

Experimental Macro Economics and Agent-Based Modeling.

Proposed Syllabus.

Lecturer: Domenico Massaro

1 Introduction

The course will achieve three main goals:

- to provide technical and conceptual knowledge needed to understand and build a Macro Agent-Based Model (MABM)
- to provide theoretical and computational tools to model expectations and learning in macroeconomics
- to provide the basic tools to read and understand economic experiments with a particular focus on macroeconomic experiments

The three objectives described above have in common two important features when building macroeconomic models, namely *bounded rationality* and *interaction* among agents populating the economic system. Both characteristics can have important consequences on the aggregate behavior of the system, such as the emergence of an endogenous business cycle or even the occurrence of a crisis. Hence, analyzing these endogenous mechanisms can improve the understanding of the economic system and possibly help the policy makers to prevent or mitigate the effects of a crisis.

In order to explicitly take into account bounded rationality and interaction, it is necessary to switch from the traditional analytical models to computational models. In fact, by means of agent-based modeling it is possible to take explicitly into account the individual decision process and agents' heterogeneity (in its different definitions).

Recent developments in modelling expectations have gone beyond rational expectations in specifying learning mechanisms which describe the evolution of expectation rules over time.

During the course, analytical and computational techniques to study learning dynamics and their impact on macroeconomic fluctuations will be analyzed. Moreover more discipline at the micro level (when defining individual behavior) can be provided through the analysis of agents' decision processes in the experimental lab. Thus some literature in experimental macroeconomics will be described during the lectures series in the attempt to make the students aware of its strong links and usefulness when building a MABM.

2 The Syllabus

We propose the following series of lectures:

- Lecture 1** Introduction to the course. Explain agent-based modeling methodology. Why are agent-based models important to describe macroeconomic systems. Preliminary links to learning models (Lecture 2) and experimental economics (Lecture 3). Overview of the literature on agent-based modeling (Assenza et al. (2014) Dosi et al. (2013), Catullo et al. (2014)).(3 hours - Tiziana Assenza)
- Lecture 2** Learning and expectations in macroeconomics. Theory and applications. (3 hours - Jakob Grazzini and Domenico Massaro) (Evans and Honkapohja (2001), Evans et al. (2008)), Bullard and Mitra (2002)
- Lecture 3** Macro Experimental Economics. Methodology overview and few important results (3 hours - Domenico Massaro) (Assenza et al. (2011), Hommes et al. (2005), Hommes et al. (2015b), Hommes et al. (2015a))
- Lecture 4** Experimental Demo. Set the students in the experimental lab and let them play as subjects. Explain to the students the results of the experiments. Explain the consequences of bounded rationality on the behavior of a macroeconomic system (3 hours - Tiziana Assenza and Domenico Massaro)
- Lecture 5** "Matlab for ABM" laboratory. Introduction to the use of Matlab for the construction of agent-based models. (3 hours - Jakob Grazzini).

The total amount of hours needed for the course is 15.

References

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- CATULLO, E., M. GALLEGATI, AND A. PALESTRINI (2014): “Towards a Credit Network Based Early Warning Indicator for Crises,” *Journal of Economic Dynamics and Control*, 37, 1598 – 1625.
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- EVANS, G. W. AND S. HONKAPOHJA (2001): *Learning and Expectations in Macroeconomics*, Princeton University Press.
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- HOMMES, C., D. MASSARO, AND M. WEBER (2015b): “Monetary Policy under Behavioral Expectations: Theory and Experiment,” Tinbergen Institute Discussion Papers 15-087/II, Tinbergen Institute.
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