

# A Basic Course in Economic Simulation Modeling using GAMS

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Preface etc.

Chapter 1: Introduction to GAMS for economic problems  
(Jesper Jensen's "Introduction to GAMS Chapter 1" on the website)

Chapter 2: Examples of economic equilibrium problems translated into GAMS  
(use "Introduction to GAMS Chapter 2" for now - needs revision)

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
- 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 An insurance problem illustrating moral hazard 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 Equilibrium 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  
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- Chapter 9: Open Economy Models for Imperfect Competition and Scale Economies
- 9.1 A two-country oligopoly model  
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  - 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
- 10.5 A more complete IO calibration example using sets

Chapter 11: Basics of Dynamic Modeling:

- 11.1 Comparative steady-state analysis  
Model M10-1
- 11.2 Converting an Infinite Horizon Problem to an MCP  
Model M10-2 (currently only available in an MPS/GE format)