

Extreme Expectile Estimation for Heavy-Tailed Time Series

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Abstract:

Expectiles are a least squares analogue of quantiles which have lately received substantial attention in actuarial and financial risk management contexts. Unlike quantiles, expectiles define coherent risk measures and are determined by tail expectations rather than tail probabilities; unlike the Expected Shortfall, they define elicitable risk measures. This has motivated recent studies of the behaviour and estimation of extreme expectile-based risk measures. The case of stationary but weakly dependent observations has, however, been left largely untouched, even though correctly accounting for the uncertainty present in typical financial applications requires the consideration of dependent data. We investigate the estimation of, and construction of accurate confidence intervals for, extreme expectiles and expectile-based Marginal Expected Shortfall in a general β -mixing context, including well-known families of models such as Autoregressive Moving Average with heavy-tailed innovations, Autoregressive Conditional Heteroscedasticity and Generalized Autoregressive Conditional Heteroskedasticity, which are of interest in financial applications. The methods are showcased in a numerical simulation study and on real financial data.

Keywords:

Asymmetric least squares; Extremal dependence; Marginal Expected Shortfall; Mixing; Tail copula.