

AGEC 685 (section 329): Directed Study
1 or 2 Credits 10-week Summer 2002

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Objective: This course will cover a mixture of general equilibrium modeling empirical and theoretical issues. After the course one should be able to build a simple CGE model using GAMS. The general purpose of the course is to cause graduate students to:

- (i) become familiar with the basic structure of a simple computable general equilibrium model and the economic logic underlying CGE,
- (ii) gain experience in implementing and solving basic CGE models including problem formulation and solution,
- (iii) examine selected applications of CGE to policy analysis issues gaining insight into potential application areas and model use techniques,
- (iv) be able to interpret and evaluate results from real-world CGE exercises, and
- (v) learn the basics of formulating CGE models in the Generalized Algebraic Modeling System (GAMS) programming software language.

Conduct: Each week we will have a single 1 hour and 15 minute lecture. The class will be on Wednesday at 3:30 p.m. in Room 448, Blocker Building. The first day of the class starts on June 5, 2002.

Grading:	Assignments	30%
	Final exam	70%

Assignments: During the semester a few assignments will be given. Individuals will turn in their own assignments, but group efforts are encouraged.

Final: The final exam will be comprehensive. Time and place will be arranged to accommodate everyone's schedule.

Additional Credit Project: Students who elect to may register for 2 hours. Those registering for the additional hour are expected to do an independent project.

Project Guidelines: If you choose to do the project, please make sure that your project follows these guidelines:

- (1). Build a simple CGE model that includes at least 2 households 2 goods and 2 factors
- (2). Use either real world data or simulated data
- (3). Model calibration
- (4). Run the benchmark equilibrium
 - Your results should replicate the observed data.
 - All equilibrium conditions must hold.
- (5). Introduce a shock to the system
- (6). Compare results between the benchmark and counterfactual equilibrium after the shock, and
- (7). Provide a discussion of the project in terms of model structure and explanation for the results.

The project should not be longer than 15 pages, double-spaced, excluding tables and figures. It should address all issues above in point 1- 7. The project is to be submitted by August 15, 2002. Students taking the project option are required to turn in a topic and basic outline by July 1. If desired, one could submit an outline earlier than July 1 for some suggestions.

Text:

- (1). There is no assigned textbook required for this course. All reading materials will be drawn from an applied general equilibrium textbook chapters or the literature, the GAMS manual, and the PATH solution manual. References related to each topic discussed in the class are given as a guide for one who wishes to explore the topics profoundly. However, the recommended textbook is:

Applying General Equilibrium by J. B. Shoven and J. Whalley, *Surveys of Economic Literature*, Cambridge University Press, 1998. (You can order from the Cambridge University Press at 1-800-872-7423, ISBN 0521319862. It costs about \$29.0 for paper copy + \$5 shipping).

- (2). Copies of the GAMS manual will be made available at the website <http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>.
- (3). GAMS student version will be available and installed to individual PCs if desired.
- (4). Course materials will be made available in pdf form through the mccarl web site.

Tentative Outline

1. Overview of Computable General Equilibrium Model

- What and why CGE?
- Partial equilibrium & econometrics
- Benefits and drawbacks of CGE
- Overview of CGE modeling
- Theory behind CGE

- Walrasian equilibrium and conditions

Suggested Reading:

- Andreu Mas-Collell, Michael D. Whinston, and Jerry R. Green, Microeconomic Theory. Chapters 15 and 16. Oxford University Press, NY, 1995.
- Hertel, T. W. "General equilibrium analysis of U.S. agriculture: What does it contribute?" *J. of Agricultural Economics Research* 42(1990):3-9.
- Hertel, T. W. "Applied general equilibrium analysis of agricultural and resource policies. *Staff Paper 99-2*, Department of Agricultural Economics, Purdue University, March 1999.
- Just, R. E., D. L. Hueth, A. Schmitz. "Applied welfare economics and public policy." Chapters 2 and 9, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1982.
- McKittrick R. R. "The econometric critique of computable general equilibrium modeling: The role of functional form choice." *Economic Modelling* 15(1998):543-573.
- Shoven, J.B., and J. Whalley. "Applied general equilibrium models of taxation and international trade: An introduction and survey." *J. of Econ. Literature* 22 (1984), 1007-1051.
- Shoven, J. B. and J. Whalley. "Applying general equilibrium." *Surveys of Economic Literature*, Chapters 2 and 3, 1998.
- Whalley, J. "How reliable is partial equilibrium analysis?" *The Review of Economics and Statistics* 57(1975), 299-310.

