

University of Colorado, Boulder
Economics 8858
Simulation Techniques for Applied Microeconomics
Fall 2016, T-Th 09:30-10:45

Professor James Markusen

Econ 216

303-492-0748

james.markusen@colorado.edu

<http://spot.colorado.edu/~markusen>

Office Hours: T-Th 11:00-12:00 or by appointment.

“Many branches of both pure and applied mathematics are in great need of computing instruments to break the present stalemate created by the failure of the purely analytical approach to nonlinear problems”

--- John Von Neumann, 1945

Eqwtug"Qdlgevixgu

There is an increasing use of simulation techniques in economics. There are several reasons for this. (1) for theoretical modeling, traditional analytical methods have sharp limitations. (2) for empirical analysis, traditional canned software might not be adequate for some questions and there is a huge role for simulations in performing counter-factual experiments on results. (3) many authors effectively use simulations to provide numerical (and then graphical) examples of opaque analytical results.

The objective of this course is to provide an introduction to simulation modeling in microeconomics in order to illustrate all of these advantages. There will be an emphasis on simple general-equilibrium models (which cannot be solved analytically past extremely simple cases) using common and well-known problems in problems in public economics, labor economics, international trade, environmental economics, industrial organization and in other applied micro fields.

But I will also provide a good number of other examples that illustrate the computation of s ds (e.g., nonlinear least squares), matrix algebra (inverting a matrix) and calibration (basis for doing structural estimation).

Dcuke"Kphqt o cvkqp

There is no textbook for the course. All course materials will be available on both my personal website and the course website. Readings will be available on my personal web site:

<http://spot.colorado.edu/~markusen>. Click on “Teaching”, click on “Simulation modeling in microeconomics”. You will see a link “CU course 8858 Fall 2-1

Then start on

- 2.4 Brief introduction to sets: Model M2-3 in set notation
Model M2-4

- Chapter 3: The Basic Closed-Economy General-Equilibrium Model as an MCP
 - 3.1 The structure of a general-equilibrium model: optimization at the sector and household level
 - 3.2 Micro-consistent data: product exhaustion and market clearing
 - 3.3 Calibration and replication: background: production, cost and expenditure functions, Shepard's lemma for the Cobb-Douglas function
 - 3.4 Two goods, two factors, one representative consumer
Model M3-4a
Model M3-4b adds taxes
 - 3.5 Initially slack activities
Model M3-5
 - 3.6 Labor-leisure decision
Model M3-6
 - 3.7 Two households with different preferences and endowments
Model M3-7

- Chapter 4: Examples of Familiar Industrial-Organization Problems Modeled in GAMS
 - 4.1 Cournot and Bertrand oligopoly with continuous strategies
Application to strategic trade policy
Model M4-1
 - 4.2 Nash equilibria with discrete strategies
Model M4-2
 - 4.3 Two-stage game, sub-game-perfect Nash equilibrium
Model M4-3
 - 4.4 An insurance problem illustrating moral hazard and adverse selection
Model M4-4a modeled as an NLP
Model M4-4b modeled as an MCP
 - 4.5 Multi-market network, logistics, and plant-location problem with plant-level increasing returns

Model M4-5a modeled as an NLP
Model M4-5b modeled as an MCP

4.6 finance problem: optimal portfolio decisions

Chapter 5: Examples of Uses of the NLP Solver in Familiar Economics and Statistics Uses

5.1 Reading data from an external excel file
Model M5-1a scalar version
Model M5-1b vector (set) version

5.2 OLS: Constrained non-linear least squares with the NLP solver
Model M5-2

5.3 Balancing a matrix to create micro-consistent data using NLP
Model M5-3

5.4 Matrix inversion as an MCP
Model M5-4

5.5 Structural estimation and counterfactuals of simultaneous eq.
Model M5-5 supply-demand simultaneous equations & counterfactuals
Model M5-6 estimating non-homothetic CRIE preferences & counterfactuals

Chapter 6: General Equilibrium with Distortionary Taxes, Public Goods, Externalities,

Model M6-6c uses constraint equation to solve for the optimal pollution tax

- 6.7 Optimal taxation and redistribution
 Model M6-7 adapts M3-7 to an MPEC maximizing social welfare

Chapter 7: Adding Scale Economies and Imperfect Competition to General Equilibrium

- 7.1 A brief introduction to the CES function - more later
- 7.2 Monopoly, with fixed costs (increasing returns)
 Model M7-2
- 7.3 Oligopoly: Cournot competition with identical products and free entry
 Model M7-3
- 7.4 Monopolistic-competition I: large group
 Model M7-4
- 7.5 Monopolistic-competition II: small group
 Model M7-5

Chapter 8: Open Economy Models for Competitive Economies

- 8.1 Small open economy
 Model M8-1
- 8.2 Small open economy: tariffs versus trade costs
 Model M8-2
- 8.3 Small open economy: calibrating to tariffs in the benchmark
 Model M8-3
- 8.4 Small open economy: modeling a quota
 Model M8-4a modeled with an endogenous (variable) tax equivalent
 Model M8-4b modeled as supply/demand for licenses
- 8.5 Large economy and the optimal tariff (rest of world not explicitly modeled)
 Model M8-5
- 8.6 Two-country Heckscher-Ohlin model: Nash tariffs as an iterative MPEC
 Model M8-6a scalar version
 Model M8-6b same model in set notation

Chapter 9: Open Economy Models for Imperfect Competition and Scale Economies

- 9.1 A two-country oligopoly model
Model M9-1
- 9.2 A two-country monopolistic-competition model
Model M9-2
- 9.3 Monopolistic-competition with horizontal multinationals
Model M9-3

Chapter 10: Toward CGE Modeling;

- 10.1 CES functions and the calibrated-share form
- 10.2 The MPS/GE subsystem of GAMS
- 10.3 The Armington assumption
- 10.4 From an IO Table into GAM

Chapter 11: Basics of Dynamic Modeling:

- 11.1 Comparative steady-state analysis
Model M11-1a mcp version
Moedl M11-1b mpsge version
- 11.2 Converting an Infinite Horizon Problem to an MCP
Model M11-2 (currently only available in an MPS/GE format)

Urgekci"Ceeq o o q f cvkqpu"Rqkne{

If you have specific physical, psychiatric, or learning disabilities and require accommodations, let me know early in the semester so that your needs may be appropriately met. You will need to provide documentation of your disability to the Disability Services Office in Willard 322 (telephone 303-492-8671)

Other template models

Specific factors

Unemployment or sticky wages

Non-homothetic preferences