

PRELIMINARY VERSION

JUNIO 15 – JUNIO 25

Fechas: Junio 15 a Junio 25

Horario: 9:00am - 1:00pm

Prerrequisitos: Macroeconomía III, Microeconomía III, Econometría I, Sexto semestre

Purpose and Scope

The course will provide a thorough introduction to the rapidly developing field of computational economics. The course will focus on practical applications of numerical methods to the formulation, solution, and analysis of stochastic dynamic models in economics and finance, with special emphasis on nonlinear dynamic optimization and equilibrium models.

Who Should Take the Course

The course should be of interest to established and emerging economists who wish to learn how to use numerical techniques to solve and analyze economic models that do not possess closed-form algebraic solution or that otherwise cannot be readily solved using conventional mathematical analytic techniques. Potential areas of application include, but are not limited to, agricultural, environmental, development, financial, industrial, and macro- economics.

Course participants should have completed standard undergraduate courses in Calculus, linear algebra, and probability and an advanced mathematically-based course in microeconomics. Familiarity with computers is also expected. Experience with the Matlab or Gauss is highly desirable, but not essential.

Instructor

Mario J. Miranda, Ph.D., Andersons Professor of Finance & Risk Management and Director of Graduate Programs, Department of Agricultural, Environmental, & Development Economics, The Ohio State University, USA; Associate Editor, Journal of Economic Dynamics and Control and Journal of Computational Economics.

Textbooks

Strongly Recommended: *Applied Computational Economics and Finance*, by Mario J. Miranda and Paul W. Fackler, MIT Press, Cambridge, MA, 2002.

Recommended: *Numerical Methods in Economics*, by Kenneth L. Judd, MIT Press, Cambridge, MA, 1998.

Recommended: *Economía de Recursos Naturales: Aplicaciones de Economía Computacional en la Solución de Problemas Dinámicos*, by Jorge Higinio Maldonado, Monograph, Universidad de los Andes, 2008.

Software

Because the course will involve hands-on applications on a computer, each student will be expected to have access to a personal computer on which MATLAB Release R2007a or higher is installed. In addition, each computer must have installed the CompEcon Toolbox, which may be freely downloaded from the website <http://www4.ncsu.edu/~pfackler/compecon/toolbox.html>. Participants who have no experience with Matlab will be provided with an elementary self-directed tutorial which should be completed before attending the workshop.

Evaluation

To be defined.

Course Outline

The first half of the course will be devoted to numerical techniques, including linear equation, nonlinear equation, integration, differentiation, and function approximation methods. The second half of the course will be devoted to the application of these methods to the formulation, solution, and analysis of dynamic stochastic economic models, with examples drawn from agricultural, environmental, financial, and macro-economics.

1. Introduction

Some Apparently Simple Questions
An Alternative Analytic Framework

2. Linear Equations and Computer Basics

L-U Factorization
Rounding Error and Pivoting
Ill Conditioning
Special Linear Equations

3. Nonlinear Equations and Complementarity Problems

Function Iteration
Newton's Method
Quasi-Newton Methods
Problems With Newton Methods
Choosing a Solution Method

Complementarity Problems

4. **Finite-Dimensional Optimization**

Univariate Optimization
Newton-Raphson Method
Quasi-Newton Methods

5. **Numerical Integration and Differentiation**

Newton-Cotes Methods
Gaussian Quadrature
Monte Carlo Integration
Quasi-Monte Carlo Integration
Numerical Differentiation

6. **Function Approximation**

Interpolation Principles
Polynomial Interpolation
Spline Interpolation
Multidimensional Interpolation
Choosing an Approximation Method
The Collocation Method

7. **Discrete Time Dynamic Models: Theory**

Continuous Space Dynamic Programming
Euler Conditions
Continuous State, Discrete Choice Models
Continuous State, Continuous Choice Models
Rational Expectations Models

8. **Discrete Time Dynamic Models: Methods**

Linear Quadratic Control
Bellman Equation Collocation Methods
Implementation of Collocation Methods
Postoptimality Analysis
Discrete Choice Examples
Continuous Choice Examples
Rational Expectations Examples

La nota final se aproxima de la siguiente manera: desde .25 y .75 para arriba se aproxima al siguiente número superior y de .24 y .74 para abajo se aproxima al siguiente número inferior. Ejemplo; 3.25 pasa a 3.5 y 3.24 pasa a 3.0.

Fecha de retiro: El estudiante podrá retirar el curso, sin devolución, hasta un día hábil antes de la fecha de entrega de la última evaluación.