Inference-Without-Smoothing for Large Scale Quantile Regression

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Summary: Quantile regression is a very important model for many areas of social and economic research. But practitioners may find it difficult to use it because parameter inference is computationally costly and controversial. Costly because estimation requires optimizing a nondifferentiable objective function which is a formidable numerical task, specially with a large number of observations and regressors. And controversial because standard asymptotic inference requires the choice of a smoothing parameter and different choices may lead to different conclusions. Bootstrap methods solves the latter problem at the price of enlarging the former. We give a theoretical justification for a new bootstrap method consisting of the construction of asymptotic pivots based on a small number of bootstrap replications. The procedure still avoids smoothing and reduces usual bootstrap methods’ computational cost. We show its usefulness to draw inferences on linear or nonlinear functions of the parameters of quantile regression models.

Keywords: Inference for quantile estimator, Bootstrap, Asymptotic pivots, Nonlinear hypotheses.