Test for 'Econometrics of panel data'

May 24, 2018

1. Fixed-effects estimation. Assume that observations on $K+1$ variables $y, X = (x_1, \ldots, x_K)'$ follow the fixed-effects model

$$y_{it} = \alpha + X'_{i,t}\beta + \mu_i + \nu_{it}, \quad i = 1, \ldots, N, \quad t = 1, \ldots, T.$$

[15 points]

(a) Why is the model called a fixed-effects model? What are the effects, what is fixed?

(b) Fixed-effects (FE) estimation, even if not formally available in a software package, can be performed by OLS. What are the regressors in such an OLS regression that yields the FE estimator? What is the disadvantage of this approach?

(c) FE estimation can also be conducted by first transforming all variables to $\tilde{y}, \tilde{x}_1, \ldots, \tilde{x}_k$, and then regressing $\tilde{y}$ on $\tilde{x}_1, \ldots, \tilde{x}_k$ by OLS. How are variables y etc. transformed, such that $\tilde{y}$ etc. evolve?

2. Random and fixed effects [15 points]

    (a) Which of the two concepts, *fixed effects* or *random effects*, is more general? Why?

    (b) Often, a Hausman test is applied in order to decide between the two models. Which model is preferred if the Hausman test rejects?

    (c) You have two panel data sets, one with variables from three major stock exchanges, daily for a whole decade; the other one with 1000 persons, their personality characteristics and their salaries. Which of the two is (without any testing evidence) more likely to be better treated by random effects, which one is more likely to be handled more appropriately by fixed effects?

3. Dynamic panel models. Often, it is convenient to consider models of the form

$$y_{it} = \phi y_{i,t-1} + \beta' X_{i,t} + \mu_i + \nu_{it}$$

[15 points]

(a) Somebody argues it is easy to cope with the bias problems in a dynamic panel and suggests just to omit the variable $y_{i,t-1}$ from the list of regressors. Why is this not really a solution?

(b) Somebody argues that the bias problems are mainly caused by the presence of effects. Why then not just apply first differences to the whole equation and then estimate by OLS?

(c) In the currently preferred GMM technique, the equation is essentially estimated in differences, but with instruments. Consider

$$\Delta y_{it} = \phi \Delta y_{i,t-1} + \beta' \Delta X_{i,t} + \Delta \nu_{it}.$$

What are the instruments for $\Delta y_{i,t-1}$? [You may assume X to be strictly exogenous.]