

UNIVERSITY OF COLORADO BOULDER

Department of Economics

ECON7040: MACROECONOMIC THEORY II

Spring 2023

Instructor:	Alessandro Peri
Time:	TTH 12:30-1:45PM
Location:	CASE W313
Class Zoom link:	https://cuboulder.zoom.us/j/91761043063
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Office Hours:	ECON 112, Tuesday, 3:30-5pm
TA:	Jiyun Kim, Danielle Parks

COURSE DESCRIPTION

This course introduces the students to the study of modern macroeconomics theory. The course focuses on both the theoretical and numerical analysis of general equilibrium dynamic model, with a particular focus on the neoclassical growth model.

The course starts with the study of dynamic programming. This part of the course focuses on the theoretical features of dynamic models. In this context, we study in great details the first five chapters of *Recursive Methods in Economic Dynamics*, by Stokey, Lucas and Prescott. Over the course, we use dynamic programming to study the neoclassical growth model. When possible (not very often), we will learn how to find a solution by hand. When not possible, we will rely on numerical methods.

The second section of the course, introduces frictions in a standard Real Business Cycle model: nominal rigidities (New-Keynesian model); search and matching frictions (Diamond-Mortensen-Pissarides model) and financial frictions (financial accelerator model). In this section, we will learn how to use Dynare to solve dynamic stochastic general equilibrium models.

The goal of the course is to develop the necessary skills to study and develop macroeconomics models, and to formulate answers to policy relevant questions.

COURSE ORGANIZATION

Lectures. We meet on Tuesday and Thursday from 12:30 to 1:45PM in room CASE W313. **Our first class will be** on Tuesday, Jan 17th (see Spring 2023, first day of classes).

Office hours. Office hours will be held in my office (ECON 112) on Tuesday from 3:30 to 5pm. If this time is not convenient for you - due to some scheduling conflict - I will be happy to set up an appointment (subject to time availability). Office hours are by appointment only. To schedule an appointment follow this link.

EVALUATION

Your final grade is determined as a weighted average among Midterm I (30%) and Final Exam (70%). **Midterm and final exam** are closed notes and books. No make-up tests will be given. **Problem sets** will be regularly assigned to cover the class material or explore other topics. You are required to work in group to complete the assignments. The group consists of 3/4 people that are formed in the first week of classes. Problem sets are submitted, one version per group as indicated in the Chronogram (see section below). Late assignments will not be accepted.

Assessment	Date	%
Midterm I	3/23/23	30%
Final Exam	Saturday, May 6, 1:30-4pm	70%

TEXTBOOK AND LECTURE NOTES

Textbooks

- Nancy L. Stokey, Robert E. Lucas, Jr., and Edward C. Prescott, (1989) *Recursive Methods in Economic Dynamics*, Harvard University Press (SLP)
- Ljungqvist, Lars and Thomas J. Sargent, (2003), *Recursive Macroeconomic Theory*, Cambridge: MIT Press.

Lecture Notes

In addition to a set of class handouts (AP), during the course we will also make use of the Lecture Notes by Nezhir Guner (NG) and Pedro Gomes (PG).

COURSE OUTLINE

This section outlines the tentative schedule for the course.

INTRODUCTION TO DYNAMIC PROGRAMMING

- Convex Optimization Theory
- Finite-Horizon Dynamic Programming
 - Application: The life-cycle model
 - Code: Finite horizon one-sector growth model (Matlab)

Readings: NG Ch 5.1.

- Jerome Adda, Russell Cooper, *Dynamic Economics: Quantitative Methods and Applications*
- One-Sector Growth Model

- Lagrangian Approach for Solving Infinite Horizon Problems
- Code: Computation of discrete one-sector growth model (Matlab)

Readings: NG Ch 5

DYNAMIC PROGRAMMING UNDER CERTAINTY

- Mathematical Preliminaries:
 - Complete Metric Spaces.
 - The Contraction Mapping Theorem and Blackwell’s Sufficient Conditions.
 - The Theorem of the Maximum.
- Dynamic Programming
 - Existence of a Value Function: the Principle of Optimality
 - Characterization of a Value Function: Monotonicity, Concavity and Differentiability.

Readings: SLP Ch 1-5, NG Ch 7-10

DYNAMIC PROGRAMMING UNDER UNCERTAINTY

- Mathematical Preliminaries:
 - Markov chains and Transition functions
 - Convergence
- Markets
 - Arrow-Debreu Economy
 - Sequential Trading
 - Recursive Competitive Equilibrium
- Application:
 - Stochastic version of one-sector growth model
 - Asset Pricing
- Code: Implementation of Tauchen Method in Matlab and C.

Readings: LS Ch 2,12

- Mehra, R. and Prescott, E.C. *The Equity Premium: A puzzle*, Journal of Monetary Economics, 15, 145-161.

HETEROGENOUS AGENTS’ MODEL AND AGGREGATION

- The Melitz (2003) Model
- CES Preferences

Readings:

- Melitz, M.J. (2003) *The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity*. Econometrica, 71, 1695-1725.

