Return period estimation for wind storm losses in Norway

Oscar Lindberg[*]

June 2021

Abstract

The insurance risk for natural catastrophes is heavily determined by extreme loss events occurring with low frequency. For insurance providers, this makes probability estimates for individual catastrophe events a crucial part of inference. In this thesis, we analyze historical wind storm loss data from the Norwegian Natural Perils Pool, in order to model the probability of extreme losses occurring from storm events. To do this, we use a Peaks over threshold model, in which the excess losses for storm events above a selected cost threshold follows a Generalized Pareto distribution. We also have access to a catastrophe model that simulates storm events and is used to estimate the probability of extreme losses. We compare this catastrophe model to a maximum likelihood estimated Peaks over threshold model, and also consider a Bayesian estimation of the Generalized Pareto distribution, in which prior uncertainty is based on the catastrophe model. Estimation uncertainty is evaluated using profile likelihood methods, a Bootstrap analysis, and through the posterior distribution for the Bayesian model.

---

[*]Postal address: Mathematical Statistics, Stockholm University, SE-106 91, Sweden. E-mail: oscar.lindberg97@gmail.com. Supervisor: Filip Lindskog.