Improving the extremal index estimation through combination of an heuristic adaptive choice algorithm and resampling techniques

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In Extreme Value Theory (EVT) we deal essentially with the estimation of parameters of extreme or rare events. A large number of applications in areas such as biology, environment, finance, hydrology and telecommunications, reveals the importance of adequate estimation procedures. Among the key parameters in EVT we refer to the extreme value index (EVI) and the extremal index (EI). Under a framework related to large values, the EVI measures the right tail-weight of the underlying distribution and the EI characterizes the degree of local dependence in the extremes of a stationary sequence. Many authors have worked with the EVI estimation but the EI has received less attention. However it needs to be adequately estimated, not only by itself but because its influence on other parameters, such as, a high quantile, the return period, the expected shortfall. Like other semi-parametric estimators, EI estimators show nice asymptotic properties, but a high variance for small values of k, the number of upper order statistics used in the estimation, and a high bias for large values of k. This brings a real need for the choice of k. After a brief reference to some estimators of the EI and their asymptotic properties, the goal of this work is to deal with the application of resampling techniques together with the adaptive choice of a 'tuning' parameter, the block size for resampling. Block-bootstrap and Jackknife-After-Bootstrap are two computational procedures applied here for improving the behaviour of the extremal index estimators. An adaptive choice algorithm for the block size for the resampling procedure as well as for the choice of the more adequate number of upper order statistics for the estimation is studied. Results from an intensive simulation study are shown. Applications of these procedures to the analysis of environmental and financial data are undertaken.
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