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Prediction of Extremal Expectile Based on Regression Models with Heteroscedastic Extremes

Expectile recently receives much attention for its coherence as a tail risk measure. Estimation of conditional expectile at extremal tails is of great interest in quantitative risk management. Regression analysis is a convenient and useful way to quantify the conditional effect of some predictors or risk factors on an interesting response variable. However, when it comes to the estimation of extremal conditional expectile, the traditional inference methods may suffer from considerable variation due to a lack of sufficient samples on tail regions, which makes the prediction inaccurate. In this article, we study the estimation of extremal conditional expectile based on quantile regression and expectile regression models. We propose three methods to make extrapolation based on a second-order condition for a framework of the so-called conditionally heteroscedastic and unconditionally homoscedastic extremes. In addition, we establish the asymptotic properties of the proposed methods and show their empirical behaviors through simulation studies. Finally, data analysis is conducted to illustrate the applications of the proposed methods in real problems.