



Department of Decision Sciences

Statistics Seminars

Optimal pooling and distributed inference for the tail index and extreme quantiles

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Abstract

We investigate pooling strategies for tail index and extreme quantile estimation from heavy-tailed data. To fully exploit the information contained in several samples, we present general weighted pooled Hill estimators of the tail index and weighted pooled Weissman estimators of extreme quantiles calculated through a nonstandard geometric averaging scheme. We develop their large-sample asymptotic theory across a fixed number of samples, covering the general framework of heterogeneous sample sizes with different and asymptotically dependent distributions. Our results include optimal choices of pooling weights based on asymptotic variance and MSE minimization. In the important application of distributed inference, we prove that the variance-optimal distributed estimators are asymptotically equivalent to the benchmark Hill and Weissman estimators based on the unfeasible combination of subsamples, while the AMSE-optimal distributed estimators enjoy a smaller AMSE than the benchmarks in the case of large bias. We consider additional scenarios where the number of subsamples grows with the total sample size and effective subsample sizes can be low. An application to insurance data across several US states is presented. Joint work with Abdelaati Daouia (Toulouse School of Economics) and Simone Padoan.