

Fourier analysis of extreme events

This is joint work with Yuwei Zhao (Copenhagen).

Davis and Mikosch (Bernoulli 2009) introduced the extremogram as a correlogram of extreme events: given a stationary sequence of observations (possibly multivariate) the extremogram is the sequence of the lag-wise tail dependence coefficients in this sequence. It can be interpreted as a limiting correlogram which assumes only non-negative values. Corresponding sample versions have the standard properties such as consistency and asymptotic normality provided the finite-dimensional distributions are regularly varying. Davis and Mikosch (Bernoulli 2011) provided confidence bands based on the stationary bootstrap of Politis and Romano (JASA 1994). In the present work, an analog of the spectral density is defined for extreme events: since the extremogram is a limiting correlogram one can define the corresponding spectral quantities. The periodogram ordinates of the extreme events can be shown to have some of the desired properties such as asymptotic independence at distinct frequencies. The latter properties can be used to smooth the periodogram. The main difference to the classical theory for the periodogram is the fact that the extremal periodogram is based on triangular arrays of stationary sequences of indicator functions of extreme events. This fact makes calculations very technical.