Structural properties of spectral tail processes and applications for extremal inference

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Abstract:
The framework of regularly varying time series allows us to describe the extremal dependence structure of multivariate (heavy-tailed) time series by means of the spectral tail process, which captures all information about the extremal dependence structure. Under the additional assumption of stationarity, it was shown in Janssen (2019) that the class of spectral tail processes is equal to the class of stochastic processes which are invariant under the so-called RS-transformation. Furthermore, this RS-transformation can be interpreted as a projection of the distribution of a stochastic process into the class of spectral tail processes. We apply this relationship in a statistical context and define a projection based estimator for extremal quantities. This new estimator now ensures that the estimated quantity is in fact derived from a spectral tail process of an underlying stationary time series. By applying and further developing the tail empirical process theory for sliding blocks estimators from Drees & Neblung (2021) we show uniform asymptotic normality of our estimators. Several simulation studies show that the new estimator has a more stable performance than previous ones. This talk is based on Drees et al. (2021).

Keywords:
Stochastic Processes; Extreme Value Theory; Empirical Processes; Extremal Dependence; Projection Estimator

References:
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