University of California, Irvine
Statistics Seminar

Robust Estimation and Inference for Joint Quantile and Expected Shortfall Regression

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Expected Shortfall (ES), as a financial term, is the average return on a risky asset conditional on the return below some quantile of its distribution. The latter is also known as the Value-at-Risk (VaR). In their Fundamental Review of the Trading Book (Basel Committee, 2016, 2019), the Basel Committee on Banking Supervision confirmed the replacement of VaR with ES as the standard risk measure in banking and insurance. From a statistical perspective, we consider a linear regression framework that simultaneously models the quantile and the ES of a response variable given a set of covariates. Existing approach is based on minizming a joint loss function, which is not only discontinuous but also non-convex. This inevitably limits its applicability for analyzing large-scale data. Motivated by the idea of using Neyman-orthogonal scores to reduce sensitivity with respect to nuisance parameters, we propose a computationally efficient two-step procedure and its robust variant for joint quantile and ES regression. Under increasing-dimensional settings, we establish explicit non-asymptotic bounds on estimation and Gaussian approximation errros, which lay the foundation for statistical inference of ES. In high-dimensional sparse settings, we study the theoretical properties of regulaized two-step ES regression estimator as well as its robust counterpart. This paves the way for developing post-selection inference methods for high-dimensional joint QR and ES regression.