

ECON 7346-1: QUANTITATIVE MACROECONOMICS

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Radek Paluszynski
Assistant Professor
Department of Economics
University of Houston

Office phone: 713 743 3800
Email: rpaluszynski@uh.edu
Office hours: Wednesdays, 11a-1p
Office location:
McElhinney Hall Room 221E

TIME AND LOCATION

Classes will be held on Mondays and Wednesdays, 1.00-2.30pm, in room M-212.

PREREQUISITES

Micro- and Macroeconomic Theory sequence (7341-7344).

COMMUNICATION

Email is the preferred means of communication, please allow up to 24 hours to get a response.

Course materials and current grades will be posted on Blackboard. Blackboard will also be used to make general course announcements.

Office hours are on Wednesday mornings, 11am-1pm. Questions and discussions of all kinds are encouraged. In case of a time conflict, alternative appointment may be arranged by email.

COURSE DESCRIPTION

The objective of this course is to help you gain proficiency at working with quantitative models in modern macroeconomics. The course naturally follows the first year macro sequence (7342-7344). Some of the topics will be covered again, other ones will be new. We will try to calibrate the curriculum and speed of the course to optimize your learning.

We will focus on canonical models in several different subfields of macro. These models typically require you to use numerical methods in order to characterize equilibrium allocations and prices. Emphasis will be placed on writing your own code rather than using “blackbox” software.

An important part of the course (and perhaps its main value-added relative to the first year sequence) will be mapping theoretical models to the data. You will need to get proficient at processing the datasets commonly used in macroeconomics. We will talk about linking the model variables to real-world objects and identification of “structural parameters” in the model.

I consider competency in Matlab to be a necessary condition for doing research in quantitative macro. While this may be enough (barely) to go through the basic curriculum of this course, I will also encourage you to learn a low-level programming language such as Fortran or C. Julia or Python are also good choices This involves a certain investment of time, stress and effort, but you will find that it is well worth it.

TEXTBOOKS

There is no required textbook for this course. You should get accustomed to working with many different sources and finding the information you need efficiently. Here are some useful references:

- Judd, Kenneth L. (1998): *Numerical Methods in Economics*, MIT Press.
- Heer, Burkhard and Alfred Maussner (2004): *Dynamic General Equilibrium Modeling*, Springer.
- Fehr, Hans and Fabian Kindermann (2018): *Introduction to Computational Economics Using Fortran*, Oxford University Press.
- Miranda, Mario J. and Paul L. Fackler (2002): *Applied Computational Economics and Finance*, MIT Press.
- Adda, Jerome and Russell Cooper (2003): *Dynamic Economics. Quantitative Methods and Applications*, MIT Press.
- Stachurski, John (2009): *Economic Dynamics. Theory and Computation*, MIT Press.
- Marimon, Ramon, and Andrew Scott (1998): *Computational Methods for the Study of Dynamic Economies*, Oxford University Press.
- Cooley, Thomas F. (1995): *Frontiers of Business Cycle Research*, Princeton University Press.
- Kehoe, Timothy J. and Edward C. Prescott (2007): *Great Depressions of the Twentieth Century*, Federal Reserve Bank of Minneapolis.
- Press, William H., Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery (1992): *Numerical Recipes in Fortran 77: The Art of Scientific Computing, Second Edition*, Cambridge University Press. (available for free at www.nrbook.com/a/bookfpdf.php)
- Press, William H., Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery (1992): *Numerical Recipes in Fortran 90: The Art of Parallel Scientific Computing, Second Edition*, Cambridge University Press. (available for free at www.nrbook.com/a/book90pdf.php)

USEFUL LINKS

Here is a (non-exhaustive) list of fantastic resources for learning computational macro:

