A Bayesian Approach to Errors-in-Variables in Regression

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It is well known that when predictor variables are measured with error, estimates of the regression coefficients of those variables have undesirable repeated sampling properties (i.e., under a wide set of circumstances, the estimated coefficients are biased and inconsistent.) I adopt a Bayesian approach to this problem, in which interest focuses not on the repeated sampling properties of parameter estimates, but on updating beliefs about parameters in light of data (where, in this case, some of the data is poorly measured). Monte Carlo methods can be used to average over the uncertainty due to measurement error, or, equivalently, to exploit whatever information there may be in instrumental variables about the poorly measured predictor. The Bayesian approach provides a simple and easily implemented solution to the errors-in-variables, with uncertainty as to the true value of predictors contributing to uncertainty in our assessments as to the effect of those variables in a regression. Examples include assessing the effects of (poorly measured) constituency preferences on the legislative behavior of members of Congress; and the effects of (poorly measured) levels of democracy on the duration of civil war.

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