

Department of Economics
University of Melbourne
Melbourne, VIC, Australia
July 11-15, 2011

Introduction to Computable General Equilibrium Modeling with GAMS and MPSGE

Instructors:

Professor James R. Markusen
University of Colorado, Boulder, USA

Associate Professor Edward J. Balistreri
Colorado School of Mines, Golden, USA

Objective:

The workshop will provide an introduction to applied (numerical) general equilibrium models constructed using GAMS and MPSGE. The workshop addresses beginners, no previous knowledge of GE modeling is assumed, but knowledge of intermediate microeconomics (Master's level) is important. This workshop is intended for economists who are interested in using numerical modeling for simulation analysis of theoretical models and those who want to do policy analysis with real data.

The teaching technique we will follow consists of three steps repeated each half day: (1) a brief lecture, (2) examination and discussion of techniques via the use of simple template models, (3) exercises for the participants. Both instructors are available during the entire workshop.

Instructors

James R. Markusen

University of Colorado, Boulder, USA

James Markusen is Professor of Economics, University of Colorado at Boulder. His research focuses on international trade and multinational activity. Over the last 20 years he concentrated on the location, production, and welfare effects of large-scale firms and multinational corporations. He worked both on theoretical models and numerical, computer simulation models. His research on the role of multinationals in the international economy culminated in a widely cited book by MIT press in 2002. He has widely published in the top economic journals such as the *American Economic Review*, the *International Economic Review* or the *Journal of International Economics*.

Edward J. Balistreri

Colorado School of Mines, Golden, USA

Edward J. Balistreri is an Associate Professor at the Colorado School of Mines, Division of Economics and Business. His research focuses on the formulation of numeric simulation models of economic policy and outcomes. Balistreri's models have been used to analyze a diverse set of topics including global climate policy and international trade. He has also contributed to the literature on structural estimation and the empirical calibration of advanced models of trade and industrial organization. Balistreri frequently collaborates with colleagues at The World Bank on the formulation of models of trade and development. Prior to his entry into academics, Balistreri worked as an International Economist for the United States International Trade Commission.

Course Coordinator

Viktoriya Koleva

Department of Economics

University of Melbourne

Melbourne, Australia

Workshop Topics and Schedule

Monday, July 11:

Morning

- Install discuss, and explain software
- Basic GAMS syntax
- Exercises
- Introduction to economic modeling in GAMS, complementarity

Afternoon

- Formulating and solving square systems of equations/inequalities
- Micro-consistent data and calibration
- Coding and replication checks
- Elements and formulation of numerical GE models
- Exercises

Tuesday, July 12:

Morning

- Simple template models: specific factors, labor-leisure, multiple households
- Exercises

Afternoon

- Extension to the basic framework taught with template examples
- Taxes in benchmark data
- Auxiliary variables and constraint equations: equal yield tax reform
- Modeling public goods, externalities
- Exercises

Wednesday, July 13:

Morning

- Modeling a small open economy
- Tariffs versus trade costs
- Armington assumption
- Quotas and voluntary export restraints
- Exercises

Afternoon

- Models with scale economies and imperfect competition
- Oligopoly
- Monopolistic competition
- A two-country example
- Exercises

Thursday, July 14:

Morning

- The MPS/GE sub-system of GAMS
- Intermediate goods, joint outputs, nesting, the calibrated share form

Afternoon

- Sets and set formulation of MCP and MPS/GE models
- Alternative representations of data: IO table, SAM, MPS/GE table
- Calibration: from an IO table to GAMS and MPS/GE
- Exercises

Friday, July 15:

Morning

- Introduction to GTAP, GTAP in GAMS

Afternoon

- Structural estimation versus calibration
- Possible parallel sessions
 - Large-scale modeling, calibration and spreadsheet interfaces
 - Added template examples, such as multi-national firms

Times and Location

Morning sessions will begin at 9am. Lunch is provided for workshop participants at noon. The afternoon sessions will run from about 1-4pm. All sessions take place at the Department of Economics at the University of Melbourne.

(Old) Economics and Commerce Building

University of Melbourne

Parkville, VIC 3010

Australia

Payment and Registration

The fee for participating in the training workshop is AUD\$3500 and includes lectures, course material and lunches. **Participants are required to bring a laptop with a CD-ROM drive. The GAMS workshop license (valid for 2 months) as well as extensive course material will be provided on CDs.**

Academic participants from accredited universities or research institutions will receive a discount of AUD\$500. Graduate students from accredited academic institutions are likewise admitted for a discount of \$1500. Please fax a copy of your student ID to get the discount.

You can register and pay on line at the following address:

<http://ecommerce.fbe.unimelb.edu.au/categories.asp?cID=8>

A hard copy registration form is available there if you prefer to pay off line.

