HO-450: Model-based Macroeconomics

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Objectives:

At the end of the course, the participant is expected (i) to understand the main concepts involving DSGE and ABM macroeconomic models, as well their limitations/advantages, (ii) to have a general perspective on the current literature of the field, and (iii) to master (at a basic level) the required computational tools to explore such models.

Subject:

The course introduces and discusses the application of recent modelling methodologies in macroeconomics, namely dynamic stochastic general equilibrium (DSGE), and agent-based (ABM) families of models. The course is focused in the latter family of models while still offering a comprehensive, hands-on introduction to the former one. The two methodologies are presented in both theoretical and applied (lab) perspectives.

DSGE models are the current state-of-the-art of the long tradition in modelling under the general equilibrium framework and based on the neoclassical microeconomic principles. The microfoundation of the DSGE approach gained much attention as an answer to the Lucas critique. Considering the complexity of solving and analyzing DSGE models, computer-based dynamic analysis tools are frequently employed.

ABM models are a recent stream of research especially taking into account that the recent crisis has showed the problems of standard macroeconomics grounded on representative-agent, optimizing DSGE models. It is based on sound evolutionary micro-foundations that consider both agents' heterogeneity and interactions, leading to history-oriented models that are close in the spirit to the (genuine) Keynesian and Schumpeterian traditions. Agent-based models are based on contemporary computing ideas and technologies. They are employed to build models that are closer to real economies by employing software elements to represent (potentially) heterogeneous individual economic agents with chosen degrees of cognition. Agents are modeled based on behavioral rules that shape their decisions and direct their local interactions with other agents. The models are run over time in the micro-level to allow for the emergence of structures at the macro level as aggregate properties, in a (potentially) far-from-equilibrium setup. ABMs are an alternative to DSGE models for both research and policy applications, addressing several of the limitations presented by the latter.

Target audience and prerequisites:

Typical participants are doctoral/PhD and advanced mestrado/masters students in Economics and other professionals in the macroeconomics field.

Undergraduate micro/macroeconomics is a prerequisite. Graduate micro/macroeconomics and knowledge of and/or familiarity with computational analysis tools are useful but not required.

Time allocation and organization:

The course is full-time with __ hours allocated (__ créditos). Course time is distributed among lectures, laboratory training and students group activities and will be conducted in English and Portuguese.

The course is organized in two parts. The first part provides an overview of the state-of-the-art of the neoclassical macro models, in particular the DSGE formalism. The theoretical and empirical foundations of DSGE models will be reviewed, as well as the techniques employed for their solution, estimation and simulation. The second part reviews the methodological basis of macro ABMs and presents a selection of relevant models in the literature. Additionally, each part offers to the students an introduction to the computational tools used to create and analyze macro DSGE and ABM models in the computer lab. Some simple applications of the three approaches will be presented and applied by the students, by means of tools like Dynare/Matlab and LSD/R.

Registration:

All interested students **must pre-register** by e-mail to posgrad@eco.unicamp.br (Secretaria de Pós-Graduação, Instituto de Economia) **until Dec. 15th 2019**. UNICAMP regular students should *also* register at DAC as usual (Curso de Verão). All registered participants will apply for a course certificate. The course is free of charges.

Due to the lab size, a limited number of students can be accepted. Students not requiring full-time allocation/equivalence (créditos) may participate in just one of the two parts of the course if there are places available after regular (full-time) student registration.

Program:

Part I. Introduction to the DSGE modeling methodology (2 days)

Introduction and motivation: basic elements of DSGE models

The basic New-Keynesian (sticky-prices) model

Costa Junior 2016

Gali 2008

LAB: Exploring step-by-step the basic NK model

Adding the government and a external sector to the NK model

Costa Junior 2016

Schmidt and Wieland 2012

LAB: Exploring the extended NK model

Part II. Macroeconomic ABM methodology (4 days)

The limits of DSGE models

Haldane and Turrell 2017

Agent-Based Computational Economics

LeBaron and Tesfatsion 2008

Pyka e Fagiolo 2007

Macroeconomic policies in agent-based models

Fagiolo and Roventini 2016

LAB: Agent-based hands-on introduction: Sugarscape

Epstein and Axtell 1996

LAB: Agent-based modelling tools and LSD

Valente and Andersen 2002

Endogenous growth (the Island Model)

Fagiolo and Dosi 2003

Fagiolo et al., 2017

Macroeconomic fluctuations

Guerini, Napoletano and Roventini 2016

LAB: Exploring sample LSD models: configuration and analysis

Arthur 1989

Nelson and Winter 1982

The Keynes Meets Schumpeter (K+S) model: exploring the effects of different ensembles of innovation, industrial, fiscal and monetary policies and the role of expectations

Dosi et al. 2013, 2015, 2016a, 2016b, 2017a

LAB: Exploring the K+S model in LSD

Dosi et al. 2010

Climate change, energy and environmental policies

Lamperti et al., 2017

Endogenous growth and economic divergence

Dosi et al. 1994, Dosi et al. 2017b

Macroprudential and monetary policies interactions

Popoyan, Napoletano and Roventini 2017

LAB: Extending the K+S model: adding a decentralized labor market

Dosi et al. 2016

References:

Part I

Costa Junior, C. J. (2016).“Understanding DSGE models”. Malaga: Vernon Press.

