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Chuan-Sheng Wang, Zhibiao Zhao

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Conditional Value-at-Risk: Semiparametric Estimation and Inference

Chuan-Sheng Wang and Zhibiao Zhao*
Department of Statistics, Penn State University
University Park, PA 16802

Abstract

Conditional Value-at-Risk (CVaR) plays an important role in financial risk management. Nonparametric CVaR estimation suffers from the "curse of dimensionality" and slow convergence rate. To overcome these issues, we study semiparametric CVaR estimation and inference for parametric model with nonparametric noise distribution. Under a general framework that allows for many widely used time series models, we propose a semiparametric CVaR estimator that achieves the parametric convergence rate. Furthermore, to draw simultaneous inference for CVaR at multiple confidence levels, we establish a functional central limit theorem for CVaR process indexed by the confidence level and use it to study the conditional expected shortfall. A user-friendly bootstrap approach is introduced to facilitate non-expert practitioners to perform confidence interval construction for CVaR. The methodology is illustrated through both Monte Carlo studies and an application to S&P 500 index.

JEL Codes: C14; C22; C53; G32.
Keywords: Bootstrap, Conditional expected shortfall, Conditional Value-at-Risk, Nonlinear time series, Quantile regression, Semiparametric methods.

*Corresponding author: Zhibiao Zhao. 326 Thomas Building, University Park, PA 16802, U.S.A. Tel.: 1-814-865-6552; fax: 1-814-863-7114. Email address: zuz13@stat.psu.edu. Zhao's research was supported by a NSF grant DMS-1309213 and a NIDA grant P50-DA10075-15. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIDA or the NIH. We are grateful to an Associate Editor and three anonymous referees for their very helpful comments.