Asymptotic conditional distribution of exceedance counts: fragility index with different margins

Michael Falk · Diana Tichy

Abstract We consider a random vector X, whose components are neither necessarily independent nor identically distributed. The fragility index (FI), if it exists, is defined as the limit of the expected number of exceedances among the components of X above a high threshold, given that there is at least one exceedance. It measures the asymptotic stability of the system of components. The system is called stable if the FI is one and fragile otherwise. In this paper, we show that the asymptotic conditional distribution of exceedance counts exists, if the copula of X is in the domain of attraction of a multivariate extreme value distribution, and if the marginal distribution functions satisfy an appropriate tail condition. This enables the computation of the FI corresponding to X and of the extended FI as well as of the asymptotic distribution of the exceedance cluster length also in that case, where the components of X are not identically distributed.