Single Country Computable General Equilibrium (CGE) Modelling: Intermediate Online Course

Course Description

This course is an intermediate course in (practical) single-country computable general equilibrium (CGE) modelling using the General Algebraic Modelling System (GAMS) software. The course is designed for individuals who have a well-developed background in economics and basic CGE modelling, who wish to develop the technical skills needed to become a CGE modeller and/or become competent users of modern comparative static single country CGE models. The course emphasises the development of the skills required to develop systematic policy experiments and the interpretation of the results from those experiments. The course also develops the participants understanding of the behavioural relationships in, and the calibration of, CGE models, while enhancing GAMS coding skills. The course uses a mix of video presentations (lectures and 'how to' videos), practical computer exercises and policy analyses exercises.

The materials are organised in 4 modules offered over 6 weeks (with a one-week allowance for 'slippage'). The first two modules have a total of 11 components, each of which requires approximately 3 hours of input from the participants. The third module has three components: the first is a series of presentations providing advice on interpreting and presenting CGE results, while the second and third are exercises in interpreting model results, each requires approximately 9 hours. The final module of the course is devoted to a guided research project that requires about 18 hours of input. Thus, participants should allocate upto 90 hours over 5 weeks to complete the course

Participants on this course are required to have completed the 'Practical Computable General Equilibrium (CGE) Modelling course' (see www.cgemod.org.uk/introcge.html for details) or provide proof of equivalent or greater skills.[1] The methods used in this course

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[1] We provide a set of exercises for which satisfactory completion is deemed 'proof of equivalent or greater skills'.

require an understanding of Social Accounting Matrices (SAMs), and the relationships between SAMs and CGE models.

The course is delivered via an electronic learning environment – Moodle. Moodle provides an environment that allows the delivery of learning materials in a structured and organised manner, and an asynchronous forum in which participants can engage with other participants and with the course tutor. The course tutor is available, by email and/or the Moodle message system, to answer specific questions and provide help with problems: questions and requests for advice submitted between 0800 and 1600 UTC will be responded to by the end of the next working (Monday to Friday) day, i.e., by 1600 UTC. Each module requires the participants to submit an assignment; this allows the tutor to monitor progress and understanding, and to intervene if participants are not understanding concepts and techniques or having difficulties. Feedback is provided for each assignment.

The course assumes that the participants have an in-depth knowledge of microeconomic theory, especially general equilibrium theory, and a reasonable understanding of standard techniques of mathematical economics, especially those relating linear homogenous functions. It is assumed that participants have appreciable experience with programming in GAMS and in the use of MS Excel.

This course does NOT use a GUI (Graphical User Interface) to access GAMS. Experience has demonstrated that the use of GUI's by participants on training programmes typically limits the development of the skills needed to be a good CGE modeller or user of CGE models, while encouraging the belief that CGE models are 'black boxes'. Basic GAMS programming skills, and an understanding of economic theory, demonstrates that allegations that CGE models are 'black boxes' are false. The development of GAMS, or GEMPACK, programming skills greatly extends the ability of the user to exploit the power of CGE models, while, at the same time, opening up the potential that participants can, in the future, change behavioural relationships in CGE models.

A time limited licence for GAMS will be provided (courtesy of GAMS).

Course Aims and Objectives

<u>Course Aims</u>

To develop the CGE modelling skills of participants (using GAMS) so they

i) understand the behavioural relationships used in CGE models;

ii) understand the impact of different behavioural relationships used in CGE models;

iii) understand the calibration of the behavioural relationships in CGE models;

iv) can formulate appropriate CGE policy experiments; and

v) can interpret the results generated by single country CGE models.

<u>Course Objectives</u>

On completion of the course the participants will be able:

i) formulate and code appropriate policy experiments;

ii) identify and understand the strengths and limitations of CGE models;

iii) modify behavioural relationships;

iv) interpret the results from single country CGE; and

v) identify, and present, the policy implications of simulations using single country CGE models.

