

Doctoral Program in Economics



Academic year 2024/25

PANEL DATA ECONOMETRICS

Period: Second term: February 2025

Course hours: 20

Teachers: Silvia Tiezzi (10 hours, course coordinator), Federico Crudu (10 hours).

Exam methods:

written test: students will have to answer 2 questions (one on Module 1 and one on Module 2) out of a basket of 4 questions.

Prerequisites:

principles of statistics and econometrics; basic calculus and linear algebra.

Module 1 - Introduction to Linear Panel Data Models (10 hours) – Prof. Tiezzi

Educational objectives

This part of Panel Data Econometrics will offer an *introduction to linear Panel Data models and estimation in a static environment*.

Class 1

Background and motivation for using panel data methods. Fixed effects panel data models.

Class 2

Random Effects models (REM). Testing Fixed and Random effects.

Class 3

Heteroskedasticity and Autocorrelation. The Hausman-Taylor (HT) IV estimator.

Class 4

Lab Session. We will estimate models with Fixed Effects, Random Effects and the HT estimator using STATA.

Class 5

Instrumental variables (IV)/generalized method of moments (GMM) estimation for Linear Panel Data Models with endogenous variables.

Bibliographical references

1. Wooldridge, J. M. (2020) (Seventh Edition) *Introductory Econometrics a Modern Approach*. Cengage Learning. Chapter 14.

or

2. Greene, W. (2018) (8th Edition) *Econometric Analysis*, Prentice Hall International. Chapter 11 (Sections 11.2.1, 11.2.2, 11.2.4, 11.2.5, 11.3, 11.3.5, 11.4, 11.4.1, 11.4.2, 11.4.3, 11.5 (until 11.5.5), 11.6, 11.7, 11.8 (until 11.8.2))

Other references

Wooldridge, J. M. (2010) (Second Edition) *Econometric Analysis of Cross Sections and Panel Data*, MIT Press. Chapter 10.

Arellano, M. (2004) *Panel Data Econometrics*, Oxford University Press. Chapter 7.

Bond, S. (2002) *Dynamic panel data models: a guide to micro data methods and practice*, Portuguese Economic Journal, volume 1, pp. 141–162.

Module 2 - Generalised Method of Moments with Applications to Dynamic Panels (10 hours) – Prof. Crudu

Educational objectives

This module introduces M-estimation as a comprehensive approach to estimation and inference with GMM and IV as special cases. Applications will focus on dynamic panel data models.

Class 1

Asymptotic properties of M-estimators.

Class 2

GMM and IV estimators.

Class 3

Pitfalls of the FE estimator and the IV approach.

Class 4

Dynamic panel data models I.

Class 5

Dynamic panel data models II.

Bibliographical references

1. Amemiya, T. (1985) *Advanced Econometrics*, Blackwell. Chapters 3 and 4.

2. Hansen, B. E. (2020) *Econometrics*, Princeton University Press. Chapters 2, 6, 12, 13, 17, 22.

3. Wooldridge, J. M. (2010) (Second Edition) *Econometric Analysis of Cross Sections and Panel Data*, MIT Press. Chapters 2, 3, 5, 11, 12, 14, 15.

Other references

1. Arellano M. (2004) *Panel Data Econometrics*, Oxford University Press. Chapters 7 and 8.

2. Baltagi, B. H. (2021). *Econometric analysis of panel data*. Springer. Chapter 8.

3. Bun, M. J. G. and V. Sarafidis (2015), Dynamic Panel Data Models, in Badi H. Baltagi (ed.), *The Oxford Handbook of Panel Data*. Oxford University Press.

4. Fritsch, M., Andrew, A. Y. P., & Schnurbus, J. (2021). pdynmc: A Package for Estimating Linear Dynamic Panel Data Models Based on Nonlinear Moment Conditions. *R Journal*, 13(1), 218.

5. Henningsen, A., and Henningsen, G. (2019). Analysis of panel data using R. In *Panel data econometrics* (pp. 345-396). Academic Press.

6. Newey, W. K., & McFadden, D. (1994). Large sample estimation and hypothesis testing. *Handbook of econometrics*, 4, 2111-2245. Elsevier.

7. Phillips, P. C., and Han, C. (2019). Dynamic panel GMM using R. In *Handbook of Statistics* (Vol. 41, pp. 119-144). Elsevier.