Academic Year/course: 2022/23

61334 - Econometrics and Mathematical Instruments

Syllabus Information

Academic Year: 2022/23
Subject: 61334 - Econometrics and Mathematical Instruments
Faculty / School: 109 - Facultad de Economía y Empresa
Degree: 525 - Master's in Economics
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Course assessment will be onsite. In the case of a new pandemic wave assessment will become partly online or fully online. It should be noted that in any online assessment task the student performance may be recorded, following the regulations described in: ?https://protecciondatos.unizar.es/sites/protecciondatos.unizar.es/files/users/lopd/gdocencia_reducida.pdf?_

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It is based on:

- Lectures and subsequent discussion between professor and students.
- Individual and voluntary assignments about open questions presented in class.

Therefore, the learning process is a mixture of lectures, done by the teacher, and the active participation of students on the different topics of the course. Moreover, students should do small presentations in class, summaries about proposed readings, and exercises suggested by the teacher. Computer resources are used in lectures and presentations.

All lectures and seminars will be imparted on site. In the case of a new health emergency caused by the current pandemic all teaching will be moved online.

4.2. Learning tasks

The course includes the following learning tasks:

- Lectures (40 hours): compulsory attendance.
- Autonomous work (90 hours).
- Discussion and presentation of a final report (20 hours): compulsory attendance. The defense of the report will take place at the end of the course.
- Presentation and discussion, at the end of the course, of a significant collection of problems and exercises.

- Assessment: continuous assessment system, or students who wish it have the opportunity to take a global final exam.

4.3. Syllabus

The course will address the following topics:

SECTION I. ADVANCED MATHEMATICAL INSTRUMENTS IN ECONOMIC ANALYSIS

Topic 1: MATHEMATICAL PROGRAMMING

1.1 Inequality constraints programs.

1.2 Kuhn-Tucker conditions.

1.3 Global optimality conditions.

1.4 Economic Analysis Applications.

Topic 2. OPTIMAL CONTROL THEORY

2.1 Hamiltonian. The Pontryagin maximun principle.

2.2 Dynamic programming.

2.3 Economic Applications.

Topic 3. MILLENNIUM PROBLEMS

3.1 The input-output framework.

3.2 Other Economic Analysis Applications.

SECTION II. ECONOMETRICS

Topic 1. INSTRUMENTS

1.1 Asymptotic results.

1.2 Maximum likelihood method.

1.3 LR, LM and Wald tests.

1.4 Introduction to the R program.

Topic 2. CROSS-SECTION DATA:

2.1 The General Linear Model:

2.1.1 Hypotheses, estimation, validation and prediction.

2.1.2 Endogenous regressors and instrumental variables estimation.

2.1.3 Application in R

2.2 Discrete response models:

2.2.1 Binary dependent variable. Logit and Probit models.

2.2.2 Multinomial models and ordered discrete choice models.

2.2.3 Application in R.

Topic 3. TIME SERIES DATA

3.1 Stationary variables: Single-equation and multi-equation models.

3.2 Non-stationary variable models: Unit root and cointegration tests.

3.3 Non-linear models: ARCH, GARCH and TAR.

3.4 Applications in R.

Topic 4. PANEL DATA

4.1. Data pool model.

4.2. Fixed effects model.

4.3. Random effects model

4.4. Application in R

4.4. Course planning and calendar

The course starts in the second half of October and ends in late January, with an approximate duration of 15 weeks. The contents will be explained according to the syllabus. Each topic will take approximately 2 weeks. There will be presentations of assignments throughout the whole period, but these presentations will take place especially at the end of the course.

4.5. Bibliography and recommended resources

Part 1

- Alpha C. Chiang (1992). Dinamical optimization. McGraw-Hill
- Mauricio Bruglieri, Mathias Ehrgott, Horst W. Hamacher, Francesco Maffioli (2006). An annotated bibliography of combinatorial problems with fixed cardinality constraints. Discrete Appied Mathematics 154, 1344-1357.
- De la Fuente, A. (2000). Mathematical methods and models for economists. Cambridge University Press
- Fernández Pérez, C.; Vázquez Hernández, F.J.; Vegas Montaner, J.M. (2003). Ecuaciones diferenciales y en diferencias. Sistemas dinámicos. Thompson
- Kurz, H.D.; Salvador, N. (1995): Theory of Production. A long-Period Analysis. Cambridge University Press
- Lawrence Blume, David Easly, Jon Kleinberg, Éva Tardos (2015). Introduction to computer and economic theory. Journal of Economic Theory 156, 1-13.
- Mas Colell, A.; Whinston, M.; Green, J. (1995). Microeconomic theory. Oxford University Press
- Ronald E. Mickens (2015). Difference equations, theory, applications and advanced topics. Third Edition. CRC Press.
- Miller, R.E.; Blair, P.D. (1985). Input-output analysis, foundations and extensions. Printice Hall
- Nikaido, H. (1978). Métodos matemáticos del análisis económico moderno. Vicens Vives
- Shone, R. (2002): Economic Dynamics. Cambridge University Press, 2nd edition
- Takayama A. (1990). Mathematical economics. Cambridge University Press, 2nd edition
- Vegara, J. (1979): Economía política y modelos multisectoriales. Tecnos

Part 2

- Hill, R. C., Griffits, W.E. y Lim, G.C. Principles of econometrics. NJ Wiley, 2012.
- Martin, V., Hurn, S. y Harris, S. Econometric modelling with time series. Cambridge University Press, New York 2013.
- Enders, W. Applied econometric time series. Wiley, New York 1995
- Greene, W. H. Análisis econométrico. (6ª ed)Pearson International Edition 2008.
- Hayashi, F. Econometrics. Princeton University Press, Princeton, New Jersey 2000.
- Stock, J.H. y Watson, M. M. Introducción a la Econometría. Pearson, Madrid 2012.
- Wooldridge, J.M. Econometric analysis of cross section and panel data. MIT, 2010.
- Wooldridge, J.M. Introducción a la Econometría. Thomson, 2001.