Timetable

Online courses are run in four cycles – Oct/Nov, Nov/Dec, Jan/Feb and March/April – with recruitment for each course limited to c12 participants. The single-country course will run in cycles 2 and 3 and will be offered in cycle 4 if there are more than c24 participants.

	Cycle 2	Cycle 3	*Cycle 4*
Final dates for registration	29th Oct 2018	30th Dec 2018	*18th Feb 2019*
Final dates for (cleared) payment of course fee	2nd Nov 2018	4th Jan 2019	*22nd Feb 2019*
Single Country CGE Courses begin	12th Nov 2018	14th Jan 2019	*4th Mar 2019*
Single Country CGE Courses end	21st Dec 2018	22nd Feb 2019	*12th April 2019*

Course Fees

Category	Developed Economy Rate	Developing Economy Rate
Professional	£(GBP)1,000	£(GBP)825
Student	£(GBP)700	£(GBP)550
Scholarship		£(GBP)150

A 10% reduction in the course fee is offered to applicants who have taken the 'Practical CGE Modelling course'. A further 10% reduction in the course fee is offered to applicants who have taken the 'Global CGE Modelling course'.

Notes:
1. Developing economies are those classified as 'Low-income economies' and 'Lower-middle-income economies' by the World Bank at the time an application is made.
2. Payments in GB pounds (sterling) are by electronic/wire transfer or international cheque. Payees pay their own bank fees and any currency fees, but not the bank fees of CGEMOD. Clearance of payments typically takes 3 to 5 working days after the funds are received by a UK bank.

3. Students are required to correspond from an academic email address and provide confirmation of their status from an academic advisor with an academic email address.

4. A limited number of scholarships are available to students from developing countries. Applications for a scholarship must be made at the time of registration; applications must be accompanied by a case for being awarded the scholarship that is not longer than one-side of A4/US letter. Applicants must be registered at a degree awarding institution, correspond from an academic email address and provide confirmation of their status from an academic advisor.

Cancellations

All requests for cancellations are must be sent to Karen Thierfelder (karen@cgemod.org.uk). An 80% refund of payments for courses, in GBP after our bank and currency charges but excluding the recipients bank fees, will be available for all cancellations received more than 10 working days before the start of the course. A 50% refund of payments, in GBP after our bank and currency charges but excluding the recipients bank fees, will be available for all cancellations received more than 5 working days before the start of the course.

Further Information and registration

For further information and registration please contact Professor Karen Thierfelder
Email: karen@cgemod.org.uk

Intermediate CGE (Online) Course

Outline

Module O7: SMOD_int CGE Model: Theory

	Topic	Tasks	Exercises
O7:1	Intro to SMOD_int	Review the model and note the extensions to SMOD_on used in the Practical CGE modelling course	Exercise 1: Model set up and calibration
O7:2	Prices and accounting relationships	Understand the relationship between information in the SAM and prices in the model.	Calculating prices & accounting matrices for AFR (Deliverable O7.1)
O7:3	Tax relationships	Code trade lib. simulations; Loop over sim; use SeeResults to access results.	Exercise 2: Trade Policy, *Ad Valorem* Tariff Changes
O7:4	Tariff changes	Review Excel files needed to use SeeResults	Exercise 3: Accessing Model Results using SeeResults
O7:5	Tariff changes & tax replacement	Code alternative macroeconomic closures; loop over sim, clos, and elas	Exercise 4 & 5: Trade Policy: and Tax Replacement & Sensitivity Analysis
O7:6	Production tax changes	Code alternative factor market clearing behaviour; loop over sim, clos, elas	Exercise 6 & 7: Factor Input Subsidies: Market Clearing & Elasticities Analyses of input subsidies and unemployment (Deliverable O7.2)

Readings:

Robinson, S., Yunez-Naude, A., Hinojosa-Ojeda, R., Lewis, J.D. and Devarajan, S., (1999). 'From Stylised to Applied Models: Building Multisector CGE Models for Policy Analysis', *North America Journal of Economics and Finance*, Vol 10, pp 5-38

Stone, R. (1954). "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand," *Johansen's legacy to CGE modelling: Originator and guiding light for 50 years* 64(255): 511-527.

