# A Basic Course in Economic Simulation Modeling using GAMS

Preface etc.

Chapter 1: Introduction to GAMS for economic problems
(Jesper Jensen's Welcome to GAMS)

Chapter 2: Examples of economic equilibrium problems translated into GAMS

- 2.1 Simple supply-demand problem illustrating complementarity
  Model M2-1
- 2.2 Maximization of utility subject to a linear budget constraint
  Formulated as a NLP problem:
  Formulated as an MCP using first-order conditions:
  Formulated as an MCP using Marshallian and Hicksian demand functions:
  Model M2-2
- 2.3 Extension of the utility optimization problem: add a rationing constraint
  Formulated as a NLP problem and an MCP.
  Formulated as an MPEC
  Automating scenario generation
  Model M2-3
- 2.4 Brief introduction to sets: Model M2-3 in set notation
  Model M2-4
- 2.5 Toward general equilibrium: a simple one-good, one-factor, one consumer example
  Model M2-5

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

3.8 Additional materials: properties and calibration of Cobb-Douglas functions, identifying and correcting calibration errors (uses M3-4a)

Chapter 4: Examples of Familiar Industrial-Organization Problems Modeled in GAMS

4.1 Cournot and Bertrand Oligopoly with Continuous Strategies
Model M4-1

4.2 Nash equilibria with discrete strategies
Model M4-2

4.3 An insurance problem illustrating moral hazzard and adverse selection
Model M4-3a modeled as an NLP
Model M4-3b modeled as an MCP

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

5.1 OLS as an NLP problem
Model M5-1

5.2 OLS one step up: constrained non-linear least squares with the NLP solver
Model M5-2

5.3 Reading and Writing to/from Excel
Model M5-3

5.4 Balancing a matrix to create micro-consistent data using NLP
Model M5-4

5.5 Matrix inversion as an MCP
Model M5-5

5.6 Structural estimation and general-equilibrium counterfactuals using MPEC
Model M5-6

Chapter 6: General Equililbrium with Distortionary Taxes, Public Goods, Externalities, Optimal Taxation and Redistribution Policies

6.1 Taxes in the benchmark data
Model M6-1

6.2 Labor supply taxation: introducing equal-yield tax reform
Model M6-2a
Model M6-2b introduces equal yield constraint

6.3 Public consumption goods
Model M6-3

6.4 Optimal provision using a Samuelson rule
Model M6-4

6.5 Public intermediate (infrastructure) good with optimal provision
Model M6-5

6.6 Pollution from production affects utility
Model M6-6a
Model M6-6b uses MPEC to solve for the optimal pollution tax
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: Basics of Dynamic Modeling:

10.1 Comparative steady-state analysis
Model M10-1

10.2 Converting an Infinite Horizon Problem to an MCP
Model M10-2 (currently only available in an MPS/GE format)

Chapter 11: Toward CGE Modeling;

10.1 CES functions and the calibrated-share form

10.2 The Armington assumption

10.3 The MPS/GE subsystem of GAMS

10.4 From an IO Table into GAMS