

*Updated: August 9, 2016*

## Contact Info

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## Overview

The main goal for this half of the class is to learn some of the theoretical tools used by macroeconomists with particular focus on choices under uncertainty and risk sharing arrangements under complete markets. We will use the tools to develop an understanding of the stochastic neoclassical growth model, which is one of the foundations of modern macroeconomics. We will then discuss departures from complete markets and their implications for individual consumption-savings behavior, aggregate savings, and inequality across households in terms of consumption and wealth.

## Meeting time and location

Location: KCB 103

Times: Monday and Wednesday 11:00 - 12:30

with TBA

Location: STH 113

Time: Friday 10:30 - 12:00

## Coursework and grading

Problem sets (20%), one final exam (80%). These grades will then be averaged with those of the first half of the course to determine the course grade.

**Problem sets** I plan to give you four problem sets, which will be due in class on the following days: 11/7, 11/21, 12/5, and 12/12. Problem sets may be done in groups, but everyone should actively work on them and write them up separately.

**Academic conduct** It is the student's responsibility to know and adhere to the [GRS academic conduct code](#) and cases of suspected academic misconduct will be referred to the Dean's Office.

**Disabilities** If you have a disability that requires extra time for assignments or any other accommodations, please bring a note from the Office of Disabilities Services.

## Course Website

Course materials, including notes and problem sets, will be available on the course website on [Blackboard](#).

## Readings and Books

Your goal should be to learn the tools not to master the literature and you should keep this in mind when you read. All of the readings are available on blackboard except for those listed as “further reading.” The most important books/manuscripts are

- Lecture notes written by Per Krusell, which are available on Blackboard.
- Manuscript by Dirk Krueger available on Blackboard.
- Introduction to Modern Economic Growth by Daron Acemoglu. If you wish to buy the Acemoglu book, you can find large discounts online [chapters 1, 2, and 5 are available as PDFs on the Princeton University Press [website](#)].
- Recursive Macroeconomic Theory by Lars Ljungqvist and Thomas Sargent (2004, second edition), which is on reserve at Mugar. [A third edition of this book was published recently, the same material can be found there, but with some change in chapter numbers as noted below.]

The items listed as “further reading” are resources in case you are particularly interested in a topic.

## Topics and readings

### 10/26 – The big picture and preliminaries

What is an economic model? What does it mean to “solve a model”? How do we use a model to understand the world? How does data inform our analysis? What is a state variable? What are recursive methods and why are they useful? What are we going from here?

\* Krueger chapter 2.

- Chapter 2 of Farmer, Roger. The Macroeconomics of Self-Fulfilling Prophecies. MIT Press, 1999.

*Some further reading on the guiding principles of economic theorizing:*

- Dekel, Eddie, and Barton L. Lipman. “How (not) to do decision theory.” *Annu. Rev. Econ.* 2.1 (2010): 257-282.
- Rodrik, Dani. Economics Rules: Why Economics Works, When it Fails, and How to Tell the Difference. Oxford University Press, Oxford, 2015.

### 10/31, 11/2, 11/7 – Competitive equilibrium under complete markets

Competitive equilibria (without then with uncertainty and risk), welfare theorems, risk sharing, asset pricing.

\* Chapter 8 (up through 8.9) in Recursive Macroeconomic Theory (2004) by Ljungqvist and Sargent.

- Krusell chapter 5
- Acemoglu chapter 5

*Further reading:*

- Debreu, Gerard. Theory of Value: An Axiomatic Analysis of Economic Equilibrium. Yale University Press, 1959.
- Mas-Colel, Andreu; Whinston, Michael D.; and Jerry R. Green. Microeconomic Theory. Chapters 15 and 16. Oxford University Press, 1995.

## 11/9, 11/14, 11/16 – Representative agent and stochastic neoclassical growth model

Until this point we have been explicit about the fact that the economy is populated by heterogeneous households who interact with one another in markets. We will discuss when and how we can analyze the economy as though it were populated by a single representative agent. We will then turn our attention to the stochastic neoclassical growth model. Nearly all analysis of business cycles builds on this model.

