

Macroeconomics I

Pau Roldan-Blanco

CEMFI, January-March, 2022

Syllabus

Latest update: March 3, 2022

Schedule. Tuesdays and Thursdays 9:30h-11:00h, and Thursdays 11:30h-13:00h.

Structure. The course is 10 weeks long, with three 90-minute sessions per week. We will normally have two sessions of theory and one session to go through your homework every week. The intention is for the two 9:30h-11:00h lectures to be theory sessions and the Thursday 11:30h-13:00h lecture to be a homework session, but there may be a few exceptions depending on course needs. For example, in week 1, all three sessions will be theory sessions.

Topics.

1. Neoclassical Growth
2. Endogenous Growth
3. Overlapping Generations
4. Firms
5. Consumption

Previous knowledge. The students are assumed to be familiarized with the basic concepts of macroeconomics. In this sense, material in Burda and Wyplosz (1997, chapters 1, 2 and 3) will be assumed as known. During the course we will meet systems of differential equations and dynamic optimization problems to be solved by use of optimal control theory. I will cover a quick review of this as part of Lecture 1, but if you need further information, the mathematical appendix in Barro and Sala-i-Martin (1999), as well as Acemoglu (2009, chapter 7 and Appendix B), are good references.

Homework. There will be 8 problem sets for you to work at home. Of those, 7 will be paper-and-pencil style and 1 will be computational. For the 7 paper-and-pencil problem sets, every student will have to submit their own solutions individually. The **hand-in time** is 9.30am on Thursdays (in class). Only a few exercises will count toward your homework grade. They will be marked with the word “graded” on the problem set itself. Failure to submit solutions to the “graded” exercises will penalize the homework grade. For the computational problem set, solutions will be submitted in teams of two, and it will be graded. We will discuss the solution to this problem set in week 4 (February 3rd, 2022).

Teaching Assistants. The TAs for the course are Tomás Budí-Ors (tomas.budi@cemfi.edu.es) and Yongkun Yin (yongkun.yin@cemfi.edu.es).

- Tomás will teach the practice sessions (Thursdays 11:30h-13:00h), where he will go over the solution to relevant exercises from the problem sets. You can also use this session to ask him questions that remain unresolved from the theory lectures.
- Yongkun will take care of collecting and grading the exercises marked as “graded” on each week’s problem set.

Exam. There will be a 3-hour final exam at the end of the course. The exam is scheduled for Wednesday, March 30th, 2022.

Grading. The final exam counts 85% of the final mark, homework grade counts 10%, and class participation counts 5%.

Contact. Feel free to contact me at any point during the course if you have questions or comments. You can either write me an email at pauroldanb@gmail.com, or drop by my office at CEMFI (Room 0.2, ground level).

Contents

Part I. Neoclassical Growth.

- **Duration:** 5 theory sessions and 3 homework sessions.
- **Program:**
 - Stylized Facts of Economic Growth
 - The Solow Model
 - The Ramsey Model
 - Growth and Development Accounting
- **References:** The class notes for *Solow* and *Ramsey* will follow Barro and Sala-i-Martin (1999, chapters 1 and 2) quite closely. For the *Solow Model*, additional references are Romer (1996, chapter 1) and Acemoglu (2009, chapter 2). For the *Ramsey Model*, additional references are Blanchard and Fischer (1991, chapter 2), Romer (1996, chapter 2) and Acemoglu (2009, chapter 8). For *Growth Accounting* you can have a look at Barro and Sala-i-Martin (1999, chapter 10) and for *Development Accounting* at Caselli (2005). The empirical performance of the Solow and Ramsey models is discussed in Acemoglu (2009, chapter 3) and Barro and Sala-i-Martin (1999, chapters 11 and 12). Several empirical facts discussed in class come from Jones (2015).

Part II. Endogenous Growth.

- **Duration:** 4 theory sessions and 1 homework session.
- **Program:**
 - The AK Model
 - Growth from Knowledge Externalities
 - Growth from Expanding Varieties
 - Schumpeterian Growth Models
 - Growth and Competition
- **References:** This part will track the development of endogenous growth theory in roughly chronological order, covering the most seminal papers along the way. The exposition will follow Barro and Sala-i-Martin (1999, chapters 4, 6 and 7) and Acemoglu (2009, chapters 11 through 15) closely. The basic model of growth with knowledge externalities is due to Romer (1986), and the foundational expanding-varieties growth model is due to Romer (1990). The first neo-Schumpeterian growth model with quality-ladder innovation is due to Aghion and Howitt (1992), and further developed by Grossman and Helpman (1991). At the end, we will study the relationship between growth and competition. The key empirical paper is Aghion, Bloom, Blundell, Griffith, and Howitt (2005), and the model of innovation and competition we will study is due to Akcigit and Ates (2021).

