

Doctoral Program in Economics



Academic year 2025/26

PANEL DATA ECONOMETRICS

Period: Second term: February 2026

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, 11.3, 11.4, 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 the GMM framework for estimation and inference. Applications will focus on dynamic panel data models and nonlinear models.

Class 1

GMM estimation.

Class 2

GMM inference.

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.