

A latent process model for temporal extremes

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Abstract

A hierarchical approach to modelling the extremal behavior of a stationary time series is presented.

The procedure comprises two stages. In the first stage, exceedances over a high threshold are modeled through a Generalized Pareto distribution, which is represented as a mixture of an Exponential variable with a Gamma distributed rate parameter. In the second stage, a latent Gamma process is embedded inside the Exponential distribution in order to induce temporal dependence among exceedances.

Unlike other hierarchical extreme value models, this version has marginal distributions that belong to the Generalized Pareto family, so that the classical extreme value paradigm is respected.

In addition, analytical developments show that different choices of the underlying Gamma process can lead to different degrees of temporal dependence of extremes, including asymptotic independence.

Simulations and applications to real data sets show that the model has a good flexibility in capturing different types of tail behavior.