The Effect of Measurement Error in Regression Discontinuity Designs

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Abstract

This paper develops a nonparametric analysis for the sharp regression discontinuity (RD) design in which the continuous forcing variable may contain measurement error. We show that if the observable forcing variable contains measurement error, the measurement error causes severe identification bias for the average treatment effect given the "true" forcing variable at the discontinuity point. The severity comes from the discontinuity of the conditional distribution of the outcome due to the RD structure. To investigate the average treatment effect using the mismeasured forcing variable, we propose approximating it by the small error variance approximation (SEVA). Based on the SEVA, the average treatment effect is approximated up to the order of the variance of the measurement error by an identified parameter when the variance is small. We develop an estimation procedure for the parameter that approximates the average treatment effect based on local polynomial regressions and kernel density estimation. The approximate analysis can be also extended to the fuzzy RD design with the mismeasured forcing variable. Monte Carlo simulations reveal that measurement error causes much severe identification bias for the average treatment effect and demonstrate that our approximate analysis is successful.

Keywords: Regression discontinuity designs; classical measurement error; approximation; nonparametric methods; local polynomial regression

JEL Classification: C13; C14; C21

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