Part III. Overlapping Generations (OLG) Models.

- **Duration:** 3 theory sessions and 1 homework sessions.
- **Program:**
 - The Basic OLG Model
 - Optimality
 - Altruism
 - Social Security
- **References:** The class lectures will somewhat follow Blanchard and Fischer (1991, chapter 3), but with very different notation. You can also have a slightly different approach with good intuitions in Romer (1996, chapter 2) and a very formal (and short) exposition in Barro and Sala-i-Martin (1999, chapter 3).

Part IV. Firms.

- **Duration:** 4 theory sessions 1 homework session.
- **Program:**
 - Firm Heterogeneity
 - The q Theory of Investment
 - An Equilibrium Open Economy
- **References:** For the *Firm Heterogeneity* part, a very helpful survey is Hopenhayn (2014). The class set-up is based on Guner, Ventura, and Yi (2008). The basic model of the q Theory can be easily followed in Romer (1996, chapter 8), Acemoglu (2009, chapter 7) or in Adda and Cooper (2003, chapter 8). The *Open Economy* case follows Blanchard and Fischer (1991, chapter 2), although in the book they solve for the social planner problem. You can also look at Barro and Sala-i-Martin (1999, chapter 3).

Part V. Consumption.

- **Duration:** 4 theory sessions and 2 homework sessions.
- **Program:**
 - The Permanent Income Hypothesis
 - The Ricardian Equivalence
 - Uncertainty and the Random Walk Result
 - Uncertainty and Precautionary Savings
 - Life Cycle
 - Non-Separable Preferences
- **References:** A very good summary for the permanent income hypothesis and the uncertainty parts can be followed at Jappelli and Pistaferri (2010). We will discuss the empirical results in Hall (1978), Hansen and Singleton (1983), Mehra and Prescott (1985), and Attanasio and Weber (1993). The simple model to study precautionary savings is based on Barsky, Mankiw, and Zeldes (1986). For the Ricardian Equivalence part, Elmendorf and Mankiw (1999) and Ljungqvist and Sargent (2000, chapters 9 and 10) or Ljungqvist and Sargent (2004, chapters 10 and 13) contain textbook material. The main reference for the data in the life cycle part is Attanasio (1999) and the more recent Attanasio and Weber (2010). We also talk about some other papers, among them Gourinchas and Parker (2002). The Beckerian model of life cycle allocation of consumption and expenditure can be followed in Ghez and Becker (1975) and its empirical application in Aguiar and Hurst (2007).

Keywords.

Throughout the course, we will introduce a lot of terms, some of which may be new to you. Here is a list with the most important ones:

- **Part I:** Balanced Growth Path, Transitional Dynamics, Saddle-Path Stability, Speed of Convergence, Diminishing Returns to Capital Accumulation, Neoclassical Production Function, Golden Rule, Modified Golden Rule, Dynamic Inefficiency, First and Second Welfare Theorems.
- **Part II:** Learning-By-Doing, Externalities, Non-Rivalry, Non-Excludability, Knowledge Spillovers, Love-for-Variety, Expanding Varieties, Product Innovation, Increasing Returns to Scale, Patents, Creative Destruction, Quality Ladder, Business-Stealing Effect, Arrow Replacement Effect, Appropriability Effect, Step-by-Step Innovation, Technology Gaps.
- **Part III:** PAYG Social Security, Fully Funded Social Security.
- **Part IV:** Lucas Model of Self-Selection, Tobin's Q, Convex Adjustment Costs, Small Open Economy, Horioka-Feldstein Puzzle.
- **Part V:** Natural Borrowing Limit, Permanent Income Theory, Ricardian Equivalence, Certainty Equivalence, Precautionary Savings, Marginal Propensity to Consume, Excess Sensitivity Puzzle, Excess Smoothness Puzzle, Equity Premium Puzzle, Life Cycle.

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