STATISTICS SEMINAR

Kanwal Ayub

PhD Defense

Wednesday, April 27th, 2022
Via Zoom, 2:00 pm (Central Time)

Extrapolation Estimation for Parametric and Non-Parametric Regression with Normal Measurement Error

For the general parametric and nonparametric regression models with covariates contam-inated with normal measurement errors, this dissertation proposes an accelerated version of the classical simulation extrapolation algorithm to estimate the unknown parameters in the parametric as well as the nonparametric regression functions.

For the parametric regression model, the proposed algorithm successfully removes the simulation step of the classical SIMEX algorithm by applying the conditional expectation directly to the target function thereby generating an estimation equation either for immediate use or for extrapolating, thus significantly reducing the computational time.

For the nonparametric regression models with covariates contaminated with normal mea-surement errors, the regression functions are estimated by applying the conditional expecta-tion directly to the kernel-weighted least squares of the deviations between the local linear approximation and the observed responses, thereby successfully bypassing the simulation step needed in the classical simulation extrapolation method, hence significantly increasing the computational efficacy. It is noted that the proposed method also provides an exact form of the extrapolation function, but the extrapolation estimate generally cannot be obtained by simply setting the extrapolation variable to negative one in the fitted extrapolation function if the bandwidth is less than the standard deviation of the measurement error.

Large sample properties of the proposed estimation procedures, including the consistency and the asymptotic normality, are thoroughly discussed. Potential applications of the pro-posed estimation procedures are illustrated by examples, simulation studies, as well as a real data analysis.