THE REAL BUSINESS CYCLE MODEL

- The Real Business Cycle Model
- Method of undetermined coefficients
- Calibration
- Code: Solution of an RBC model in Dynare

Readings:

- King, R. and S. Rebelo (2000), *Resuscitating Real Business Cycles*, in Taylor and Woodford, Handbook of Macroeconomics, 1B, 931-42
- Rebelo, S. (2005), *Real business cycle models: Past, present, and future?*, Scandinavian Journal of Economics, 107(2), 217-238
- Stock, J. and M. Watson (2000), *Business Cycle Fluctuations in U.S. Macroeconomic Time Series*, in J. Taylor and M. Woodford eds., Handbook of Macroeconomics, 1A, 3-64
- Chari, V., Kehoe, P. McGrattan, E. (2007), *Business cycle accounting* Econometrica, 3(5)
- Kydland, F. and E.C. Prescott (1990), *Business Cycles: Real Facts and a Monetary Myth*, Quarterly Review, Federal Reserve Bank of Minneapolis

MONEY, NOMINAL FRICTIONS AND MONETARY POLICY

- The New Keynesian (NK) Model
- Code: Solution of an NK Model in Dynare

Readings:

- Gali, J. (2008), *Monetary Policy, Inflation and the Business Cycle*, Princeton University Press, Chapters 2, 3 and 4.
- Christiano, L., M. Eichenbaum, and C. Evans (1998), *Monetary Policy Shocks: What Have We Learned and to What End?*, in J.B. Taylor, and M. Woodford eds., Handbook of Macroeconomics, 1A, 65-148.
- Clarida, R., J. Gali and M. Gertler (1999) *The Science of Monetary Policy: A New-Keynesian Perspective*, Journal of Economic Literature, 37, 1661-1707.
- McCandless, G. and W. Weber (1995) *Some Monetary Facts*, Federal Reserve Bank of Minneapolis, Quarterly Review.
- Smets, F. and R. Wouters (2007) *Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach*, American Economic Review, 97(3), 586-606.

CHRONOGRAM

Our first class will be on Tuesday, Jan 17th from 12:30-1:45PM (see Spring 2023, first day of classes). Here it is the tentative schedule.

TUESDAY		THURSDAY	
Jan 17th Introduction to Dynamic Programming	1	19th Instructions in Homework 0 Introduction to Dynamic Programming	2
24th Introduction to Dynamic Programming	3	26th Introduction to Dynamic Programming	4
31st Introduction to Dynamic Programming	5	Feb 2nd Hand In Homework 1 Introduction to Dynamic Programming	6
7th Introduction to Dynamic Programming	7	9th Introduction to Dynamic Programming	8
14th Dynamic Programming Under Certainty	9	16th Dynamic Programming Under Certainty	10
21st Blackwell Sufficient Conditions + Correspondences	11	23rd Hand In Homework 2 Correspondences + Berge's Maximum Theorem	12
28th Berge's Maximum Theorem Proof on Board	13	Mar 2nd Optimality SP then FE and FE then SP	14
7th Dynamic Programming Under Certainty	15	9th Dynamic Programming Under Certainty	16
14th Stochastic Dynamic Programming	17	16th Hand In Homework 3 Stochastic Dynamic Programming	18
21st Stochastic Dynamic Programming	19	23rd Midterm I Stochastic Dynamic Programming	20
28th Spring Break (No Classes)		30th Spring Break (No Classes)	
Apr 4th Heterogenous Agents Models	21	6th Hand In Homework 4 Heterogenous Agents Models	22
11th Heterogenous Agents Models	23	13th RBC	24
18th RBC	25	20th Hand In Homework 5 New Keynesian Model	26
25th New Keynesian Model	27	27th Topics in Macro	28

TUESDAY		THURSDAY	
May 2nd	29	4th	30
Topics in Macro		Topics in Macro	

UNIVERSITY POLICIES

You should familiarize yourself with the following University of Colorado policies.

CLASSROOM BEHAVIOR

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the classroom behavior policy, the Student Code of Conduct, and the Office of Institutional Equity and Compliance.

REQUIREMENTS FOR COVID-19

As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you want to alter your instructor about an absence due to illness or quarantine, reach out to your TA via email. In compliance with the FERPA privacy protection, there is no need need for you to state the nature of your illness or require a doctor note (campus health services no longer provide “doctor’s notes” or appointment verifications).

ACCOMMODATION FOR DISABILITIES

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed.

Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website.

PREFERRED STUDENT NAMES AND PRONOUNS

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

HONOR CODE

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution (honor@colorado.edu); 303-492-5550). Students found responsible for violating the Honor Code will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the Honor Code website.

SEXUAL MISCONDUCT, DISCRIMINATION, HARASSMENT AND/OR RELATED RETALIATION

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, protected-class discrimination and harassment, and related retaliation by or against members of our community on- and off-campus. These behaviors harm individuals and our community. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who believe they have been subjected to misconduct can contact OIEC at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and support resources can be found on the OIEC website.

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of any issues related to these policies regardless of when or where they occurred to ensure that individuals impacted receive information about their rights, support resources, and resolution options. To learn more about reporting and support options for a variety of concerns, visit Don't Ignore It.

RELIGIOUS HOLIDAYS

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. See the campus policy regarding religious observances for full details.