

UNIVERSITY OF COLORADO BOULDER

Department of Economics

ECON7040: MACROECONOMIC THEORY II

Spring 2022

Instructor:	Alessandro Peri
Time:	TTH 12:30-1:45PM
Location:	ECON 119 (Economics Building)
Class Zoom link:	https://cuboulder.zoom.us/j/91761043063
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Office Hours:	ECON 112, Friday, 1:30-3pm
Office Hours Zoom link:	https://cuboulder.zoom.us/j/97090643828
TA:	Lucas Ladenburg, Paro Suh

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. **Our first class will be on Tuesday, Jan 11th** (see Spring 2022, first day of classes). The first two weeks of classes will be held remotely at the Zoom Link. Absent different directives, after the 24th of January we meet in-person in room ECON 119.

Office hours. Office hours will be held virtually (via Zoom Link) or in my office (ECON 112) on Friday from 1:30pm to 3pm. 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	3/17/22	30%
Final Exam	April 30th, 1:30-4p.m	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 11th from 12:30-1:45PM (see Spring 2021, first day of classes). Here it is the tentative schedule.

TUESDAY		THURSDAY	
Jan 11th	1	13th	2
Introduction to Dynamic Programming		Introduction to Dynamic Programming	
18th	3	20th	4
Introduction to Dynamic Programming		Hand In Homework 1 Introduction to Dynamic Programming	
25th	5	27th	6
Dynamic Programming Under Certainty		Dynamic Programming Under Certainty	
Feb 1st	7	3rd	8
Blackwell Sufficient Conditions + Correspondences		Hand In Homework 2 Correspondences + Berge's Maximum Theorem	
8th	9	10th	10
Berge's Maximum Theorem Proof on Board		Optimality SP then FE and FE then SP	
15th	11	17th	12
Dynamic Programming Under Certainty		Hand In Homework 3 Dynamic Programming Under Certainty	
22nd	13	24th	14
Stochastic Dynamic Programming		Stochastic Dynamic Programming	
Mar 1st	15	3rd	16
Stochastic Dynamic Programming		Hand In Homework 4 Stochastic Dynamic Programming	
8th	17	10th	18
Heterogenous Agents Models		Heterogenous Agents Models	
15th	19	17th	20
RBC		Midterm I	
22nd		24th	
Spring Break (No Classes)		Spring Break (No Classes)	
29th	21	31st	22
RBC		Hand In Homework 5 New Keynesian Model	
Apr 5th	23	7th	24
New Keynesian Model		Topics in Macro	
12th	25	14th	26
Topics in Macro		Hand In Homework 6 Topics in Macro	
19th	27	21st	28
Topics in Macro		Topics in Macro	

TUESDAY		THURSDAY	
26th	29	28th	30
Topics in Macro		Hand In Homework 7 Topics in Macro	

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. Students who fail to adhere to these 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.

CU Boulder currently requires masks in classrooms and laboratories regardless of vaccination status. This requirement is a precaution to supplement CU Boulder’s COVID-19 vaccine requirement. Exemptions include individuals who cannot medically tolerate a face covering, as well as those who are hearing-impaired or otherwise disabled or who are communicating with someone who is hearing-impaired or otherwise disabled and where the ability to see the mouth is essential to communication. If you qualify for a mask-related accommodation, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus. In addition, vaccinated instructional faculty who are engaged in an indoor instructional activity and are separated by at least 6 feet from the nearest person are exempt from wearing masks if they so choose. In this class, you may be reminded of the responsibility to complete the Buff Pass and given time during class to complete it.

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 (contacttracing@colorado.edu). To alert me about absence due to illness or quarantine just send me an email. Because of FERPA student privacy laws, there is no need for you to state the nature of your illness when alerting me. Doctors notes or appointment verifications are also not needed.

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 policies on classroom behavior and the Student Conduct & Conflict Resolution policies.

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 academic integrity policy. 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 the Honor Code (honor@colorado.edu; 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as 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. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and the 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 incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting 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. In case such conflicts emerge, feel free to reach out via email within the first two weeks of class and we will find a solution. See the campus policy regarding religious observances for full details.