

On Efficient Estimation and Inference of Functionals of Semiparametric Conditional and Unconditional Moment Models

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Abstract

This paper considers estimation and inference of functionals that are identified via "plug-in" semi/nonparametric conditional and unconditional moment restrictions models. It addresses a difficult issue of semiparametric efficient estimation of functionals of nonlinear ill-posed inverse problems with nonparametrically estimated operators. Regardless whether a functional has a singular or non-singular information bound, we show that the centered, profiled optimally weighted penalized sieve minimum distance (PSMD) criterion function is asymptotically chi-square distributed, which extends Wilk's theorem to possibly non-regular semiparametric models. We establish the asymptotic normality of our plug-in PSMD estimator of any functional that may or may not be root-n estimable, and provide a simple consistent estimator of its variance. The estimator is automatically root-n efficient for any functional with a non-singular information bound. We apply our general theory to estimation and inference of a weighted average derivative of nonparametric quantile instrumental variables regression. We present a Monte Carlo study and a real data analysis of average derivatives of consumer demand quantile curves with endogenous total expenditure.