Dates. Tuesday and Friday 13:30 to 15:45. Final Exam: TBA.

Objective. The objective of the course is to introduce the modeling of heterogeneous agents economies, learn about economies with incomplete markets, and search and matching frictions. In the first part of the course, the student will familiarize with the modern quantitative techniques used in macroeconomics, and will be exposed to important research questions in macroeconomics. In addition, the course will review some of the numerical methods used to solve heterogeneous agents economies with incomplete markets.

A cornerstone to the theory of incomplete markets is uninsurable (income) risk which households face. In the second part of the course, students will familiarize with recent approaches that infer the size and structure of this risk from micro-data. The course covers both reduced form and structural approaches. Arguably, labor income risk is the largest risk households face over their life-cycle. Therefore, the course puts particular emphasize on structural approaches which explicitly model the search friction household face in the labor market. This friction implies deviations from the Walrasian equilibrium which allows us to address issues like unemployment risk, and wage inequality.

Requirements. The course requires some basic knowledge of: (1) dynamic programming, (2) measure theory, and (3) Markov chains. There are several references to refresh the basics of dynamic programming: a simple one is Chapter 3 in Ljungqvist and Sargent (2004) but the most complete source is Stokey, Lucas, and Prescott (1989). Its first chapter is a very easy help. For measure theory you can check Stokey, Lucas, and Prescott (1989, chapter 7) For Markov chains, a good reference is Ljungqvist and Sargent (2004, chapter 2). A very comprehensive treatment can be found in Stokey, Lucas, and Prescott (1989, chapter 8).

For the second part of the course, students are expected to have basic knowledge of search theory. This includes dynamic programming in continuous time. Ljungqvist and Sargent (2000), Chapters 6.1-6.4 and 26.1-26.5 provide a nice introduction with discrete time. Pissarides (2000), Mortensen and Pissarides (1999a); and Mortensen and Pissarides (1999b) provide additional
insights. Rogerson, Shimer, and Wright (2005) is an extensive survey of search frameworks which go beyond the framework we cover in this course. Additionally, they provide a nice comparison between discrete and continuous time within a simple framework. Students should also have basic knowledge in econometrics about maximum likelihood estimation and identification strategies.

**Homework.** Some of the homework will be computer based. It is recommended you do the computer-based problem sets in pairs. Please, submit just one copy per group.

**Grading.** The final grade on the course will be based on:

1. Homework assignments (40%).
2. A final exam (60%).

**Part I. The neoclassical growth model with heterogeneous agents.**

1. Introduction

2. Theoretical Framework

   - The neoclassical stochastic growth model: recursive formulation.
     Brock and Mirman (1972) and Stokey, Lucas, and Prescott (1989, chapter 1).
   - Stylized facts on inequality.
   - The heterogeneous agents model in steady state.

3. Data

   - The importance of uninsurable idiosyncratic shocks and precautionary savings.
     Storesletten, Telmer, and Yaron (2004a) and Kaplan and Violante (2009).
   - Accounting for the wealth distribution.

**Part II. Numerical methods applied to heterogeneous agents economies.**

1. Introduction: basic concepts on numerical solutions.

2. Solving the household problem
• Value function iteration: discretization.
• Policy function iteration.

3. Finding the steady state equilibrium.
   Aiyagari (1994) and Ríos-Rull (1998)

4. Accuracy.
   Judd (1992)

**Part III. Precautionary Savings Motive and Social Security Reform.**


**Part IV. Size and Structure of Income Risk.**

1. Search frictions, data and theory:
   Topel and Ward (1992), Hornstein, Krusell, and Violante (2012), Burdett, Carrillo-Tudela, and Coles (2011)

2. Measuring the search friction in the data:

3. Reduced form estimation of earnings risk:

4. Structure of Income Risk:
References


