Elements of Econometrics. 2022-2023.
Seminar 23. Panel Data Models

Question 1. Explain what is unobserved heterogeneity in panel data model.

Question 2. (practice exercise) Create panel data on the basis of four time series of expenditures on different types of amusements (MAGS – printed magazines, TOYS – toys and games, BOOK –books, ADM – admissions to the concerts etc.) using file **demand_panel_data.wf1.** Estimate pooled regression and explain why the results can be considered as unsatisfactory.

Question 3. (practice exercise) Compare the results of pooled regression with separate regressions for different types of amusements and make a conclusion on the presence of the unobserved heterogeneity in the data. Why it is not correct to use four separate regressions for the analysis?

Question 4. Explain LSDV fixed effect panel model: the structure of the model, the idea of method used and its advantages.

Question 5. (practice exercise) Use LSDV fixed effect method for the data under consideratuion.

Question 6. What are comparative advantages and disadvantages of using different method for panel data under different assumptions on the unobserved geterogeneity.

Question 7. What are the other fixed effect methods: first difference and within groups in comparison with LSDV method? What they have in common, and what are their advantages and disadvantages?

Question 8. How to choose between pooled regression and separate regression analysis?

Question 9. How to choose between pooled regression and fixed effect panel model?

Question 10. What are the structure and assumptions of random effect panel model?

Question 11. (practice exercise) Estimate random effect panel data model for our data.

Question 12. Explain what is Durbin-Wu-Hausman test. What are assumptions, hypotheses, decision rules and conclusions?

Question 13. (practice exercise) Do Durbin-Wu-Hauman test for our data. What is your conclusion?

Question 14. What are relative advantages and potential risks of choosing different types of the panel data model?

Question 15. How to use time trend and time dummies in the panel data models?

Question 16. How to solve the problems of autocorrelation, heteroscedasticity and other issues in panel data analysis?

Final Challenge

Question 17. UoL Exam

(a) Consider a model

$$Y_{it} = \beta_1 + \beta_j \sum_{j=2}^{K} X_{jit} + \alpha_i + u_{it};\ i = 1, 2, ..., N;\ t = 1, 2, ..., T$$

where Y is the dependent variable, the X_j are observed explanatory variables, α_i is an unobserved effect and u_{it} is the disturbance term assumed to satisfy the usual regression model conditions. The index i refers to cross-section and t refers to the time period.

Explain the differences between the within-groups, first differences and least squares dummy variables versions of the fixed effect model.

(b) The following estimates were made as part of a study of whether countries with low income per head had higher growth rates than countries with higher income per head (convergence). Data was obtained over a period of four years on 121 countries.

The first estimates are pooled ordinary least squares estimates:

$$gr_{it} = \underset{(0.358)}{-0.129} - \underset{(0.004)}{0.023}\, pgdp_{it} + \underset{(0.018)}{0.139} inv_{it} + e_{1it};\ i = 1, 2, ..., N\ \ t = 1, 2, ..., T \qquad (1)$$

$$N = 121,\ T = 4,\ R^2 = 0.133.$$

The second estimates are fixed effects (least squares dummy variable variant):

$$gr_{it} = \underset{(0.358)}{3.524} - \underset{(0.012)}{0.046}\, pgdp_{it} - \underset{(0.032)}{0.020} inv_{it} + e_{2it};\ i = 1, 2, ..., N\ \ t = 1, 2, ..., T \qquad (2)$$

$$N = 121,\ T = 4,\ R^2 = 0.541.$$

Standard errors are in brackets. *gr* is the average percentage annual rate of growth of *gdp* per head, *pgdp* is the *gdp* per head in constant US dollar, *inv* is the average percentage ratio of investment to *gdp*. e_1 and e_2 are the ordinary least squares residuals. R^2 is the conventionally calculated coefficient of determination.

(b.i) Comment on the differences in R^2 for each equation.

(b.ii) Equation (1) is restricted version of equation (2). Test the validity of the restrictions.

(b.iii) From these results , what would you conclude about the convergence of *gdp* per head? Give details.