Econometrics III

Academic Year: (2020 / 2021) **Review date: 14-12-2020**

Department assigned to the subject: Economics Department

Coordinating teacher: GONZALO MUÑOZ, JESUS

Type: Compulsory ECTS Credits : 9.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Econometrics I and Econometrics II

OBJECTIVES

The objective of this course is to deal with some important topics in the empirical analysis of micro data (households, firms, etc.). We will study issues in the specification, estimation and testing of different models with cross-sectional and with panel data. The emphasis of the course is both on the econometric techniques and in the economic applications. Therefore, this course will be useful for those interesting in studying these econometric techniques per se, and for those who see the econometric techniques as necessary tools to develop applied work using micro data.
The examples of applications will be from wide range of fields: labour economics, health economics, economics of education, Industrial Organization, demand estimation, evaluation of public policies, etc.
Prerequisites: Econometrics I and Econometrics II. Students are expected to know well and review before the course GMM, MLE, and other Extremum Estimators. This includes asymptotic properties of these estimators, testing, and selecting optimal instruments (in a GMM setting).

DESCRIPTION OF CONTENTS: PROGRAMME

Microeconometrics:

1. Linear Models for Panel Data

Introduction and motivation. Review of Static models and control for unobserved heterogeneity: Within-groups, between-groups and Random Effects Methods.
Dynamic models. Models with strictly exogenous and predetermined variables. The bias of the within-groups estimator. GMM estimation of dynamic panel data models. Specification tests.
Examples of applications of these methods:
- I.O.: Identification and Estimation of Production Functions (e.g. Productivity in the telecommunications equipment industry). Olley and Pakes (1996); Ackerberg, Caves and Fraser (2006); and its comparison with Arellano and Bover (1995) and Blundell and Bond (1998, 2000).
- Labour and Education Economics: Estimates of the Return to Schooling. Ashenfelter and Krueger (1994) - Labor and Health Economics: ¿Can Pay Regulation Kill? Panel Data Evidence on the Effect of Labor Markets on Hospital Performance¿ Propper and van Reenen (2010)

2. Discrete Choice Models

Introduction and motivation. Review of binary choice models for cross sectional data: linear probability models, probit and logit models. Maximum likelihood, semi-parametric, and non- parametric estimation. Interpretation.
Multiple choice models: multinomial probit and multinomial logit. Simulated method of moments estimation. Ordered probit.
Binary choice models for panel data. Fixed-T solutions: static and dynamic models, random effects and fixed effects approaches to account for unobserved heterogeneity, identification problems and set identified parameters of interest. General solutions to fixed effects estimation (T is not fixed). Limitations of the linear index specification.
Structural dynamic discrete choice models and dynamic discrete games: Models, Estimation Methods, and Examples such as studying retirement decisions, occupational choices and career decisions, school drop-outs, patents renewal, estimation of demand and supply curves, effect of number of firms on the entry decision of a new firm, Auctions .
Examples of applied papers using these methods:
- Health Economics: ¿State dependence and heterogeneity in health using a bias corrected fixed effects

estimator¿. J. Carro and A. Traferri (2014).
- Labour Economics: "State dependence, serial correlation and heterogeneity in intertemporal labor force participation of married women", D. Hyslop (1999)
- I.O.: ¿Estimating the Consumer Surplus and Welfare Gains from the Introduction of Minivans¿ A. Petrin (2002).
- Public Policy: ¿Estimating The Effects of a Time-Limited Earnings Subsidy for Welfare-Leavers¿, D. Card and D. Hyslop (2005).
- I.O.: ¿Patents as Options: Some Estimates of the Value of Holding European Patent Stocks¿ A. Pakes (1986)
- Labour and Education Economics: ¿Why Youths Drop out of High School: The Impact of Preferences, Opportunities, and Abilities¿, Z. Eckstein and K. Wolpin (1989)

3. Sample Selection Models

Applications. Truncated Regression Models. Tobit: Censored Regression Models. Sample selection models: maximum likelihood estimation and two-stage estimation. Unbalanced panels. Switching regression models.
Example of an applied paper using these methods:
- The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumptions, Mroz (1987)

Macroeconometrics:

COURSE OUTLINE

PART I: INTRODUCTION

1. BASIC CONCEPTS OF STOCHASTIC PROCESSES
Definitions and examples of stochastic processes and time series. Stationarity and ergodicity. The mean. The autocovariance and autocorrelation function. One of the goals of time series analysis: Forecasts based on conditional expectation and Forecasts based on linear projection (least squares).