2. An Introduction to the Structure of CGE Models

- Fundamental relationship of simple CGE model
- Incorporating taxes
- Interpretation of results
- Incorporating shocks
- Comparative analysis

Suggested Reading:

- McCarl, B. A. and D. Gillig. Notes on Formulating and Solving Computable General Equilibrium Models within GAMS (<http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>).
- Lofgren, H., R. L. Harris, S. Robinson, M. Thomas, and M. El-Said. A Standard computable general equilibrium (CGE) model in GAMS. International Food Policy Research Institute (IFPRI), Washington, D.C., 2001.
- Shoven, J.B., and J. Whalley. "Applied general equilibrium models of taxation and international trade: An introduction and survey." *J. of Econ. Literature* 22 (1984), 1007-1051.

3. An Introduction to GAMS

- Using GAMS
- A User interface -GAMS IDE
- GAMS Documentation
- Dissecting GAMS formulation
- GAMS Exercise

Suggested Reading:

- McCarl, B. A. Basic GAMS class. (<http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>).

4. CGE Modeling via GAMS

- Applying CGE into GAMS
- Extend simple CGE including hierarchical (nested) functions
- Choice of functional forms
- Numerical examples

Suggested Reading:

McCarl, B. A. Basic GAMS class (<http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>).

McCarl, B. A. and D. Gillig. Notes on Formulating and Solving Computable General Equilibrium Models within GAMS (<http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>).

Shoven, J. B. and J. Whalley. "Applying general equilibrium." *Surveys of Economic Literature*, Chapter 4, 1998.

5. The Data Base and application

- Input-output table
- Social Accounting Matrices
- Other supplemental data e.g. energy balance table
- Building benchmark equilibrium data sets
- Parameters calibration
- Discussion on a selected application

Suggested Reading:

Abbink, G. A. M. C. Braber, and S. I. Cohen. "A SAM-CGE demonstration model for Indonesia: Static and dynamic specifications and experiments." *International Economic Journal* 9(1995), 15-33.

Cohen, S. I. Social Accounting and Economic Modelling for Developing Countries. Ashgate, London, 2002.

Miller, R. E. and P. D. Blair. Input-Output Analysis: Foundations and Extensions. Prentice-Hall, 1985.

Shoven, J. B. and J. Whalley. "Applying general equilibrium." *Surveys of Economic Literature*, Chapter 5, 1998.

6. Mix complementary problem (MCP)

- Moving from LP to NLP to MCP
- MCP solvers
- General modeling examples
- Tricks to overcome problems

Suggested Reading:

Ferris, M. C. and T. S. Munson, GAMS/PATH User Guide. A copy is available at the website <http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>.

Ferris, M. C. and J. S. Pang, "Engineering and economic applications of complementarity problems." *Siam Review* 39(1997), 669-713.

McCarl, B. A. Basic GAMS class. (<http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>).

McCarl, B. A. and D. Gillig. Notes on Formulating and Solving Computable General Equilibrium Models within GAMS (<http://agecon.tamu.edu/faculty/mccarl/mccarl.htm>).

Shoven, J. B. and J. Whalley. "Applying general equilibrium." *Surveys of Economic Literature*, Chapter 4, 1998.

7. Review of Basic Application of CGE Models

- Review of existing CGE models
- Discussion on selected applications

Suggested Reading:

Colatei, D. and J. I. Round, "Poverty and policy: Experiments with a SAM-Based CGE model for Ghana," Paper presented to the XIII International Conference on Input-Output Techniques, 21-25 August 2000, Macerata, Italy

Harris, R. L. A Computable general equilibrium analysis of Mexico's agricultural policy reforms. International Food Policy Research Institute (IFPRI), Washington, D.C., 2001. (<http://www.cgiar.org/ifpri/divs/tmd/dp.htm>)

Shoven, J.B., and J. Whalley. "Applied General Equilibrium Models of Taxation and International Trade: An Introduction and Survey." *Journal of Economic Literature* 22 (1984), 1007-1051.

Shoven, J. B. and J. Whalley. "Applying general equilibrium." *Surveys of Economic Literature*, Chapters 7 and 8, 1998.

8. Advanced application of CGE Models

- Review of existing CGE models
- The impact of greenhouse gas mitigation policies on the U.S. emissions under the Kyoto protocol.

Suggested Reading:

MacCracken, C. N., J. A. Edmonds, S. H. Kim, and R. D. Sands. "The Economics of the Kyoto Protocol," in *The Costs of the Kyoto Protocol: A Multi-Model Evaluation*, John Weyant (ed.), special issue of *The Energy Journal*, 1999.

Manne, A. S. and R. G. Richels. "The Kyoto Protocol: A Cost-Effective strategy for meeting environmental objectives?" in *The Costs of the Kyoto Protocol: A Multi-Model Evaluation*, John Weyant (ed.), special issue of *The Energy Journal*, 1999.

Jacoby, H. D. and I. S. Wing. "Adjustment time, capital malleability and policy cost." in *The Costs of the Kyoto Protocol: A Multi-Model Evaluation*, John Weyant (ed.), special issue of *The Energy Journal*, 1999.