Reading Group in *Advanced Macroeconomics*. Module on
Behavioral and Experimental Macroeconomics
(Domenico Massaro)

Objective of the module

Modern macroeconomic theory builds upon dynamic stochastic general equilibrium models. Agents in these models make decisions in dynamic and uncertain environments. Standard examples include households' intertemporal consumption/saving decisions and firms' pricing decisions in the presence of nominal rigidities. Agents are thus confronted with two related but conceptually distinct issues: *i)* how to make decisions given available forecasts of future macroeconomic conditions *ii)* how to make forecasts of future macroeconomic conditions given available information.

According to the Rational Expectations (RE) hypothesis, individual decisions are the outcome of maximization of an objective function (e.g. utility or profits) conditional on expectations, while expectations are assumed to be model-consistent. The RE approach has the advantage of imposing strong discipline on individual behavior and minimizing the number of free parameters to explain data. On the other hand the RE hypothesis has been criticized on the ground that it rests on unrealistic assumptions about agents' computational abilities and knowledge of the economy.

The objective of the course is to explore possible departures from the RE paradigm proposed in the macroeconomic literature and their implications for policy analysis. In particular, the course will retain the hypothesis of optimizing behavior but will consider models where agents' perceived law of motion may deviate from the actual law of motion of the economy. Within the context of these models, a key question will be whether convergence to a RE equilibrium can be obtained through some learning process and how such convergence depends on implemented policy measures.

Structure of the module

In the first part of the course I will overview alternative approaches to modeling expectation formation of economic agents proposed in the learning literature and present technical tools needed to analyze such models. A tentative outline of these lectures is the following:

- Perfect vs. bounded rationality
- Adaptive learning, recursive least-squares and the E-stability principle
- Misspecified perceived law of motion and behavioral learning equilibria
- Heterogeneous expectations and reinforcement learning
- Laboratory experiments

The second part of the course will be devoted to students' presentations of scientific papers related to the topics discussed in the first part of the course.

Exam

The evaluation of the students'performance will be carried out by grading referee reports on papers in the reading list below; replication of results; devising experiments and the like.

Expected learning outcomes

At the end of the course students will acquire knowledge of a wide range of behavioral models of expectation formation. The course will also provide students with the technical skills needed to

carry out policy analysis in economic frameworks featuring departures from the RE hypothesis. Moreover, students will gain understanding on how to use experimental methods as test bed for policy. Finally, students will be able to carry out empirical validation of theoretical learning models by means of aggregate time series, survey and experimental data.

Reading list

Branch, W. (2004): The Theory of Rationally Heterogeneous Expectations: Evidence from Survey Data on Inflation Expectations. *The Economic Journal*, 114, 592-621.

Branch, W. and B. McGough (2010): Dynamic Predictor Selection in a New Keynesian Model with Heterogeneous Expectations. *Journal of Economic Dynamics and Control*, 34(8), 1492-1504.

Brock, W. A. and C. Hommes (1997): A rational route to randomness. *Econometrica*, 65, 1059-1095.

Bullard, J. and K. Mitra (2002): Learning about monetary policy rules. *Journal of Monetary Economics*, 49, 1105-1129.

Cornea-Madeira, A., C. Hommes, and D. Massaro (2019): Behavioral heterogeneity in U.S. inflation dynamics. *Journal of Business & Economic Statistics*, 37, 288-300.

Duffy J. and F. Heinemann (2021): Central bank reputation, cheap talk and transparency as substitutes for commitment: Experimental evidence. *Journal of Monetary Economics*, 117, 887-903.

Eusepi, S. and B. Preston (2011): Expectations, learning, and business cycle fluctuations. *American Economic Review*, 101, 2844–72.

Evans, G. W., E. Guse, and S. Honkapohja (2008): Liquidity traps, learning and stagnation. *European Economic Review*, 52, 1438-1463.

Evans, G. W. and S. Honkapohja (2001): Learning and Expectations in Macroeconomics. Princeton University Press.

Gabaix X. (2020): A Behavioral New Keynesian Model. *American Economic Review*, 110(8), 2271-2327.

García-Schmidt, M. and M. Woodford (2019): Are Low Interest Rates Deflationary? A Paradox of Perfect-Foresight Analysis. *American Economic Review*, 109 (1): 86-120.

Hommes, C. (2013): Behavioral rationality and heterogeneous expectations in complex economic systems. Cambridge University Press.

Hommes, C. and J. Lustenhouwer (2019): Inflation targeting and liquidity traps under endogenous credibility. *Journal of Monetary Economics*, 107, 48-62.

Hommes, C., D. Massaro and I. Salle (2019): Monetary and Fiscal Policy Design at the Zero Lower Bound - Evidence from the Lab. *Economic Inquiry*, 57, 1120 - 1140.

Hommes, C., D. Massaro and M. Weber (2019): Monetary Policy under Behavioural Expectations: Theory and Experiment, *European Economic Review*, 118, 193-212.

Hommes, C. and M. Zhu (2014): Behavioral learning equilibria. *Journal of Economic Theory*, 150, 778-814.

Kryvtsov, O. and L. Petersen (2021): Central Bank Communication that Works: Lessons from Lab Experiments. *Journal of Monetary Economics* (forthcoming).

Marcet, A and J. P. Nicolini (2003): Recurrent Hyperinflations and Learning. *American Economic Review*, 93, 1476-1498.

Milani, F. (2007): Expectations, learning and macroeconomic persistence. *Journal of Monetary Economics*, 54, 2065-2082.

Pfajfar, D. and B. Zakelj (2018): Inflation expectations and monetary policy design: Evidence from the laboratory. *Macroeconomic Dynamics*, 22, 1035-1075.