PART II: MODELS BASED ON UNIVARIATE INFORMATION

2. STATIONARY LINEAR MODELS I: CHARACTERIZATION AND PROPERTIES
Wold's decomposition. Causal and Invertible ARMA processes. The Partial autocorrelation function. The Autocovariance generating function. Identification of ARMA processes.
3. STATIONARY LINEAR MODELS I': SPECTRAL ANALYSIS
Spectral Densities. The Periodogram. Time-Invariant Linear Filters. The Spectral density of an ARMA process.
4. STATIONARY LINEAR MODELS II: ESTIMATION AND INFERENCE
Estimation: The maximum likelihood method (the likelihood function for a gaussian AR(1) and a gaussian MA(1)) and Least squares. Asymptotic behavior of the sample mean and autocovariance function. Estimation of the Long-Run Variance. Inference on the parameters of ARMA models.
Appendix: Asymptotics for linear processes (LLN and CLT). Martingale Theory.
5. MODEL SELECTION
Box-Jenkins Methodology. Information Criteria: AIC, BIC, HQ and LCIC. Consistency of the IC. Inference on models selected by the IC. Testing versus IC.
6. FORECASTING
Forecasts from ARMA and ARIMA models. The prediction function and its economic interpretation. Combination of forecasts. Evaluation of forecasts. Forecast comparisons of trend-stationary and unit root processes.
7. NON-STATIONARY LINEAR MODELS: THE CASE OF AN AR WITH A UNIT ROOT
Deterministic trends versus stochastic trends. Processes with unit roots: Testing and Estimation. Decompositions in trend and cycle: Beveridge-Nelson decomposition and orthogonal decompositions.
Appendix: The functional central limit theorem and the continuous mapping theorem.
8. NON-STATIONARY MODELS: THE CASE OF STRUCTURAL BREAKS
Testing for a Single Break. Testing for Multiple Breaks. Unit Roots versus Breaks.
PART III: MODELS BASED ON MULTIVARIATE INFORMATION
9. STATIONARY MULTIVARIATE LINEAR MODELS: VARs
Structural VAR models. Identification of Shocks: Short-run conditions; Long-run conditions (example: Blanchard and Quah); Via Sign restrictions; Via Heterokedasticity. Stability, Estimation and inference in VAR models. Lag selection. Transfer functions derived from VAR models. Bivariate Granger causality tests. Impulse-response function. Variance decomposition. Standard errors for impulse-response functions.
10. NON-STATIONARY MULTIVARIATE LINEAR MODELS I: VAR MODELS WITH UNIT ROOTS-

COINTEGRATION
Spurious regression. Cointegration. Implications of cointegration for the VAR representation: the Error correction model (Granger's representation theorem). Testing for cointegration and estimation of the cointegrating vector: A single equation approach (OLS and DOLS). Testing for the rank of cointegration and estimation of the cointegrating vectors: A simultaneous equation approach (Reduced Rank Regression). Consequences of misspecification of the trend components on testing for cointegration.
Appendix: Asymptotic results for non-stationary vector processes.
11. NON-STATIONARY MULTIVARIATE LINEAR MODELS II: VAR MODELS WITH UNIT ROOTS-COINTEGRATION
Common trends representations. Permanent and Transitory Decompositions: Stock-Watson and Gonzalo-Granger representations. Identi cation of the shocks of a cointegrated VAR: Gonzalo-Ng approach.
12. MODEL SELECTION
Consequences of lag or/and rank misspecification in VARs. Information criteria approach to select the number of lags and the rank of cointegration. Consistency of the IC; Testing versus IC.
PARTE IV: FURTHER TOPICS
13. LONG MEMORY
Definition. How long-memory appears in Economics. Modelling. Estimation and inference. Testing I(1) versus I(d). Testing I(d) versus I(0)+ Breaks.
14. THRESHOLD MODELS
Threshold autoregressive models. Conditions for Stationarity. Estimation, Inference and Model Identification. Testing linearity. The Case of Threshold Unit Root (TARUR and TARSUR Models).
15. DYNAMIC FACTOR MODELS
Standard Factor Models. Determination of the number of Factors. Inferential Theory for Factor Models.

The primary texts are Brockwell and Davis (1991), Hamilton (1994), and Hayashi (2000). The other texts provide treatments of various subtopics.

LEARNING ACTIVITIES AND METHODOLOGY

Lectures to cover the most important aspects of the syllabus, and practical sessions where we will work over the Problem Sets.

ASSESSMENT SYSTEM

The course will be graded based on a project (20%), a midterm exam (33%) and a final exam (47%).

% end-of-term-examination:	47
% of continuous assessment (assigments, laboratory, practicals…):	53

BASIC BIBLIOGRAPHY

- Arellano Panel Data Econometrics, Oxford University Press.
- Brockwell, P.J. and R.A. Davis Time Series: Theory and Methods, New York. Springer-Verlag, second edition 2009.
- Cameron, C. and P. Trivedi Microeconometrics, Cambridge University Press.
- Hamilton, J. Time Series Analysis, Princeton University Press, 1994
- Hayashi, F. Econometrics, Princeton University Press, 2000
- Wooldridge Econometrics Analysis of Cross Section and Panel Data, MIT Press.

BASIC ELECTRONIC RESOURCES

- - . -: http://www.eco.uc3m.es/~jgonzalo/teaching/PhDTimeSeries.html