Econ 741 Masao Ogaki

SUMMARY OF HAYASHI

Chapter 5

KEY TERMS AND CONCEPTS

Panel data, error-components model, fixed effect (or individual effect), fixed-effects estimator, group mean, pooled OLS

FORMULAS AND RESULTS

Let $\mathbf{y}_i$ and $\boldsymbol{\eta}_i$ be $M \times 1$ vectors and $\mathbf{Z}_i$ be $M \times L$ matrix of random variables, and α_i is a random variable. An error components model is

$(S1)$ $\quad \mathbf{y}_i = \mathbf{Z}_i \boldsymbol{\delta} + \mathbf{1}_M \alpha_i + \boldsymbol{\eta}_i \quad (i = 1, 2, \cdots, n)$

where $\mathbf{1}_M$ is the M-dimensional vector of ones. Let $\mathbf{x}_i$ be the union of $(\mathbf{z}_{i1}, \cdots, \mathbf{z}_{iM})$ and define

$(S2)$ $\quad \mathbf{Q} = \mathbf{I}_M - \mathbf{1}_M(\mathbf{1}'_M \mathbf{1}_M)^{-1} \mathbf{1}'_M.$

We assume that $\mathbf{Z}_i$ can be written as

$(S3)$ $\quad \mathbf{Z}_i = (\mathbf{F}_i \mid \mathbf{1}_M \mathbf{b}'_i)$

where $\mathbf{b}_i$ is the vector of common regressor, and partition $\boldsymbol{\delta}$ accordingly:

$(S4)$ $\quad \boldsymbol{\delta} = [\boldsymbol{\beta}' \mid \boldsymbol{\gamma}']'.$

We assume that

(A5.1) $\{\mathbf{y}_i, \mathbf{Z}_i\}$ is i.i.d.

(A5.2) $E(\mathbf{z}_{\text{im}} \boldsymbol{\eta}_{ih}) = 0$ for $m, h = 1, 2, \cdots, M$.

(A5.3) $E(\mathbf{Q}\mathbf{F}_i \otimes \mathbf{x}_i)$ is of full column rank.

(A5.4) $E(\boldsymbol{\eta}_i \boldsymbol{\eta}'_i \mid \mathbf{x}_i) = \boldsymbol{\Sigma}$ does not depend on $\mathbf{x}_i$

(A5.5) $E(\mathbf{g}_i \mathbf{g}'_i)$ is nonsingular, where $\mathbf{g}_i = \boldsymbol{\eta}_i \otimes \mathbf{x}_i$