UAB
Universitat Autònoma de Barcelona

2019/2020

Mètodes Quantitatius

Codi: 40094
Crèdits: 15

Titulació	Tipus	Curs	Semestre
4313805 Anàlisi Econòmica / Economic Analysis	OB	1	1

Professor/a de contacte

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Equip docent

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Utilització d'idiomes a l'assignatura

Llengua vehicular majoritària: anglès (eng)

Prerequisits

Sense prerequisits

Objectius

This module provides students advanced quantitative tools. These tools are necessary for economic analysis.

This module covers optimization, and probability and statistics . The module is organized in thwo

sections. The first section covers the foundations of optimization theory. The second section provides students

with the theoretical foundations of probability and statistics necessary for econometric and financial analysis.

Competències

- Analitzar conceptualment un problema econòmic concret utilitzant eines analítiques avançades.
- Que els estudiants tinguin les habilitats d'aprenentatge que els permetin continuar estudiant, en gran manera, amb treball autònom a autodirigit.
- Ser capaç d'articular els fonaments de la teoria econòmica derivant-los analíticament a partir de raonaments matemàtics.
- Ser capaç d'identificar els fonaments de l'anàlisi estadística i de les tècniques economètriques derivant-los de les lleis de la probabilitat i l'estadística.
- Tenir coneixements que aportin la base o l'oportunitat de ser originals en el desenvolupament o l'aplicació d'idees, sovint en un context de recerca.

Resultats d'aprenentatge

1. Descriure els temes d'estadística sobre els quals es basa l'anàlisi econòmica estocàstica i l'anàlisi empírica

2. Distingir els elements que cal incloure i els supòsits necessaris per plantejar un problema de decisió amb interaccions estratègiques molt senzilles
3. Emmarcar una pregunta econòmica de decisió en un context estratègic senzill en un problema matemàtic i derivar la seva resposta a través de la lògica matemàtica
4. Que els estudiants tinguin les habilitats d'aprenentatge que els permetin continuar estudiant, en gran manera, amb treball autònom a autodirigit.
5. Tenir coneixements que aportin la base o l'oportunitat de ser originals en el desenvolupament o l'aplicació d'idees, sovint en un context de recerca.
6. Utilitzar les matemàtiques per analitzar problemes econòmics

Continguts

<u>I. Optimization</u>

1. Sets and Metric Spaces:

1) Ordered Sets (Equivalence Relations, Order Relations, Partially Ordered Sets, Weakly Ordered Sets)

2) Metric Spaces (Open and Closed Sets, Convergence)

2. Functions and Correspondences:

1) Monotonicity

2) Continuity

3) Fixed Point Theorems (Tarski, Banach, Brower)

3. Linear Spaces and Linear Algebra:

1) Subspaces

2) Basis and Dimension

3) Affine and Convex Sets

4) Normed Linear Spaces

5) The determinant

6) Systems of Linear Equations

4. Smooth functions, Optimization and Comparative Statics:

1) Linear Approximation and the derivative

2) Mean Value Theorem

3) Unconstrained Optimization, Equality and Inequality constraints

4) Envelope Theorem

5. Difference and Differential Equations:

1) Types and Solution concepts

<u>II. Probability and Statistics</u>

1. Probability

Combinatorics. Events and measurable spaces. Probability. Conditional probability. Theorem of total probability. Bayes' theorem.

2. Measure Theory

Lebesgue measure. Lebesgue-Stieltjes measures and distribution functions. Measurable functions. Integral with respect to a measure. Absolute continuity of measures and the Radon-Nikodym theorem. Product measures and Fubini's theorem.

3. Random Variables and Distributions

Random variables. Probability distributions. Distribution functionof a random variable. Discrete random variables and probability functions. Absolutely continuous random variables and densities. Random vectors and marginal distributions. Independent random variables. Generalized conditional probability and distribution.

4. Expectation

Mathematical expectation. Moments. Chebyshev's inequality. The moment-generating function of a random variable. Product moments. Mean and variance of linear combinations of random variables. Conditional expectation. The law of iterated expectations. Jensen's inequality.

5. Special Distributions

The discrete uniform, Bernoulli, binomial, Pascal, geometric, and hypergeometric distributions. The multinomial and multivariate hypergeometric distribution. Integration by parts and by change of variable to polar coordinates. The uniform, gamma, exponential, chi-square, and beta distributions. The normal and the multivariate normal distributions.

6. Functions of Random Variables

The distribution of a function of a random variable. The probability function of a function of a random variable. The density of a function of a random variable. Characteristic functions, moment-generating functions, and Laplace transforms of functions of random variables.

7. Stochastic Processes and Limiting Distributions

Stochastic processes. Filtrations and martingales. Markov processes. Convergence in probability, in mean square, in distribution, and almost sure convergence. Convergence of distribution functions and of probability measures. The Poisson distribution as the limit of binomial distributions. The standard normal distribution as the limit of standardized binomial distributions. Laws of large numbers. The central limit theorem.

8. Sampling

Random samples and statistics. The distribution of the sample mean. The distribution of the variance of a random samplefrom a normal population. The *t* distribution. The *F* distribution.

9. Estimation

Point estimation. Efficiency of estimators. The sample mean and sample variance as unbiased estimators. The Cramér-Rao lower bound for unbiased estimators. Asymptotic properties of estimators: consistent estimators. Sufficient estimators. The method of moments. Maximum likelihood estimation. Bayesian estimation. Interval estimation.

10. Hypothesis Testing

Statistical hypotheses and their tests. The power function of a test. The Neyman-Pearson lemma. Likelihood ratio tests. Acceptance intervals. The *p*-value.Contingency tables. Goodness of fit.

Metodologia

- Theory classes

- Practical classes

- Learning based on problem solving

- Tutorials

- Personal study

- Study groups

- Textbook reading

- Article reading

Activitats formatives

Títol	Hores	ECTS	Resultats d'aprenentatge
Tipus: Dirigides			
Problems sets, tutorials	112,5	4,5	1, 2, 3, 4, 5, 6
Theory classes	112,5	4,5	1, 2, 3, 4, 5, 6
Tipus: Autònomes			
Personal study, study groups, textbook readings, article readings	150	6	1, 2, 3, 4, 5, 6

Avaluació

Final Exams   50%

A module consists of different courses which are evaluated through final exams, problem sets and assignments and other class activities sucha as class attendance, presentations, etc.

Class attendance and active participation   20%

Activitats d'avaluació

Títol	Pes	Hores	ECTS	Resultats d'aprenentatge
Problem sets and assignments				30%
Class Attendance and Problem sets and assignments	50%	0	0	1, 2, 3, 4, 5, 6
Final Exams	50%	0	0	1, 2, 3, 4, 5, 6

Bibliografia

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