ДЗ-06 **Сдать 18.04.2020**

Задача 1.

Let you have the model $y_{it} = x_{it}'\beta + c_i + u_{it},\ i = 1,...,n;\ t = 1,2.$

Show that FE and FD estimators are numerically identical.

Задача 2.

Estimating the Economic Model of Crime with Panel Data

Becker (1968) introduced an economic model explaining the number of crimes. The main implication of this model is that the number of crimes depends negatively on the probability to be arrested, the probability to be convicted conditional on being arrested, the probability to be imprisoned conditional on being convicted, and the average length of the imprisonment sentence. Since 1968, many empirical studies have tested the empirical implications of Becker's model, usually with cross-section data. Cornwell and Trumbull (1994) use panel data and their results suggest that the cross-section based estimates can be misleading. In this set of exercises, we will use some standard panel data models for an analysis similar to that of Cornwell and Trumbull. The Cornwell and Trumbull study is also briefly described as an example in Wooldridge's textbook (Wooldridge, 2000, p. 432-433), and the data set is taken from the web site of this textbook.

Data

The data set CRIME4.DTA contains data on 90 counties in North Carolina covering the years 1981 till 1987. The data are stored in ASCII format. The variables are as follows, stored in the order given below:

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 1. county          county identifier
 2. year            81 to 87
 3. crmrte          crimes committed per person
 4. prbarr          'probability' of arrest
 5. prbconv         'probability' of conviction
 6. prbpris         'probability' of prison sentenc
 7. avgsen          avg. sentence, days
 8. polpc           police per capita
 9. density         people per sq. mile
10. taxpc           tax revenue per capita
11. west            =1 if in western N.C.
12. central         =1 if in central N.C.
13. urban           =1 if in SMSA
14. pctmin80        perc. minority, 1980
15. wcon            weekly wage, construction
16. wtuc            wkly wge, trns, util, commun
17. wtrd            wkly wge, whlesle, retail trade
18. wfir            wkly wge, fin, ins, real est
19. wser                wkly wge, service industry
20. wmfg                wkly wge, manufacturing
21. wfed                wkly wge, fed employees
22. wsta                wkly wge, state employees
23. wloc                wkly wge, local gov emps
24. mix                 offense mix: face-to-face/other
25. pctymle             percent young male
26. d82                 =1 if year == 82
27. d83                 =1 if year == 83
28. d84                 =1 if year == 84
29. d85                 =1 if year == 85
30. d86                 =1 if year == 86
31. d87                 =1 if year == 87
32. lcrmrte             log(crmrte)
33. lprbarr             log(prbarr)
34. lprbconv            log(prbconv)
35. lprbpris            log(prbpris)
36. lavgsen             log(avgsen)
37. lpolpc              log(polpc)
38. ldensity            log(density)
39. ltaxpc              log(taxpc)
40. lwcon               log(wcon)
41. lwtuc               log(wtuc)
42. lwtrd               log(wtrd)
43. lwfir               log(wfir)
44. lwser               log(wser)
45. lwmfg               log(wmfg)
46. lwfed               log(wfed)
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47. lwsta                   log(wsta)
48. lwloc                   log(wloc)
49. lmix                    log(mix)
50. lpctymle                log(pctymle)
51. lpctmin                 log(pctmin)
52. clcrmrte                lcrmrte - lcrmrte[t-1]
53. clprbarr                lprbarr - lprbarr[t-1]
54. clprbcon                lprbconv - lprbconv[t-1]
55. clprbpri                lprbpri - lprbpri[t-1]
56. clavgsen                lavgsen - lavgsen[t-1]
57. clpolpc                 lpolpc - lpolpc[t-1]
58. cltaxpc                 ltaxpc - ltaxpc[t-1]
59. clmix                   lmix - lmix[t-1]
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The probability of arrest is an estimated probability, obtained as the ratio of the number of arrests and the reported number of crimes. Similarly, the probabilities of conviction is estimated by the ratio of the number of convictions and the number of arrests, and the probability of prison sentence is estimated as the ratio of the number of people sent to prison and the number of convictions.

Exercises

1. Read the data and present some descriptive statistics on the variables of main interest. Discuss some findings that you think are interesting.

2. Estimate a pooled regression model explaining lcrmrte from an intercept and the variables lprbarr, lprbconv, lprbpris, lavgsen and lpolpc. Briefly discuss the results. Which assumptions have you made? Do you think these assumptions are realistic?

3. Estimate the same model for each separate cross-section. Compare the results with those of the previous exercise.

4. Construct the means over time for each county of the dependent and independent variables in the regression in the previous exercise. Carry out the "between groups" regression on these individual means. Discuss the results and compare them with those of the previous exercises.

5. Estimate a fixed effects model with the same dependent and independent variables as in the previous model. Discuss the results and compare them to those of the previous exercises. Explain why Cornwell and Trumbull concluded that cross-section estimates are misleading.

6. Test the fixed effects model against the pooled regression model.

7. Regress the estimated county specific effects on the means of the regressors included in the previous exercises and on the (time invariant) variables WEST, CENTRAL, URBAN, and PCTMIN80. Discuss the results.

8. Test whether it is useful to add time dummies to the fixed effects model.

9. Go through the other (time varying) variables available in the data set and select some that in your opinion could help to explain the number of crimes. Include them in the fixed effects model and test whether they are significant. In this way, select your favorite model and discuss the policy implications of the results.

10. Estimate a random effects model assuming that the random effects are independent of the regressors. Discuss the results.

11. Test the random effects model in the previous exercise against the fixed effects model and against the pooled regression model.