Gali, J. (2008). “Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework”. PUP, 2008.

Lim, G. C., & McNelis, P. D. (2008). “Computational Macroeconomics for The Open Economy”. Cambridge: The MIT Press.

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Part II

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Dosi, G., Fagiolo, G. and Roventini, A. (2010), “Schumpeter Meeting Keynes: A Policy-Friendly Model of Endogenous Growth and Business Cycles”, Journal of Economic Dynamics and Control, 34:1748-1767

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Dosi, G., Fagiolo, G., Napoletano, M., Roventini, A. and Treibich, T. (2016a), “The Short- and Long-Run Damages of Fiscal Austerity: Keynes beyond Schumpeter”, in Stiglitz J. And Guzman M. (eds.), Contemporary Issues in Macroeconomics, Palgrave Macmillan

Dosi, G., Fagiolo, G., Napoletano, M., Roventini, A. and Treibich, T. (2016b), "Micro and macro policies in the Keynes+Schumpeter evolutionary models", Journal of Evolutionary Economics, DOI 10.1007/s00191-016-0466-4

Dosi, G., Pereira, M. C., Roventini, A. and Virgilito, M. E. (2016), "When more flexibility yields more fragility: searching for the microfoundations of Keynesian aggregate unemployment and fluctuations", LEM Working Paper Series 2016/12, Laboratory of Economics and Management (LEM), Scuola Superiore Sant'Anna, Pisa, Italy (http://www.lem.sssup.it/WPLem/files/2016-12.pdf)

Dosi, G., Fagiolo, G., Napoletano, M., Roventini, A., Stiglitz, J., and Treibich, T. (2017a), "Rational Heuristics? Expectations and Behaviors in Evolving Economies with Heterogeneous Interacting Agents", LEM Working Paper Series 2017/31, Laboratory of Economics and Management (LEM), Scuola Superiore Sant'Anna, Pisa, Italy (http://www.lem.sssup.it/WPLem/files/2017-31.pdf)

Dosi, G., and Roventini, A., and Russo, E. (2017b), "Endogenous growth and global divergence in a multi-country agent-based model", LEM Working Paper Series 2017/32, Laboratory of Economics and Management (LEM), Scuola Superiore Sant'Anna, Pisa, Italy (http://www.lem.sssup.it/WPLem/files/2017-32.pdf)

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Fagiolo, G., Giachini, D. and Roventini A., (2017), "Innovation, Finance, and Economic Growth: An Agent-Based Approach", Working paper series 2017/30, Laboratory of Economics and Management (LEM), Scuola Superiore Sant'Anna, Pisa, Italy (http://www.lem.sssup.it/WPLem/files/2017-30.pdf)

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Haldane, A. G., Turrell, A. E. (2017), "An interdisciplinary model for macroeconomics", Bank of England, Staff Working Paper 696 (https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/an-interdisciplinary-model-for-macroeconomics.pdf)

Lamperti F., Dosi G., Napoletano M., Roventini A., Sapio S. (2017), "Faraway, so close: an agent-based model for climate, energy and macroeconomic policies", Working paper series 2017/12, Laboratory of Economics and Management (LEM), Scuola Superiore Sant'Anna, Pisa, Italy

LeBaron, B. and Tesfatsion, L. (2008), "Modeling Macroeconomies as Open-Ended Dynamic Systems of Interacting Agents", American Economic Review, 98:246-250

Popoyan L., Napoletano, M., and Roventini, A. (2017), “Taming Macroeconomic Instability: Monetary and Macro-Prudential Policy Interactions in an Agent-based model”, Journal of Economic Behavior & Organization, vol. 134, pp. 117-140.

Pyka, A. and Fagiolo, G. (2007), “Agent-Based Modelling: A Methodology for Neo-Schumpeterian Economics”, in H. Hanusch and A. Pyka, (eds.), The Elgar Companion to Neo-Schumpeterian Economics, E. Elgar

Valente, M.; Andersen, E. S. (2002) “A Hands-on Approach to Evolutionary Simulation: Nelson and Winter Models in the Laboratory for Simulation Development”, Electronic Journal of Evolutionary Modeling and Economic Dynamics, 1003 (http://www.business.auc.dk/evolution/esapapers/esa99/NelwinSim.pdf).