Weiterführende Fragen der Ökonometrie

Übungsaufgaben – Blatt 6

Aufgabe 1

In Example 13.9 in Wooldridge (2009) the authors used `crime4.txt` a panel data set on counties in North Carolina, for the years 1981 through 1987, to estimate an unobserved effects model of the following form

$$\begin{aligned}\log(crmrte_{it}) = \beta_0 &+ \delta_0 d82_t + \delta_1 d83_t + \delta_2 d84_t + \delta_3 d85_t + \delta_4 d86_t + \delta_5 d87_t \\ &+ \beta_1 \log(prbarr_{it}) + \beta_2 \log(prbconv_{it}) + \beta_3 \log(prbpris_{it}) \\ &+ \beta_4 \log(avgsen_{it}) + \beta_5 \log(polpc_{it}) + a_i + u_{it}.\end{aligned}$$

(i) (3 Punkte) Estimate the unobserved effects model for crime in Example 13.9 but use fixed effects rather than differencing (for results of the model in first differences see 13.33 in Wooldridge or reestimate it). Are there any notable sign or magnitude changes in the coefficients? What about statistical significance?

(ii) (2 Punkte) Add the logs of each wage variable in the data set and estimate the model by fixed effects. How does including these variables affect the coefficients on the criminal justice variables in part (i)?

(iii) (2 Punkte) Do the wage variables in part (ii) all have the expected sign? Explain. Are they jointly significant?

Quelle: Wooldridge 3e & 4e Computer Exercise C14.2

Aufgabe 2

For this exercise, we use `jtrain.txt` to determine the effect of the job training grant on hours of job training per employee. The basic model for the three years is

$$hrsemp_{it} = \beta_0 + \delta_0 d88_t + \delta_2 d89_t + \beta_1 grant_{it} + \beta_2 grant_{i,t-1} + \beta_3 \log(employ_{it}) + a_i + u_{it}.$$

(i) (2 Punkte) Estimate the equation using fixed effects. How many firms are used in the FE estimation? How many total observations would be used if each firm had data on all variables (in particular, *hrsemp*) for all three years?

(ii) (1 Punkt) Interpret the coefficient on *grant* and comment on its significance.

(iii) (1 Punkt) Is it surprising that $grant_{-1}$ is insignificant? Explain.

(iv) (1 Punkt) Do larger firms provide their employees with more or less training, on average? How big are the differences? (For example, if a firm has 10% more employees, what is the change in average hours of training?)

Quelle: Wooldridge 3e & 4e Computer Exercise C14.3

Aufgabe 3

Use the data in `rental.txt` for this exercise. The data set contains information on rental prices and other variables for college towns for the years 1980 and 1990. The idea is to see whether a stronger presence of students affects rental rates. The unobserved effects model is

$$\log(rent_{it}) = \beta_0 + \delta_0 y90_t + \beta_1 \log(pop_{it}) + \beta_2 \log(avginc_{it}) + \beta_3 pctstu_{it} + a_i + u_{it},$$

where *pop* is city population, *avginc* is average income, and *pctstu* is student population as a percentage of city population (during the school year).

(i) (2 Punkte) Estimate the equation by pooled OLS and report the results in standard form. What do you make of the estimate of the 1990 dummy variable? What do you get for $\hat{\beta}_{pctstu}$?

(ii) (1 Punkt) Are the standard errors you report in part (i) valid? Explain.

(iii) (2 Punkte) Now, difference the equation and estimate by OLS. Compare your estimate of $\hat{\beta}_{pctstu}$ with that from part (i). Does the relative size of the student population appear to affect rental prices?

(iv) (1 Punkt) Estimate the model by fixed effects to verify that you get identical estimates and standars errors to those in part (iii).

Quelle: Wooldridge 3e & 4e Computer Exercise C14.1

Aufgabe 4

Betrachten Sie für $T = 2$ das unobserved effects Modell

$$y_{it} = \beta_0 + \beta_1 x_{it1} + \ldots + \beta_k x_{itk} + a_i + u_{it},$$

$$i = 1, \ldots, N, \quad t = 1, 2,$$

dabei sei $x_{it1} = d2_t$ ein Zeitdummy der für $t = 2$ den Wert 1 annimmt und 0 sonst.

(i) (5 Punkte) Zeigen Sie, dass man die gleichen Parameterschätzer erhält, wenn man obiges Modell mittels fixed effects und first differences schätzt. (Hinweis: Drücken Sie beispielsweise $\ddot{u}_{it}$ in Abhängigkeit von Δu_i aus.)

(ii) (2 Punkte) Zeigen Sie, dass sich in beiden Fällen die gleiche Anzahl an Freiheitsgraden ergibt.

(iii) (3 Punkte) Zeigen Sie, dass $\hat{\sigma}^2_{fe} = \frac{1}{2} \cdot \hat{\sigma}^2_{fd}$ gilt.

(iv) (4 Punkte) Zeigen Sie nun, dass auch die geschätzten Standardfehler der Parameterschätzer aus den Schätzungen mit fixed effects und first differencing identisch sind.