Analyzing Climate Risk and Insights for Predicting Economic Losses

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1 Introduction

This project is about understanding how climate risks, like extreme weather events, impact economic losses in different regions. We'll be looking at various climate data and the Global Climate Risk Index to find patterns and trends. By doing this, we hope to get a clear picture of which areas are most at risk and what factors are causing economic problems related to climate change. This information will help us identify the regions that need the most help and understand the main causes of their economic instability due to climate issues.

2 Used Data

2.1 Climate Change Dataset

This climate change .csv file contains the historical climate data, providing insights into how climate change has affected our planet. It includes records of temperatures, CO2 emissions, and sea level rise for various cities around the world over the years. This dataset is beneficial for individuals eager to study global climate trends and gain multiple perspectives.

2.2 Climate Risk Index Dataset

This dataset holds information of Global Climate Risk index of various countries along with details about economic losses due to extreme weather events. This information is invaluable for researchers and policymakers aiming to understand the economic fluctuations of countries in relation to climate change and extreme weather patterns. Additionally, the dataset can help in planning and implementing effective climate adaptation and mitigation strategies.

3 Analysis

3.1 Data Pipeline Overview

The project workflow involves several key steps to ensure data readiness. First, it fetches and loads data from Kaggle using the Kaggle API. Once the data is retrieved, it undergoes a series of processing steps to ensure accuracy and standardization. The cleaned and normalized data is then loaded into Pandas DataFrames for easy manipulation and analysis. Finally, the processed data is stored in an SQLite database.

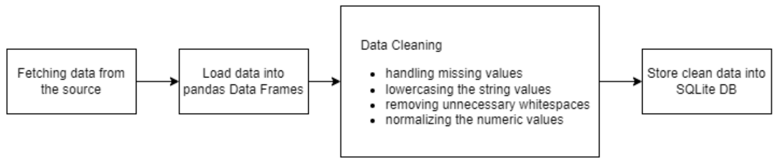

Figure 1: Project Data Pipeline

However, there were some challenges in this process. For example, identifying the correct files from a folder with many files was a bit difficult. Additionally, handling missing data was tough because removing it could also remove useful information.

3.2 Insights from the Data

3.2.1 Correlation Analysis

The correlation matrix shows important relationships between different environmental and climate risk variables. There's a strong connection (0.99) between `cri_rank` and `cri_score`, indicating that changes in the climate risk rank are closely mirrored by changes in the climate risk score. Similarly, `losses_usdm_ppp_total` and `losses_usdm_ppp_rank` have a perfect correlation (1.00), highlighting a direct link between economic losses and their ranking. Negative correlations, such as those between `fatalities_per_100k_rank` and other climate risk metrics, suggest that as one increases, the other decreases.

Variables like Temperature and CO2 Emissions have weak correlations with climate risk and economic loss metrics, suggesting they don't have much direct impact in this dataset. Groups of related climate risk variables highlight areas that need more attention. These insights can help focus further research and develop strategies for dealing with climate change and planning for economic impacts.

3.2.2 Focus on Specific Correlations

The correlation matrix reveals key relationships between variables. There's a strong positive correlation (0.85) between the climate risk index score `cri_score` and the rank of economic losses per GDP `losses_per_gdp_rank`, indicating that higher climate risk scores are linked to greater economic losses relative to GDP. On the other hand, environmental factors like Temperature, CO2 Emissions, and Sea Level Rise show weak or negligible correlations with both `cri_score` and `losses_per_gdp_rank`, suggesting they don't significantly influence climate risk scores or economic losses in this dataset.

