Dynamic optimization

Lecturers
Thomas DEMUYNCK (Coordinator), Bram DE ROCK and Luca Paolo Merlino

Course mnemonic
MATH-S401

ECTS credits
5 credits

Language(s) of instruction
English

Course period
Second term

Campus
Solbosch

Course content

Gives the theoretical background and tools for discrete dynamic programming.

- Vector spaces, norms, Banach spaces
- Contraction mappings, Blackwell's theorem
- Berge's optimization theorem,
- Discrete dynamic optimization under certainty,
- Algorithms to solve discrete dynamic optimization problems under certainty
  - Value function iteration,
  - Interpolation,
  - Howard improvement
  - Coding
- Discrete dynamic optimization under undertainty,
- Algorithms to solve discrete dynamic optimization problems under uncertainty.
- Finite horizon dynamic programming with applications to shortest path problems, currency exchange, knapsack problems, longest common subsequence, etc
  - analysis of problems, complexity analysis and coding

Objectives (and/or specific learning outcomes)

The aim of this course is to provide students with some the mathematical and practical tools to set up, analyze and simulate discrete time dynamic optimization problems.

Pre-requisits and co-requisits

Required knowledge and skills

In addition to the list of courses, some programming experience in either Matlab, Python or Julia would be useful.

Teaching method and learning activities

Lectures, group work, For some parts of the course podcasts are available.

The relevant learning objectives for this course are:
- LO 1.3: Identify and analyse an issue using the relevant analytical tools and methods.
- LO 2.1: Adopt a scientific approach to data collection, research and analysis and communicate results with clear, structured, and sophisticated arguments.
- LO 3.1: Apply quantitative and qualitative techniques to support data analysis using standard office and statistical software.

References, bibliography and recommended reading

- Stokey, Lucas with Prescot, 1989, Recursive methods in economic dynamics, Harvard University Press
- Ljunqvist and Sargent, 2000, Recursive macroeconomic theory, MIT press
- Daron Acemoglu, 2009, Introduction to modern economic growth, Princeton University Press
- Ferguson and Lim, 2003, Discrete time dynamic economic models, Routledge

Course notes

Syllabus and Université virtuelle

Other information

Place(s) of teaching

Solbosch

Contact(s)

Thomas Demuynck (thomas.demuynck@ulb.be)

Evaluation method(s)

Other

Evaluation method(s) (additional information)

Written open book exam, Group assignements (usually in the form of analysing a problem and coding)

Determination of the mark (including the weighting of partial marks)

Written exam 80%, assignment 20%

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the Solvay Brussels School of Economics and Management

MA-ECOE | Master in Economics : Econometrics | finalité Research in Economics/unit 1