

ECONOMETRICS II

MSc in ECONOMIC ANALYSIS
Universidad Carlos III de Madrid

Fourth Term 2012/13

Instructor: Carlos Velasco.
Room: 15.1.09
Phone: 9646
e-mail: carlos.velasco@uc3m.es
web page: www.eco.uc3m.es/~cavelas

SYLLABUS

PART I. LINEAR SYSTEMS OF EQUATIONS

- 1. Estimating systems of equations by OLS, GLS and GMM.** Inferences on a multivariate linear system based on OLS; GLS and FGLS; Seemingly unrelated systems of equations; the linear panel data model. The generalized method of moments: 2SLS, 3SLS. Testing overidentifying restrictions. Optimal instruments.
- 2. Simultaneous linear equations systems.** Identification in a linear system. Estimation after identification. Identification with cross-equation and covariance restrictions. Models nonlinear in the endogenous variables.
- 3. Basic linear unobserved effects panel data models.** Motivation: the Omitted Variables Problem. Random Effects Methods. Fixed Effects Methods. First Differencing Methods. Comparison of Estimators.

PART II. DYNAMIC MODELS

- 4. Time series data. Dynamic linear models.** Basic concepts: Stationarity and weak dependence. Basic models: Martingale difference and linear processes. Properties. Examples: Distributed lags. Adjustment models. Adaptive expectations. Autoregressions. Trends and seasonality.
- 5. Asymptotic inference with autocorrelated data and inference based on OLS with autocorrelated errors.** Laws of large numbers and central limit theorems. Fixed, trending and stochastic regressors. Standard errors and covariance

matrices. Autocorrelation-robust inference. Testing for serial correlation: tests for AR(1); higher order serial correlation; endogenous regressors.

6. Correcting for autocorrelation and heteroskedasticity. Inference based on GLS and FGLS estimates. Asymptotic properties. Efficiency. Example: AR(1) errors. IV solutions for autocorrelated errors: 2SLS and GMM. Correction for heteroskedasticity. AutoRegressive Conditional Heteroskedasticity models. Basic properties.

PART III. NONLINEAR ESTIMATION & RELATED MODELS

7. Asymptotic properties of extremum estimates. M-estimation. Conditional Maximum Likelihood estimation. Nonlinear LS: nonlinear regression. Nonlinear GMM estimates: rational expectations. Minimum distance estimation. ML estimation for dynamic models. Asymptotic distribution of nonlinear GMM estimates. Optimal instruments. Numerical optimization methods: Newton-Raphson and Gauss-Newton.

8. Models with limited dependent variables. Qualitative response models: Probit and logit models; likelihood function; ML and IRLS estimation; count data. Censored (Tobit) regression: OLS and ML estimation. Sample selection: truncated regression.

COURSE OUTLINE AND OBJECTIVES

This second course in Econometrics in the Economics Ph. D. program at University Carlos III de Madrid complements the Econometrics I course in three main directions. First, inference for systems of equations is discussed, extending many ideas described in Econometrics I. Second, dynamic models for time series data are presented and methods for such models are developed and justified. Third, extremum estimates, including conditional maximum likelihood and nonlinear GMM, and its application to nonlinear and limited dependent variable models is discussed. Asymptotic properties of such estimates and test procedures are studied in detail.

Lecture notes are provided for each topic, together with a problem set including theoretical and applied exercises. Selected exercises will be worked out in classes. The final exam will contain problem and exercises similar to those of the problem sets.

The basic textbooks are Wooldridge (2002) and Hayashi (2000). Wooldridge (2000) is a good introduction for many topics including dynamic models. Some other useful texts with additional examples and details are provided in the reading list and will be commented lectures. Further references for specialized topics are provided in a second list.

BASIC TEXTBOOKS

1. Davidson, J. (2000). *Econometric Theory*. Blackwell.
2. Davidson, R. & MacKinnon, J.G. (1993). *Estimation and Inference in Econometrics*. Oxford University Press.
3. Gouriéroux, C. & Monfort, A. (1997). *Time Series and Dynamic Models* Cambridge University Press.
4. Greene, W.H. (1997). *Econometric Analysis*. Macmillan.
5. Hayashi, F. (2000). *Econometrics*. Princeton University Press.
6. Wooldridge, J.M. (2000). *Introductory Econometrics. A Modern Approach*. South Western.
7. Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

OTHER USEFUL TEXTBOOKS

1. Amemiya, T. (1985). *Advanced Econometric Theory*. Blackwell.
2. Davidson, J. (1994). *Stochastic Limit Theory*. Oxford University Press.
3. Dhrymes, P.J. (1994). *Topics in Advanced Econometrics: Vol. II. Linear and Nonlinear Simultaneous Equations*. Springer Verlag.
4. Gallant, A.R. (1986). *Nonlinear Statistical Models*. Wiley.
5. Gouriéroux, C. & Monfort, A. (1995). *Statistics and Econometric Models. Vol I & II*. Cambridge University Press.
6. Hamilton, J.D. (1994). *Time Series Analysis*. Princeton University Press.
7. Harvey, A.C. (1990). *The Econometric Analysis of Time Series*. Phillip Allan.
8. Hendry, D.F. (1995). *Dynamic Econometrics*. Oxford University Press.
9. Intriligator, M.D., Bodhin, R.G. & Hsiao, C. (1996). *Econometric Models, Techniques and Applications*, 2nd edition. Prentice Hall.
10. Judge, G.G., Griffiths, W.E., Hill, H., Lütkepohl R.C. & Lee, T.C. (1985). *The Theory and Practice of Econometrics*. Wiley.
11. Maddala, G.S. (1983). *Limited-dependent and Qualitative Variables in Econometrics*. Cambridge University Press.

12. Mittelhammer, R.C., Judge, G.G. & Miller, D.J. (2000). *Econometric Foundations*. Cambridge University Press.
13. Ruud, P.A. (2000). *Classical Econometric Theory*. Oxford University Press.
14. White, H. (1986). *Asymptotic Theory for Econometricians*. Academic Press.