

Introduction to numerical simulation techniques:

Getting practical experience in building computable general equilibrium (CGE) model in GAMS

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Date and Location: March, 7 – 11 (Monday to Friday)

Faculty of Economics and Business, University of Zagreb

J. F. Kennedy square 6, 10000 Zagreb

Computer lab classroom 42 (ground floor)

How to apply: Register at <http://goo.gl/forms/5YEjufZQmH> (preferred) or send an e-mail to onadoveza@efzg.hr. Number of participants is limited to **30**.

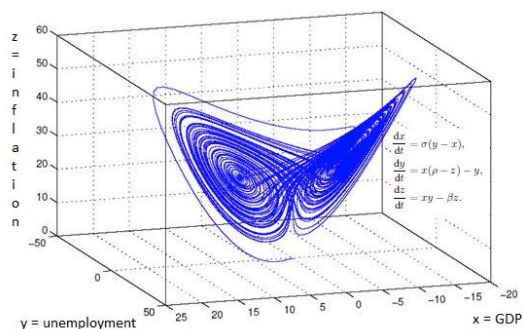
Tuition fee: No tuition fee

Financirano iz projekta *Stvaranje preduvjeta za izgradnju računalnog makroekonomskog modela za Hrvatsku (SPIRITH)* kojeg je sufinancirala Europska unija iz Europskog socijalnog fonda

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Ministarstvo
znanosti,
obrazovanja
i sporta



Agencija za
strukovno obrazovanje
i obrazovanje odraslih

Course objectives and description

The aim of the course is to provide basic knowledge and tools necessary to develop and use a standard Computable General Equilibrium (CGE) model of an economy. The standard model will be developed by building its components *part-by-part* and by gradual addition of new features into the basic CGE model. The lectures are suited for professional economists in central and private banks, insurance companies, and government offices who search for a well suited tool designed to assess possible impacts of different shocks and policy changes on all relevant economic variables, as well as for Ph.D. and graduate students and academic researchers who seek to test their hypotheses and theories. Additionally, CGE models are multi-sectoral and therefore offer their users a unique opportunity to evaluate potential structural changes which accompany policy changes.

Since the course is introductory in its nature, there are no prerequisites needed. However, it should be clear that a **reasonably solid grounding in microeconomic theory is required**. People unfamiliar with basic concepts of firm/consumer optimization will not be able to work with these types of models.

Five-hour lectures will cover theoretical background of the model and hands-on exercises designed to give practical experience to course participants in building the model and evaluating the effects of different model structures and assumptions on its results. Theory and practice will be combined during the lectures.

The course objective is to provide a systematic practical experience in economic modeling, by building a CGE model *from scratch*. The focus is on the numerical simulation techniques, in particular CGE modeling techniques using GAMS, and not on mathematical methods used to derive model equations. However, the latter is necessary to understand the model and its implications and to avoid the black-box trap of complex economic models. After the course, participants will be able to model a standard CGE model and to simulate it in GAMS. In case the group is able to follow the course materials faster than the planned schedule assumes, the lectures will cover some extensions (e.g. imperfect competition and joint production function assumptions or multiple household considerations). The special emphasis will be put onto building the participants' capacity to describe and interpret the model, its results and limitations, as well as to evaluate the effects of alternative economic policy decisions using sensitivity analysis.

The course includes introduction to modeling in General Algebraic Modeling System (GAMS) which is a widely used programming environment for numerical simulation models. Free download of the demo version of GAMS is available at <http://www.gams.com/download/> and this version is just enough to serve the course goals. At the end of the course, all GAMS *codes will be provided* to participants.

