

Macroeconomics

411-1

Fall, 2021

Christiano

## Syllabus

### 1. General Information.

- Lectures: T-Th, 9-10:50AM, KGH 1410. Discussion section: Friday 11 - 12.50am, in the lecture room.
- My office number is KGH 3359; phone: 491-8231; email: l-christiano@northwestern.edu. Office hours by [zoom](#): Wednesday 3:30-5pm. You don't need to have specific questions in mind, to come to office hours. You can simply hangout. If, say, everyone comes to hangout then I'll just start stepping through the last two lectures and people can stop me when they see stuff they would like to see clarified.
- Teaching Assistant: Andrea Ferrara, zoom office hours, Thursday, 3:30-5:30pm (he will leave at 4:15pm if no one shows up until then); email, andreaferara2025@u.northwestern.edu.
- The grades will be determined as follows: homeworks, 10%; midterm, 40%; final, 50%. There will be weekly homework assignments. You are requested to work in teams of three or maybe four students on these problem sets, and only one answer should be submitted per group. Homeworks should be emailed to the TA by Wednesday, 5pm, in the week after they are assigned. The homeworks should be sent by pdf format.<sup>1</sup> The first assignment is due Wednesday, September 29 (questions 2.1, 2.2, 2.3, 3.9 in S-L).
- The midterm is on Thursday, November 4, in the lecture room. The [official date and time](#) of the final exam is December 6, 3-5pm, in the lecture room.
- Any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU (accessiblenu@northwestern.edu; 847-467-5530)

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<sup>1</sup>Three (of many) ways this can be done are: (i) typing the answers into a word processor and converting to pdf, (ii) writing by hand in a software like GoodNotes and converting that to pdf; or (iii) by writing by hand and converting that to pdf using your cell phone.

and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential.

- Please stick to the Covid rules so we all stay safe!

## 2. Goals.

Macroeconomics is about: (i) developing positive models that are helpful for understanding aggregate economic phenomena; and (ii) using these models to make judgements about whether markets generate an efficient allocation of resources and, if not, what policy interventions might improve things.

To address (i), we will begin by developing the basic building block of modern macroeconomics: the infinite lived, deterministic, homogeneous agent growth model. We will use the model to review basic concepts such as the efficient allocation of resources and the role markets may play as a device to help achieve the efficient allocations. In addition, we will use the model to illustrate the theoretical and computational advantages of formulating economic models in recursive form. One set of variations of this model will allow us to review aspects of the modern theory of growth. Other variations will allow us to review several approaches to the integration of financial frictions into macroeconomics.

- The textbooks for the course are S-L and L-S:

Nancy L. Stokey and Robert E. Lucas, Jr., with Edward C. Prescott, *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989 (S-L).

Ljungqvist and Sargent's, *Recursive Macroeconomic Theory*, 4rd Edition, MIT Press, 2018 (L-S).

- Additional reading materials will be made available on the course website.

## COURSE OUTLINE

The primary and related readings for each lecture are listed. In some cases I have indicated ‘extra readings’. These are not required for the course, but are for students that would like to dig deeper into a particular topic. The core material in the course is indicated by a ‘\*’. Web addresses for handouts are included in the pdf version of this document.

### 1. Basic concepts: equilibrium, efficient allocations, recursive formulation\*.

#### (a) Efficient Allocations.

- i. Sequence approach (S-L: pp. 8-13, sec. 4.5). Extra: see Christiano, Eichenbaum and Trabandt (2014) for a discussion of the [extended path](#) method, a more efficient way to do shooting, one that works when there is uncertainty. See [Kamihigashi \(2002\)](#) for a simple proof of the necessity of the transversality condition.
- ii. Functional equation approach (S-L; pp. 13-16, sec. 4.2, sec. 6.1).
- iii. Projection and perturbation. Here are some [notes](#), but they extend the method beyond what I do in the class room, to include uncertainty. A published paper that does the same thing, extending the perturbation method to uncertainty, can be found [here](#). The first person in economics to propose the perturbation method is, to my knowledge, Ken Judd’s 1999 [book](#). The first rigorous treatment of the differentiability of the policy function,  $g$ , appears to be Santos’ 1991 [Econometrica](#) paper.

#### (b) Equilibrium concepts (S-L: sec. 2.3; L-S: chap. 6, 7).

- i. Sequence concepts:
  - A. Date 0 Arrow-Debreu.
  - B. Sequence-of-Markets.
- ii. Recursive Competitive Equilibrium.

