysis

With our data, we looked at how the financial costs of major natural disasters connect to changes in insurance prices over time. Beyond what we already analyzed earlier, we want to see if certain areas are more frequently affected by disasters and if they experience sharper increases in insurance prices. In order to do so, we will need to find additional datasets to do this analysis. We also want to see if factors such as inflation or GDP growth can determine whether changes in insurance prices are driven primarily by disasters or by general market conditions.

Github link (code, visualizations, etc.): [https://github.com/puppy7777/STAT107\\_FINAL\\_PROJECT](https://github.com/puppy7777/STAT107_FINAL_PROJECT)