

Earthquake Catastrophe Modeling | T-Rupt

31 July 2024, Wednesday



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Summary

Catastrophe (Cat) modeling is crucial for estimating the social and economic impacts of extreme events, particularly earthquakes. Cat modeling helps the insurance and reinsurance industry in assessing potential losses from seismic events and their financial consequences. By utilizing advanced computational methods and data analytics, catastrophe models simulate comprehensive sets of earthquake scenarios to understand the loss distributions in a portfolio for developing effective mitigation and pricing strategies.

Catastrophe modeling is an essential tool for calculating the social and economic impacts of extreme events. Catastrophe modeling for earthquakes is implemented for the insurance and reinsurance industry to estimate the potential losses caused by seismic events and assess their financial consequences for policyholders and insurers.

To achieve this objective, catastrophe loss modeling employs advanced computational methods and data analytics to simulate a suite of earthquake scenarios to determine the loss distribution results for the locations of the exposures accordingly. Modeling is crucial in understanding the complex nature of earthquake-related risks and developing effective risk mitigation and pricing strategies for re/insurers.

Why Earthquake Catastrophe Modeling is Important?

Insurance and reinsurance companies utilize CAT models, or catastrophe models, to manage and transfer their risks effectively. These models evaluate the financial loss distributions that seismic events can cause across their portfolio of policies, enabling the companies to make informed decisions regarding underwriting, pricing, and risk retention. Based on the CAT model loss distribution outputs, a company can decide to purchase reinsurance to cover a portion of the potential loss.

By incorporating sophisticated modeling techniques, re/insurance companies can better assess:

- the potential financial impact of earthquakes,
- optimize the spatial distribution of their exposure,
- ensure the sustainability,
- and profitability of their portfolios.

Key Features of Earthquake Catastrophe Modeling in CatMod

T-Rupt's CatMod platform offers a computational solution catastrophe modeling for earthquake losses for industrial, commercial, and residential buildings. The insurance agreement could cover the damages to structure itself and/or the contents inside, or the business interruption. The financial losses are separately calculated for each coverage by CatMod.

CatMod has **scenario-based, stochastic, event response, fatality and injury modeling modules** developed to address the needs of the re/insurer companies.

1) Scenario-based Earthquake Loss Modeling

The scenario-based module in CatMod calculates the impact of specific earthquake scenarios on the financial losses of the portfolios in re/insurance companies. These financial losses, if any, are assessed against existing re/insurance agreements including the losses covered by proportional or non-proportional treaties.

For example, T-Rupt proposes eight specific earthquake scenarios with magnitudes greater than 7.0 to simulate potential earthquakes in the Marmara Sea. Using these earthquake scenarios, CatMod calculated the financial losses of more than 30 companies by considering their re/insurance agreements. The results are interpreted by the insurance companies in terms of sufficiency of the agreement limits.

2) Stochastic Earthquake Loss Modeling

Leveraging statistical methods and probability theory, CatMod goes beyond deterministic modeling to account for uncertainties and randomness inherent in earthquakes and corresponding property damage. Considering the uncertainties in earthquake rupture scenarios, the stochastic approach provides a more robust loss assessment framework by giving annual exceedance probabilities of portfolio losses at specific loss levels. This helps insurers develop resilient reinsurance strategies that can withstand unexpected variations in seismic activity on a yearly basis.

3) Event Response Earthquake Loss Modeling

Event response in earthquake catastrophe modeling involves forecasting the insurance-related loss impacts likely to occur immediately after a seismic event. This aspect of modeling focuses on predicting how re/insurers are affected by the earthquake in terms of financial implications. CatMod enables re/insurers to anticipate post-earthquake losses in advance.

4) Earthquake Fatality and Injury Modeling

In addition to financial losses, CatMod has developed a module to estimate fatalities and injuries resulting from catastrophic earthquakes. The CatMod fatality and injury model has been validated using data from the catastrophic 1999 Kocaeli and 2023 Kahramanmaras earthquakes.

Final Words

Catastrophe modeling for earthquake losses is an indispensable component of re/insurance strategy, providing critical insights into the financial impacts of seismic events. T-Rupt's CatMod platform offers advanced capabilities, including scenario-based, stochastic, event response, and fatality and injury modeling, to meet the needs of re/insurers in a comprehensive manner.

By leveraging these sophisticated tools, insurance and reinsurance companies can better understand and manage their risk exposure, optimize their underwriting and pricing strategies, and ensure the sustainability and profitability of their portfolios. CatMod 's ability to simulate earthquake scenarios and predict potential losses enables re/insurers to make informed decisions regarding risk retention and reinsurance purchases, ultimately enhancing their resilience against earthquake-induced financial disruptions.

Contact T-Rupt today to learn how CatMod can strengthen your reinsurance strategy against the ever-present threat of seismic events.

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