

Quantile regression using shape-constrained density estimation

Quantile regression estimates a quantile of a distribution of y , conditioned on the value of a predictor x . Traditionally, a “check” shape is used for a discrepancy function, so that the estimate of the 50th quantile function coincides with the least-absolute-deviations regression estimator. The method is nonparametric because no distribution of the errors is assumed. In this talk, a novel quantile regression method is presented, which combines estimation of the error density, the variance function, and the regression function. We assume that the observations $y = f(x) + s(x)\varepsilon$, where the density of the random error ε is assumed only to be unimodal. The regression function f and the standard deviation function s can be estimated non-parametrically, providing a framework for a fully non-parametric regression method. Estimated quantile functions readily follow from the combined density, variance and regression function estimates, and are guaranteed not to cross.

Keywords: unimodal, quantile regression, splines