EVALUATION OF SEMI-PARAMETRIC ESTIMATION METHODS OF EXTREME-VALUE INDEX AND ROBUSTIFYING MODIFICATIONS

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Abstract

This thesis is concerned with the systematic study of the extreme values that can be observed in every field of our lives. Although the most commonly-used statistical measure of any phenomenon is the 'arithmetic mean', the occurrence of a single extreme can have drastic impact. This alone suggests the importance of studying extremes. So, we start by illustrating some of the areas where extreme-value analysis has already been applied and proceed by providing it's theoretical background.

There are more than one approaches to analyze extremes. After giving a brief description of the parametric methods we concentrate on semi-parametric ones. The essence of semi-parametric technique is that the extreme behaviour of any phenomenon under study is described by a single index (the so-called extreme-value index) and can be estimated by using only the largest observations. The 'Achilles' Hill' of this approach is related to the choice of number of largest observations used in the estimation. The evaluation of several estimators of extreme-value index, as well as of smoothing and robustifying procedures of these, is the main scope of the present thesis. The results of an extensive simulation study reveal that there is not a uniformly best estimator. On the contrary, indications about the area where the true value of extreme-value index lies can be proven to be really useful to the proper choice of estimator as well as to whether the application of a smoothing (averaging) procedure is a good idea or not. Finally, extreme-value analysis is performed on a data-set stemming from the area of teletraffic engineering. This is a field where extreme-value analysis has recently been introduced but gradually proves its value.