

Summer School on Heterogeneous Agents in Macro Models

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Description

This course teaches state-of-the-art techniques to solve and analyze dynamic stochastic general equilibrium (DSGE) models with heterogeneous agents. After a short refresher on solution methods for representative agent models (such as perturbation and projection), the course provides students with an understanding of (i) workhorse algorithms to solve models with heterogeneous agents with(out) aggregate uncertainty (such as the Krusell-Smith algorithm), (ii) different simulation methods and accuracy tests, (iii) alternative solution algorithms (such as Reiter's hybrid method) and (iv) an introduction into continuous time models and their solutions.

Throughout the course, students will learn how to implement the covered material in practice using Matlab and Dynare (where possible).

Suggested reading

Den Haan, W. (2008). "Comparison of Solutions to the Incomplete Markets Model with Aggregate Uncertainty", *Journal of Economic Dynamics and Control*, 34 (1).

Judd, K. (1998). "Numerical Methods in Economics", The MIT Press.

Krusell, P. and A. Smith (1998). "Income and Wealth Heterogeneity in the Macroeconomy", *Journal of Political Economy*, 106 (5).

Reiter, M. (2009). "Solving Heterogeneous-Agent Models by Projection and Perturbation", *Journal of Economic Dynamics and Control*, 33 (3).

Sedláček, P. and V. Sterk (2017). "Growth Potential of Startups over the Business Cycle", *American Economic Review*, 107 (10).

Winberry, T. (forthcoming). "A Toolbox for Solving and Estimating Heterogeneous Agent Macro Models", *Quantitative economics*.

Lecture notes of e.g. Den Haan, Kopecky, Mukoyama

Day 1 – Introduction and Aiyagari model

Lecture

- Introduction
- Quick refresher of basic solution techniques (perturbation and Dynare, projection and PEA)
- Solving the Aiyagari model – workhorse heterogeneous agent model WITHOUT aggregate risk

Assignment

- Solve Aiyagari model using Dynare
 - Using penalty function and the bi-section method

Day 2 – Krusell-Smith algorithm

Lecture

- Krusell-Smith economy – workhorse heterogeneous agent model WITH aggregate risk
- Solving the individual's problem
- Approximating (time-varying) distributions
 - The aggregate law of motion

Assignment

- Solve Krusell-Smith economy using Dynare
 - Using stochastic simulation

Day 3 – Krusell-Smith continued and Alternatives

Lecture

- Practical issues in Krusell-Smith algorithm
 - Alternative simulation methods
 - Convergence and accuracy tests
- Introduction into alternatives to Krusell-Smith
 - Explicit aggregation
 - Hybrid methods

Day 4 – Explicit aggregate and hybrid methods

Lecture

- Explicit aggregation
- Hybrid methods:
 - Parametrizing distributions of microeconomic agents
 - Perturbation and aggregate distribution dynamics
- Solving heterogeneous agent models in Dynare

Assignment

- Solve model with ex-ante heterogeneous firms using Dynare

Day 5 – Continuous time

Lecture

- Introduction
- Basic concepts and models
 - Solow growth model
 - Search and matching model
- Basic solution methods
- Extending to models with heterogeneous agents

Assignment

- Solve Solow growth model in continuous time