- \* Krueger chapter 3 (especially 3.3.4) and chapter 6 (especially 6.4)
- Krusell chapter 6 (especially 6.2.1 and 6.3.1)
- King, Robert G., and Sergio T. Rebelo. “Resuscitating Real Business Cycles.” *Handbook of Macroeconomics* 1 (1999): 927-1007.
- Cooley, Thomas F., and Edward C. Prescott. “Economic Growth and Business Cycles.” *Frontiers of Business Cycle Research* 39 (1995): 64.

## 11/21, 11/28 – Numerical analysis crash course

We started this part of the course asking what does it mean to solve a model? Our answer was that solving a model means finding a function or stochastic process that satisfies some conditions. But how do you do that? As we have seen, in very special cases we can do this analytically but in most cases there is no closed-form solution. Most macroeconomic models are analyzed numerically. We will discuss three general approaches for solving a wide range of macroeconomic models numerically and apply two of them to the stochastic growth model. In doing so we will also cover some foundations of numerical analysis answer the questions of how do you represent an unknown function on a computer and how do you take an expectation on a computer?

- Judd, Kenneth L. “Projection Methods for Solving Aggregate Growth Models.” *Journal of Economic Theory* 58.2 (1992): 410-452.

*Further reading:*

- Miranda, Mario J., and Paul L. Fackler. Applied Computational Economics and Finance. MIT press, 2004.

## 11/30, 12/5 – Relaxing the complete markets assumption

In the previous lectures we have made use of the complete markets assumption to simplify our analysis of the economy through a representative agent. You might be wondering whether this is realistic. Realism is not the right criterion—all models are necessarily simplified versions of reality. Nevertheless, it is indisputable that markets are not complete so a better question is how would our analysis differ if we made other assumptions about the market structure? This week we will discuss microeconomic consumption decisions and how uninsurable risk affects them. We will discuss empirical evidence on departures from perfect consumption smoothing.

- \* Jappelli, Tullio, and Luigi Pistaferri. “The Consumption Response to Income Changes.” *Annual Review in Economics* 2 (2010): 479-506.
- Deaton, Angus. “Saving and Liquidity Constraints.” *Econometrica* 59.5 (1991): 1221-1248.

*Further reading:*

- Carroll, Christopher D. “Buffer-Stock Saving and the Life Cycle/Permanent Income Hypothesis.” *The Quarterly journal of economics* 112.1 (1997): 1-55.

- Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. “Household expenditure and the income tax rebates of 2001.” *The American Economic Review* 96.5 (2006): 1589-1610.

## 12/7, 12/12 —Heterogeneous households

In the previous week’s lectures we discussed the partial-equilibrium consumption-savings behavior of an individual who faces a stochastic income stream and has no insurance as the only financial asset available is a risk-free bond. We will now consider a general equilibrium model populated by many such households all receiving their own idiosyncratic incomes. There are several important elements here: (i) we will see how market incompleteness affects the equilibrium level of savings, output, and interest rates, (ii) the model will be our first real theory of heterogeneous households and we will derive predictions for inequality in wealth and consumption, (iii) we will see another reason why recursive methods are useful in macroeconomics in particular we will specify an equilibrium in terms of a recursive competitive equilibrium and we will discuss why it is infeasible to use a sequential definition of an equilibrium in this setting.

- \* Aiyagari, S. R., 1994. “Uninsured Idiosyncratic Risk and Aggregate Saving.” *Quarterly Journal of Economics* 109 (3), 659-684.
- Heathcote, J., Storesletten, K., and Violante, G. (2009). “Quantitative Macroeconomics with Heterogeneous Households.” *Annual Review of Economics*, Vol. 1, 2009, 319-354.

*Further reading:*

- Chapters 16 and 17 (up through 17.6) in Recursive Macroeconomic Theory (2004) by Ljungqvist and Sargent. [In the third edition, these are chapters 17 and 18.]
- Huggett, Mark. “The Risk-Free Rate in Heterogeneous-Agent Incomplete-Insurance Economies.” *Journal of Economic Dynamics and Control* 17.5 (1993): 953-969.
- De Nardi, Mariacristina. “Wealth Inequality and Intergenerational Links.” *The Review of Economic Studies* 71.3 (2004): 743-768.