3.3 Visualizations

3.3.1 Scatter Plot of Temperature vs Economic Losses

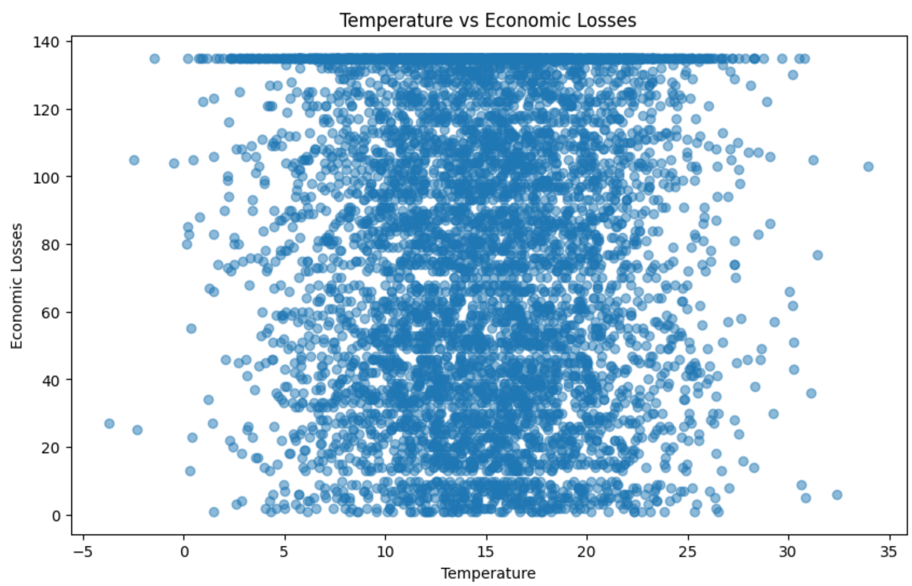

Figure 2: Temperature vs Economic Losses

The scatter plot comparing Temperature and Economic Losses shows a lot of variability with no obvious pattern. This means there's no strong link between temperature changes and economic losses. This finding matches our earlier observations of a weak correlation, suggesting that temperature by itself doesn't have a major impact on economic losses from climate risks.

3.3.2 Line Plot for Observed vs Predicted Economic Losses

The line plot shows a clear gap between observed and predicted economic losses over time. While the actual losses vary greatly and have significant peaks, the predicted losses stay mostly flat. This indicates that the prediction model isn't accurately capturing the real-world fluctuations in economic losses. To improve the model, we need to refine it and consider adding more variables or using more advanced techniques.

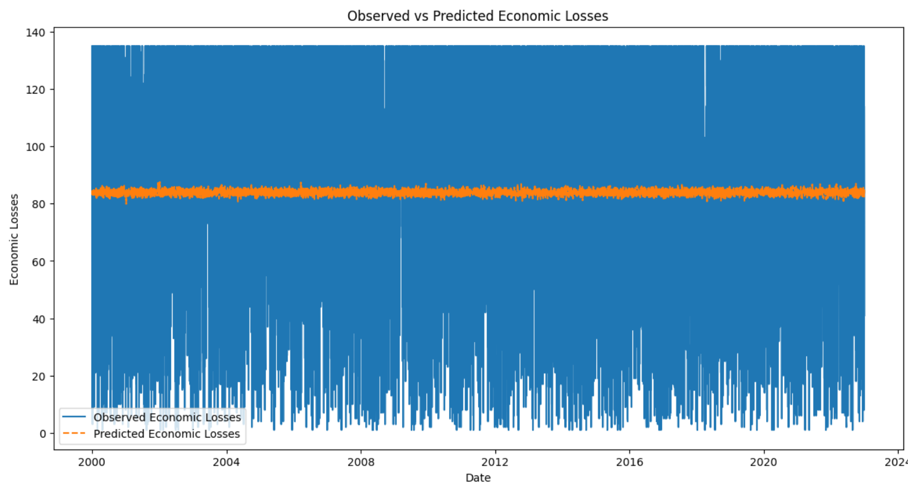

Figure 3: Observed vs Predicted Economic Losses

4 Conclusion

In conclusion, the above analysis shows that temperature, CO2 emissions, and sea level rise do not strongly correlate with economic losses from climate risks. The scatter plot confirms this, showing no clear trend between temperature and economic losses. Additionally, the line plot highlights significant gaps between observed and predicted economic losses, indicating our model's limitations.

To better understand and predict economic losses related to climate risk, we need a more comprehensive approach. This could involve incorporating additional variables or using more advanced modeling techniques, ultimately helping to develop more effective strategies for climate risk management and economic planning.