Dixon, P. and Rimmer, M. (2016). "Johansen's legacy to CGE modelling: Originator and guiding light for 50 years," *Journal of Policy Modeling*, 38(3): 421- 435.

Module O8: STAGE_int CGE Model: Exercises

	Topic	Tasks	Exercises
O8:1	Introduction to the STAGE_int model	Understanding the features of the stg_int model	No computer exercises
O8:2	Setting up & checking the STAGE_int model	Understanding the structure of, and data used in, stg_int model	Loading data, calibrating and checking the stg_int model
O8:3	Policy experiment in STAGE_int	Other Features of the stg_int model	Coding and analysing a simple policy experiment using SeeResults
O8:4	Additional options in STAGE_int	Customising the stg_int model	Running experiments with different model configurations
O8:5	Save and Restart	Implement experiments using Save and Restart	Comparing results with different methods for running experiments

Readings:

Go, D., Korman, V., Robinson, S., and Thierfelder, K. (2010). "Wage Subsidy and Labour Market Flexibility in South Africa," Journal of Development Studies 46(9): 1481-1502.

Robinson, Sherman (2006). Macro Models and Multipliers: leontief, Stone, Keynes, and CGE Models. In Alain de Janvry and Ravi Kanbur, eds., Poverty, Inequality and Development: Essays in Honor of Erik Thorbecke, New York: Springer Science. 205-232.

Lofgren, Hans (1994). "A Brief Survey of Elasticity Values for CGE Models," mimeo, presented to the Ford Foundation.

Module O9: Interpreting Model (STAGE_int) Results: Exercises

	Topic	Tasks	Exercises
O9:1	Analysing and reporting results	Appreciating the formulation and interpretation and presentation of policy experiments	No computer exercises
O9:2	Interpreting model results (I)	Trade liberalisation by RSA	Interpreting trade liberalisation experiments for RSA
O9:3	Interpreting model results (II)	Changes in World prices	Interpreting world price experiments for RSA

Readings:

Perroni C & Rutherford T (1995). Regular flexibility of nested CES functions. European Economic Review 39:335-343. Polenske KR (1970). An empirical test

Keller, WJ.(1976). "A nested CES-type utility function and its demand and price-index functions," *European Economic Review* 7(2): 175-186.

Module O10: Course Project

The objectives of the project are to develop your ability to (i) set up and implement policy experiments in a CGE model; and (ii) interpret the results of your policy experiments. There are five elements to the project; model recalibration, experiment programming, policy experiments and interpretation, sensitivity analyses and project report.

This part of the course not only synthesizes the coding skills you have developed in the previous exercises, it will help develop your ability to set up a database for a model. The emphasis is on interpreting results, particularly in the context of the structure of the economy. The policy simulations, closure assumptions and sensitivity analysis conducted are not prescribed. Instead, you must design the simulation to answer a policy question.

The database provided has databases for 10 countries

You are an economic consultant hired to analyse policy issues that are relevant and current to your chosen country. The final report will be a maximum of 10 pages.

	Topic	Tasks	Exercises
O10:1	STAGE_int project	The project aims are 1. set up and implement policy experiments in the stg_int CGE model; 2. interpret the results of your policy experiments	There are seven elements to the project; 1. choose country, write-up the 'backstory' 2. Setup the model's Excel database 3. model recalibration and testing; 4. experiment programming; 5. policy experiments and interpretation; 6. sensitivity analyses; and 7. project report

Readings:

Devarajan S., and Robinson, S. (2005). "The Influence of Computable General Equilibrium Models on Policy," in Kehoe, T., Srinivasan, T., and Whalley, J. (eds) *Frontiers in Applied General Equilibrium Modeling*, Cambridge University Press.

Devarajan S., and Robinson, S. (2013). "Contribution of Computable General Equilibrium Modeling to Policy Formulation in Developing Countries," in Dixon, P. and Jorgenson, D. (eds) *Handbook of Computable General Equilibrium Modeling,Vol 1A,* North Holland Press.