Schedule

Day	Time
Monday, 7/3/2016	08:00 – 14:00
Tuesday, 8/3/2016	16:00 – 21:00
Wednesday, 9/3/2016	16:00 - 21:00
Thursday, 10/3/2016	08:00 - 12:00
Friday, 11/3/2016	15:00 - 20:00

Course Syllabus

Lectures and exercises will cover basic tools and parts of CGE modeling such as:

- ✓ *Computation of welfare changes after the policy shock*
- ✓ *Computation of post-policy changes of all variables in the model*
- ✓ *Simulation of different policy shocks*
- ✓ *Interpretation of numerical simulation results*
- ✓ *Sensitivity analysis*

Day 1: Introduction to CGE models and GAMS and consumer problem

Part I: *Demand*

- What are CGE models about
- Getting Started with GAMS
 - Introduction to syntax and useful commands in GAMS (GAMS User's Guide)
 - General structure of CGE models in GAMS
- Consumer - *Modeling demand*

Part II: *Introduction to GAMS and computation of demand in GAMS*

- Hands-on exercise: Setting up consumer problem in GAMS
- Hands-on exercise: Computation and simulation consumer problem in GAMS

Day 2: Producer problem

Part I: *Supply*

- Producer - *Modeling supply*
 - Producer problem (no intermediate inputs)
 - Producer problem (with intermediate inputs)

Part II: *Computation of supply in GAMS*

- Hands-on exercise: Setting up producer problem in GAMS
- Hands-on exercise: Computation and simulation producer problem in GAMS
- Hands-on exercise: Basic CGE model in GAMS

Day 3: Government and Foreign sector

Part I: *Export, Import, government expenditures and revenues*

- Modeling international trade
 - Small open economy
 - Large open economy
- Modeling government
- Modeling Tariffs and other government interventions

Part II: *Computation of (i) import demand and export supply and (ii) government demand in GAMS*

- Hands-on exercise: Computation and simulation of foreign sector supply and demand in GAMS
- Hands-on exercise: Computation and simulation of government problem in GAMS
- Hands-on exercise: Policy simulations

Day 4: Armington assumption

Part I: *Extended Supply*

- Modeling (extended) production
 - more on production
 - composite good

Part II: *Computation of (i) extended supply and (ii) investment demand in GAMS*

- Hands-on exercise: Computation and simulation of extended supply in GAMS

Day 5: Investment supply and demand, closure rules and social accounting matrices (SAMs)

Part I: *Setting standard CGE model*

- Modeling investment supply and demand
- Alternative closure rules
- SAMs

Part II: *Standard CGE model in GAMS*

- Hands-on exercise: Computation and simulation of investor's problem in GAMS
- Hands-on exercise: Computation and simulation of standard CGE model in GAMS
- Hands-on exercise: Policy simulations

*Extensions***: multiple households, imperfect competition, environmental considerations, joint production.

***Note: The cover of CGE extensions will depend on participants' ability to access and follow the learning material.*

Lecturer

Professor John Gilbert
Jon M. Huntsman School of Business
Utah State University

Potential applicants

This course could be interesting for the following groups:

- Professional economists in banks, insurance, Ministry of finance, central banks, and government
- Economic specialists interested in policy evaluations
- Academic researchers who are interested in modern economic analysis
- Graduate and Ph.D. students in economics

Recommended preparation

Reading

There are no prerequisites needed since the course is introductory. However, participants should be familiar with the basics of CGE models and its possible applications as well as to have reasonably solid grounding in microeconomic theory. Therefore, we recommend participants to choose among:

For those familiar with the basic general equilibrium theory:

1. Gilbert, J. and Tower, E., 2013. *Introduction to Numerical Simulation for Trade Theory and Policy*. World Scientific Publishing Co. Pte. Ltd., London.
2. Hosoe, N., Gasawa, K. and Hashimoto, H., 2010. *Textbook of Computable General Equilibrium Modeling - Programming and Simulations*. UK: Palgrave Macmillan.

For those unfamiliar with the basic general equilibrium theory or for non-economists:

3. Burfisher, M. E., 2011. *Introduction to Computable General Equilibrium Models*. Cambridge University Press, New York.

Software

No programming knowledge is necessary for the course. However, it is recommended that students are familiar with the basics of GAMS. A great starting point is the GAMS User's Guide. Free download of the demo version of GAMS is available at <http://www.gams.com/download/>.

Tuition Fee

There is no tuition fee. The workshop is co-financed by the European Union from the European Social fund. The number of participants is limited to 30.



Quality Assessment

The course and the lecturer will be evaluated by participants through an individual and anonymous survey that takes into account the organizational and academic aspects of the course.