#### (c) Digging deeper into the concept of equilibrium.

- i. Complete/incomplete markets: perfect insurance (complete markets) in the ‘frictionless’ Arrow-Debreu model with perfect commitment and incomplete insurance in the presence of imperfect commitment (see [class handout\\*](#), Marcet and Marimon (1992, 1999) and Ljungqvist and Sargent (2018)).
  - ii. Equilibrium and rationality ([class handout\\*](#), section 2 of [this](#) paper and Chapter 8 of your Micro text by Mas-Colell, Whinston and Green, Microeconomic Theory).
  - iii. Multiple equilibria, Equilibrium Implementation and Rationalizability ([class handout\\*](#)).
  - iv. Equilibrium and learning (class notes and the basic text here is Evans & Honkapohja’s *Learning and Expectations in Macroeconomics* (Princeton University Press)).
  - v. Will probably survey, using very simple examples in a handout, material in [Angeletos and Sastry](#), [Garcia-Woodford](#) and [Fahri-Werning](#).
2. Growth Theory (L-S, chap11; Jones and Manuelli, 1997).
- (a) Exogenous growth models.
    - i. Growth generated by ‘disembodied’ technical change (S-L, sec. 5.4; related paper: Christiano (1989)).\*
    - ii. Growth generated by investment-specific technical change (Greenwood, Hercowitz and Krusell, 1997, Hornstein and Krusell, 1996).
  - (b) Endogenous growth models (will probably only do i and iii).
    - i. “Ak” models (Rebelo (1991), Jones-Manuelli, 1997).\*
    - ii. Learning-by-doing and learning-or-doing (S-L; sec. 5.7).
    - iii. Increasing variety and specialization ([Romer](#), 1987\*; extra reading: Matsuyama, 1999; [class notes](#) on Matsuyama).
  - (c) Reasons that growth might not happen, even if the technology is ‘right’ (i is very important).
    - i. The young might not be rich enough to buy an ever-growing stock of capital ([Jones](#)

[and Manuelli, 1997](#))\*.

A twist on this model provides a theory of perpetually increasing income inequality.

- ii. Extra reading: the politics of vested interests may get in the way of growth (Herrendorf and Teixeira, (2003), Parente and Prescott (1994, 1999), Krusell and Rios-Rull (1996)).

3. Business cycles (will do relatively little of this).

- (a) Business cycles driven by technology disturbances ('real business cycles') (Cooley and Prescott (1995); Prescott (1986); extra reading: Summers (1986)).
- (b) Business cycles driven by 'animal spirits'. These models complement the earlier discussion of equilibrium because they highlight the possibility that equilibrium might not be unique (see: Bryant (1981,1983); Christiano and Harrison (1999), [class notes on Christiano-Harrison](#); Shleifer (1983), [class notes on Shleifer](#); extra readings: Cass and Shell (1983); Cooper and John (1988); Diamond and Dybvig (1983); Diamond (1982); Farmer (1993); Farmer and Guo (1994,1995); Farmer and Woodford (1984); Gali (1994a,b); Krugman (1991); Woodford (1986,1991)).

4. Macroeconomics and financial frictions (here is some background (not required) material: [JEP, article](#).)

(a) Frictions in non-financial firms.

- i. A model with heterogeneous firms and households who have [Kiyotaki-Moore](#) type collateral constraints ([handout](#)\*). We will evaluate what happens to consumption, investment, output, interest rates and total factor productivity when there is 'deleveraging'. It will look surprisingly similar to what we saw after 2008 in the US. The lecture will summarize [Buera and Moll \(2015\)](#).
- ii. The macroeconomic implications of costly state verification and asymmetric information ([handout](#)\*, [code](#) for examples and [this](#) for much more detail). Readings: Bernanke, Gertler and Gilchrist, (1999); Bernanke and Gertler (1989), Christiano, Motto and Rostagno (2014) and Townsend (1979)).

(b) Frictions in the banking system (not sure if I'll do this).

- i. Running away model ([handout](#), [Gertler-Karadi \(2011\)](#), section 3 in [reading](#)).
- ii. Maturity mismatch ([handout](#), [Gertler-Kiyotaki \(2015\)](#), [Gertler-Kiyotaki-Prepitino \(2018\)](#))

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