- Víctor Ríos-Rull's course: <http://www.sas.upenn.edu/~vr0j/econ8185-12/index.html>
- David Wiczer's course: http://sites.google.com/site/davidwiczer/teaching/numerical_methods
- Makoto Nakajima's notes: <http://sites.google.com/site/makotonakajima/notes>
- Stachurski and Sargent's Quantitative Economics Lectures: <http://lectures.quantecon.org/>

COURSE REQUIREMENTS

Participation in this course only makes sense if it is complemented with significant learning-by-doing. You will therefore be required to complete several homework assignments throughout the semester. To achieve the passing grade, you will need to:

1. Submit homework assignments consisting of source codes and a rough summary of results.
2. Make an in-class presentation of your results for one of the assignments (15-30 minutes).
3. Replicate the quantitative results of one canonical paper in the field of macro that interests you, and propose your own research that builds on this framework. Submit it in the form of a formal report.
4. Make an in-class presentation of your research proposal (15-30 minutes).

For those who decide to audit the class, I strongly encourage you to attempt the homeworks anyway. At the very least, as a courtesy to other course participants, you will be asked to make an in-class presentation as well. If you are an upper-year student, your presentation may be about your own research, as long as it relates to one of the homework assignments and you focus on its quantitative component.

COURSE POLICIES

This course will strictly observe the University's deadlines regarding withdrawals.

There is no extra credit available in this course beyond the grading schemes described above. Participants who have experienced unusual circumstances (such as an accident, crime or other occurrence of *force majeure*) are requested to contact the instructor as soon as possible. An official proof from the doctor or police will be required in order to make special arrangements.

The course will follow the standard grading scale (93-100: A, 90-92: A-, 87-89: B+, and so on), but it may be adjusted to the distribution of scores at the end of the semester.

Students with Disabilities: The University of Houston System complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for students with a disability. In accordance with Section 504 and ADA guidelines, the University of Houston strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. Students seeking accommodation in this course should contact the instructor after obtaining the appropriate documentation through the UH Center for Students with Disabilities.

Counseling and Psychological Services: Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by calling 713-743-5454 during and after business hours for routine appointments or if you or somebody you know is in crisis. No appointment is necessary for the "Let's Talk" program, a drop-in consultation service at convenient locations and hours around campus. http://www.uh.edu/caps/outreach/lets_talk.html

Face Covering Policy

To reduce the spread of COVID-19, the University strongly encourages everyone (vaccinated or not) to wear face coverings indoors on campus including classrooms for both faculty and students.

Presence in Class

Your presence in class each session means that you:

- Are NOT exhibiting any Coronavirus Symptoms that makes you think that you may have COVID-19
- Have NOT tested positive or been diagnosed for COVID-19
- Have NOT knowingly been exposed to someone with COVID-19 or suspected/presumed COVID-19
- If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to class. Please see Student Protocols for what to do if you experience symptoms and Potential Exposure to Coronavirus for what to do if you have potentially been exposed to COVID-19. Consult the (select: Undergraduate Excused Absence Policy or Graduate Excused Absence Policy) for information regarding excused absences due to medical reasons.

COVID-19 Information

Students are encouraged to visit the University's COVID-19 website for important information including on-campus testing, vaccines, diagnosis and symptom protocols, campus cleaning and safety practices, report forms, and positive cases on campus. Please check the website throughout the semester for updates.

Vaccinations

Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent vaccine information, consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact the Justin Dart Jr. Student Accessibility Center (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructors recordings for their own studying and notetaking. Instructors recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through (specify how students will be notified of changes).

COURSE OUTLINE (TENTATIVE)

1. Review of programming/numerical methods in macro
2. Growth accounting and the neoclassical growth model
3. Business cycle accounting
4. Search and matching in labor markets
5. Life cycle models
6. Models with endogenous default

7. Heterogeneous agent models with a stationary distribution
8. Heterogeneous agent models with transitional dynamics
9. Heterogeneous agent models with aggregate fluctuations
10. Calibration of macro models and global optimization
11. Parallel computing