

The Effect of Measurement Error in the Sharp Regression Discontinuity Design*

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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, this error causes severe identification bias for the average treatment effect given the “true” forcing variable at the discontinuity point. The bias is critical in the sense that even if there is a significant causal effect, researchers are misled to the incorrect conclusion of no causal effect. Furthermore, the measurement error leads the conditional probability of the treatment to be continuous at the threshold. To investigate the average treatment effect using the mismeasured forcing variable, we propose an approximation using the small error variance approximation (SEVA) originally developed by Chesher (1991). Based on the SEVA, the average treatment effect is approximated up to the order of the variance of the measurement error using an identified parameter when the variance is small. We also develop an estimation procedure for the parameter that approximates the average treatment effect based on local polynomial regressions and the kernel density estimation. Monte Carlo simulations reveal the severity of the identification bias caused by the measurement error and demonstrate that our approximate analysis is successful.

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

JEL Classification: C13; C14; C21

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