Hands-On Heterogeneous Agent Macroeconomics

Using the Econ-ARK/HARK Toolkit

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Because Representative Agent ('RA') models were not useful for understanding much of what happened in the Great Recession, policymakers including Larry Summers (2011), Fed Chair Janet Yellen (2016), former IMF Chief Economist Olivier Blanchard (2016), ECB Governing Board Member Benoit Coeure (2013), and Bank of England Chief Economist Andy Haldane (2016) have suggested that incorporation of heterogeneity (for example, across borrowers and lenders) must be an essential part of the agenda in developing new and better models. In confirmation of that intuition, a number of recent papers, most notably Kaplan, Moll, and Violante (2018) and Krueger, Mitman, and Perri (2016), have developed models that include a realistic description of microeconomic heterogeneity, and have shown that such models can generate more sensible macroeconomic implications than RA models for important questions like the operation of fiscal and monetary policy.

The aim of this course is to provide a hands-on introduction to the construction of models with 'serious' heterogeneity (that is, heterogeneity that matches the microeconomic facts that theory suggests *should* matter for macroeconomic outcomes like consumption dynamics); why such heterogeneous agent ('HA') models have implications different from those of RA models; and how existing HA models can be adapted to new questions. ('Hands-On' means that students with their own laptops will run the and experiment with the code that solves these models in class.)

The course will have two main components: Lectures explaining the conceptual foundations of the models work; and hands-on demonstrations of live working versions of such models using the open-source Econ-ARK/HARK toolkit.

Students should bring a laptop on which they have permissions to install and run new software. Prior to class, on a laptop that they should bring to class, students should have installed the anaconda3 stack, which is a distribution of python 3 that includes a robust set of extra tools that are useful for doing computational work. A good guide to installing anaconda is here.

1 Motivation and Preliminaries

Day 1
Lect 1
mins 30

1.1 Motivation

The introduction and conclusion to Ahn, Kaplan, Moll, Winberry, and Wolf (2017)'s NBER Macro Annual paper provides a compact and well written discussion of the state and progress of HA macro.

This discussion of that paper puts the relationship of HA to RA models in context.

Notes:

NBER-Macro-Annual-Heterogeneity-Discuss

Readings:

* Ahn, Kaplan, Moll, Winberry, and Wolf (2017), Introduction, Conclusion
* Carroll and Crawley (2017), Sections 1, 2, and 4

1.2 Micro Consumption Theory Refresher

Day 1
Lect 2
mins 60

1.2.1 The Infinite Horizon Perfect Foresight Model

Notes:

- Consumption Under Perfect Foresight and CRRA Utility

1.2.2 Consumption With Labor Income Uncertainty

- Notebook: Theoretical Foundations of Buffer Stock Saving

1.2.3 The Special Case of Rate-Of-Return Uncertainty

Notes: Consumption out of Risky Assets
Origins: Merton (1969), Samuelson (1969)

2 Computational Tools

2.1 Vision for the Econ-ARK Project

- Intro-To-Econ-ARK

3 Hands-On Introduction

Day 1
Lect 3
mins 30

Here we will explain how to begin using the Econ-ARK toolkit for heterogeneous agent macro modeling, and will guide students through the use of the toolkit to solve increasingly sophisticated models, starting with partial equilibrium perfect foresight models and ending with some exercises using a full general equilibrium micro-macro model with idiosyncratic and aggregate risks.

Day 2
Lect 1
mins 60

3.1 A Gentle Introduction

Notebook: A Gentle Introduction to HARK

3.1.1 Perfect Foresight

3.1.2 Adding 'Serious' Income Uncertainty

References

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