

Homework Review

Nicholas Ray

2023-09-29

Omitted Variables Bias

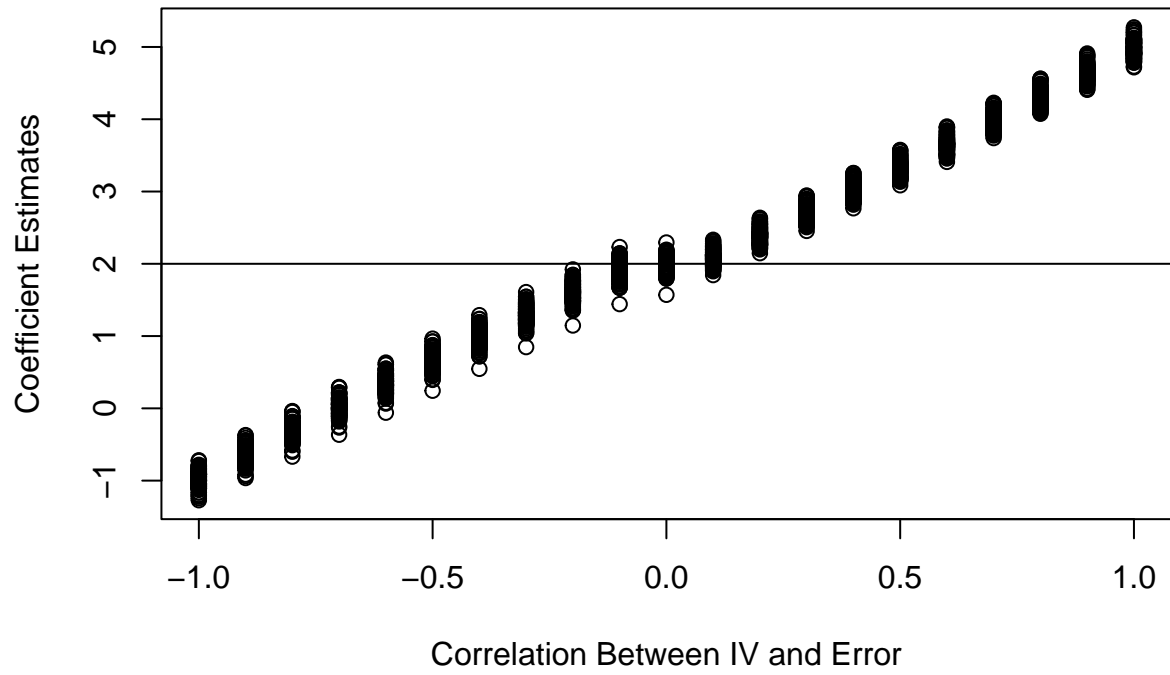
For homework you were asked to use Monte Carlo methods to estimate the effects of omitted variables bias under different conditions. Specifically, simulate the following model:

$$Y_i = \beta_1 + \beta_2 X_i + \beta_3 Z_i + \varepsilon_i,$$

where $\beta_1 = 1$, $\beta_2 = 2$, $\beta_3 = 3$, $\varepsilon_i \sim N(0, 1)$, $(X_i, Z_i) \sim N(0, \begin{bmatrix} 1 & p \\ p & 1 \end{bmatrix})$, and $p \in \{0.1, 0.9\}$. For the purposes of this problem, specifying the distribution of (X_i, Z_i) in this manner is to allow for the manipulation of the covariance between these two independent variables (i.e., p). This may be done using the `MASS::mvrnorm()` function in R.

The point of your Monte Carlo experiment will be to vary p , setting it at 0.1 and 0.9, while holding all else constant to examine differences in the bias induced (or not) from omitting Z_i when the relationship between Z_i and X_i varies. You should fix your sample size to be 100 and run 100 trials for each variation you make to the experiment (i.e., the two values of p). Once complete, describe the simulation you conducted and state the results of omitting Z_i at differing levels of p .

Simulation Results



Theoretical Effect of Omitted Variable