The registration deadline is June 15, 2011. The maximum number of participants is restricted to 20. There will be a limited number of places set aside for Melbourne University students and staff. **Slots are guaranteed only upon full payment of fees (by check or credit card) through the GAMS Course Coordinator.** Cancellations will be fully refunded if made prior to June 15, 2011. No refunds will be made after the registration deadline.

Note the following disclaimer and limited liability: The program and the list of instructors are confirmed and correct at the time of publication. In case of any serious circumstances or acts of nature beyond control of the organizers, such as for example illness, death, cancellation of flights etc., the organizers aim for an adequate substitution. In the very unlikely, but still possible case, the maximum liability of the organizers is limited to the tuition. The organizers do not cover any other costs of the participants, such as travel bookings, visa fees etc.

Venue and Accommodation

The workshop will be held at the Department of Economics at the University of Melbourne, Parkville, VIC. Venue information will be provided after reservation.

The following hotels are recommended as they are in the vicinity of the location of the coursework.

Carlton Clocktower Apartments Shop 27

255 Drummond Street

Carlton, VIC 3053

Australia

Phone: (+61 3) 9349 9700

Fax: (+61 3) 9349 2542

Email: questclocktower@questapartments.com.au

Website: <http://www.clocktower.com.au>

Rydges On Swanston Hotel Melbourne

701 Swanston Street

Carlton VIC 3053

Phone: (+61 3) 9347 7811

Website: <http://www.rydges.com/hotel/RVCARL/Rydges-On-Swanston-Melbourne.htm>

Workshop participants should make their own arrangements with the above hotels. For both hotels, mention when booking that you are taking a course at the University of Melbourne and you should get the government rate.

The low-cost option for accommodation is Trinity College on The University of Melbourne campus: <http://www.trinity.unimelb.edu.au>. The rate is \$60 per night including breakfast. This option can only be booked for the entire 6 night period, arriving on July 10 and leaving on July 16. Trinity College does not do individual bookings; you will need to pay for accommodation there along with your registration.

How to Prepare

This is to provide information on pre-course preparations. We ask all participants to do a fair bit of preparation work. For those who have a background in CGE modeling and GAMS, some of the exercises may be easy and you may be able to proceed quickly. But we would like all participants to be familiar with this material at the beginning of the workshop.

Below you will see links to a number of files. Please set aside a big chunk of time for these.

First, please download and install the GAMS system on your laptop prior to the workshop. The system can be downloaded here:

<http://www.gams.com/download/>

The system will run in "demo" mode (i.e., with limitations on the size of the model that the system can handle). The demo mode is sufficient to run the simple models covered on the first couple of days of the workshop.

At the workshop we will provide you with a CD with a 30 day full license to GAMS. We will help you install the license on your computer. This will not require re-installation of the system, only adding one file. For this reason, please make sure that you can log on as an administrator to your computer.

Here is a chapter that introduces the basic features of GAMS:

http://spot.colorado.edu/~markusen/teaching_files/applied_general_equilibrium/GAMS/intro1.pdf

To get started on modeling please read:

http://spot.colorado.edu/~markusen/teaching_files/applied_general_equilibrium/GAMS/intro2.pdf

This chapter provides an introduction to complementarity modeling and to the basic framework for attacking general-equilibrium problems. There are two executable GAMS files for this chapter: MOA.GMS and MOB.GMS:

http://spot.colorado.edu/~markusen/teaching_files/applied_general_equilibrium/GAMS/Examples/

The next chapter gets into the basics of models we will use repeatedly over the first few days.

http://spot.colorado.edu/~markusen/teaching_files/applied_general_equilibrium/GAMS/ch1.pdf

Please spend time on this. You may want to temporarily skip pages 19--32 on the mps/ge subsystem of GAMS which will be taken up later in the week. There is one executable GAMS file for this chapter: M1_MCP.GMS. This is found in the "example" section noted above.

All models throughout the course employ functional forms known as constant-elasticity-of-substitution (CES) functions. If you are not familiar with CES algebra, or think you need revisit this topic, please read one or more of the following. For a textbook treatment of CES functions, read an advanced text on microeconomics, for example Hal Varian (1992), *Microeconomic Analysis*. New York: W.W. Norton & Company
Here is a note on CES functions

www.tecatraining.dk/MoscowWorkshop/Markusen_MC_CES_CET_Moscow.pdf

The note also introduces two other topics covered by the course: Monopolistic Competition and the Constant-Elasticity-of-Transformation (CET) functions.

CES functions come in several varieties, all with the same properties. In applied models, the so-called calibrated-share form is convenient. Here is a note comparing the textbook form (as presented in Varian (1992) and the calibrated-share form:

www.tecatraining.dk/MoscowWorkshop/JensenCES_FactSheet.pdf