Weiterführende Fragen der Ökonometrie

Übungsaufgaben – Blatt 8

Aufgabe 1 (3 Punkte)
Consider the simple regression model

$$y = \beta_0 + \beta_1 x + u$$

and let z be a *binary* instrumental variable for x. Use (15.10) to show that the IV estimator $\hat{\beta}_1$ can be written as

$$\hat{\beta}_1 = (\bar{y}_1 - \bar{y}_0)/(\bar{x}_1 - \bar{x}_0),$$

where $\bar{y}_0$ and $\bar{x}_0$ are the sample averages of y_i and x_i over the part of the sample with $z_i = 0$, and where $\bar{y}_1$ and $\bar{x}_1$ are the sample averages of y_i and x_i over the part of the sample with $z_i = 1$. This estimator, known as a *grouping estimator*, was first suggested by Wald (1940).
Quelle: Wooldridge 3e & 4e Problem 15.3

Aufgabe 2
Suppose that, for a given state in the United States, you wish to use annual time series data to estimate the effect of the state-level minimum wage on the employment of those 18 to 25 years old (EMP). A simple model is

$$gEMP_t = \beta_0 + \beta_1 gMIN_t + \beta_2 gPOP_t + \beta_3 gGSP_t + \beta_4 gGDP_t + u_t,$$

where MIN_t is the minimum wage, in real dollars, POP_t ist the population from 18 to 25 years old, GSP_t is gross state product, and GDP_t is U.S. gross domestic product. The g prefix indicates the growth rate from year $t-1$ to year t, which would typically be approximated by the difference in the logs.

(i) (1 Punkt) If we are worried that the state chooses its minimum wage partly based on unobserved (to us) factors that affect youth employment, what is the problem with OLS estimation?

(ii) (2 Punkte) Let $USMIN_t$ be the U.S. minimum wage, which is also measured in real terms. Do you think $gUSMIN_t$ ist uncorrelated with u_t?

(iii) (2 Punkte) By law, any state's minimum wage must be at least as large as the U.S. minimum. Explain why this makes $gUSMIN_t$ a potential IV candidate for $gMIN_t$.

Quelle: Wooldridge 3e & 4e Problem 15.4

Aufgabe 3

(i) (2 Punkte) In the model with one endogenous explanatory variable, one exogenous explanatory variable, and one extra explanatory variable, take the reduced form $y_2 = \pi_0 + \pi_1 z_1 + \pi_2 z_2 + \nu_2$ (15.26), and plug it into the structural equation $y_1 = \beta_0 + \beta_1 y_2 + \beta_2 z_1 + u_1$ (15.22). This gives the reduced form for y_1:

$$y_1 = \alpha_0 + \alpha_1 z_1 + \alpha_2 z_2 + \nu_1.$$

Find the α_j in terms of the β_j and the π_j.

(ii) (1 Punkt) Find the reduced form error, ν_1, in terms of u_1, ν_2, and the parameters.

(iii) (3 Punkte) How would you consistently estimate the α_j?

Quelle: Wooldridge 3e & 4e Problem 15.6

Aufgabe 4

In Example 15.2 in Wooldridge (2009) the authors use the data in `wage2.txt` to estimate effect of education on the logarithm of wages for men. However, they use the variable *sibs* (number of siblings) as an instrument for *educ*.

(i) (2 Punkte) In the regression with *sibs* as an instrument for *educ*, the IV estimate of the return to education is .122. To convince yourself that using *sibs* as an IV for *educ* is *not* the same as just plugging *sibs* in for *educ* and running an OLS regression, run the regression of $\log(wage)$ on *sibs* and explain your findings.

(ii) (2 Punkte) The variable *brthord* is birth order (*brthord* is one for a first-born child, two for a second-born child, and so on). Explain why *educ* and *brthord* might be negatively correlted. Regress *educ* on *brthord* to determine whether there is a statistically significant negative correlation.

(iii) (2 Punkte) Use *brthord* as an IV for *educ* in equation (15.1). Report and interpret the results.

(iv) (3 Punkte) Now, suppose that we include number of siblings as an explanatory variable in the wage equation; this controls for family background, to some extend:

$$\log(wage) = \beta_0 + \beta_1 educ + \beta_2 sibs + u.$$

Suppose that we want to use *brthord* as an IV for *educ*, assuming that *sibs* is exogenous. The reduced form for *educ* is

$$educ = \pi_0 + \pi_1 sibs + \pi_2 brthord + \nu.$$

State and test the identification assumption.

(v) (1 Punkt) Estimate the equation from part (iv) using *brthord* as an IV for *educ* (and *sibs* as its own IV). Comment on the standard errors for $\hat{\beta}_{educ}$ and $\hat{\beta}_{sibs}$.

(vi) (2 Punkte) Using the fitted values from part (iv), $\widehat{educ}$, compute the correlation between $\widehat{educ}$ and *sibs*. Use this result to explain your findings from part (v).

Quelle: Wooldridge 3e & 4e Computer Exercise C15.1