



A statistical model for collective risk assessment

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In this paper we present the theoretical basis of a statistical method that can be used as the basis of a collective risk assessment for country (or continent)-wide events. Our method is based on the conditional dependence model of Heffernan and Tawn (2004), which has been extended to handle missing data and temporal dependence by Keef et al (2009). This model describes the full joint distribution function of a set of variables and incorporates separate models for the marginal and dependence characteristics of the set using a copula approach. The advantages of this model include; the flexibility in terms of types of dependence modelled; the ability to handle situations where the dependence in the tails of the data is not the same as that in the main body of the data; the ability to handle both temporal and spatial dependence; and the ability to model a large number of variables.

In this paper we present further extensions to the statistical model which allow us to simulate country-wide extreme events with the correct spatial and temporal structure and show an application to river flood events.

Heffernan J. E. and Tawn J. A. (2004) A conditional approach for multivariate extreme values (with discussion) *J. R. Statist. Soc. B*, 66 497-546

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