Macroeconomics II : Autumn 2020

The University of Tokyo

Class time: Wednesday 2nd period 10:25-12:10 (via zoom)
Instructor: Sagiri Kitao
Office: Econ Bldg 1306
Email: sagiri.kitao@gmail.com
Office hours: by appointment
Classes, TA sessions and office hours will use the same zoom URL.

Teaching Assistants:
Kao Nomura and Haruki Shibuya
Email (to both TAs): utcoremacro2.2020@gmail.com

TA Session:
Wednesday 3rd period 13:00-14:45 (via zoom)
Not every week. Only on preannounced dates.

TA Office Hours:
Tuesday 8:30-9:30am (Nomura)
Friday 8:30-9:30am (Shibuya)
Prior sign-ups are required via a doodle link below. Sign-up will close at 22:00 the day before.
https://doodle.com/poll/xfyf8s6y423ecwbz

Course Site:
Various announcements, lecture slides, supplemental documents, and homeworks will be posted at the ITC-LMS, which students are asked to **check regularly**.

Course Description

The objective of the course is to learn a set of analytical tools in modern dynamic macroeconomics and to apply them to answer various economic questions. The course will provide students with knowledge of theoretical and practical dynamic programming, the method widely used in recursive macroeconomics. In the second half of the course, applications in selected topics will be covered.

Suggested Textbooks (referenced in lectures)

- Krueger, Dirk (2019) *Macroeconomic Theory*, manuscript (available to enrolled students via ITC-LMS for a limited duration, by courtesy of Dirk Krueger with his permission. Please do not share) (**"Krueger"**)
- Ljungqvist, Lars and Thomas J. Sargent (2018) *Recursive Macroeconomic Theory*, 4th edition, MIT Press. (**"LS"**)
- Stokey, Nancy, Robert E. Lucas and Edward Prescott (1989) *Recursive Methods in Economic Dynamics*, Harvard University Press. (**"SLP"**)
- Blanchard, Olivier Jean and Stanley Fisher (1989) *Lectures on Macroeconomics*, MIT Press (**"Blanchard and Fisher"**)
- Pissarides, Christopher (2000) Equilibrium Unemployment Theory, MIT Press (**"Pissarides"**)
- Cooley, Thomas (1995) *Frontiers of Business Cycle Research*, Princeton University Press. (**"Cooley"**)

All (except for "Krueger") are available at the Economics Department Library on reserve.

Other Reference Books

Macro Theory (additional)

- Acemoglu, Daron (2009) *Introduction to Modern Economic Growth*, Princeton University Press
- Romer, David (2019) *Advanced Macroeconomics*, 5th edition, McGraw-Hill

Computation and Numerical Methods

- Judd, Kenneth (1999) *Numerical Methods in Economics*, MIT Press
- Miranda and Fackler (2002) *Applied Computational Economics and Finance* (Matlab toolbox https://pfackler.wordpress.ncsu.edu/compecon/154-2/)
- Heer and Maussner (2009) Dynamic General Equilibrium Modeling: Computational Methods and Applications, 2nd Ed., Springer (codes in Gauss/Matlab/Fortran available at https://www.wiwi.uni-augsburg.de/vwl/maussner/dge_buch/dge_book_2ed/)

Real Analysis for Economists and DP Theory

- Efe Ok (2007) *Real Analysis with Economic Applications*, Princeton University Press
- Stachurski, John (2009) *Economic Dynamics: Theory and Computation*, MIT Press
- Bertsekas, Dimitry (2012) *Dynamic Programming and Optimal Control* (Vol 1 and 2), 4th edition, Athena Scientific

Grade Policy

- About 5 Homeworks (30% total)
- 1 Final Exam (70%)

HOMEWORK will include both theoretical and numerical/computational assignments. Solutions must be **typed in latex** and submitted via ITC-LMS by the set due date and time, typically on Tuesday 24:00. Late submission is not accepted. Students are encouraged to work in groups (of up to three students) but each student must submit his/her own uniquely written solutions including computer codes that he/she wrote. **Acknowledge cooperation on the first page of your homework solutions (write down names of other students you worked with, if any)**. Working by yourself is perfectly fine too. Each homework will receive a grade of 0-100pt and all homeworks are weighted equally. Copying another student's solutions is plagiarism and will prove fatal in terms of your learning and exam performance. Solutions will be discussed in TA sessions. **ANY COMPLAINT** about grade of homework must be made in writing with a clear explanation of your claims and be submitted to a TA or the instructor. This request will only be accepted within one week of distributing the graded assignment. Both the instructor and TAs will examine the claim and notify a student of the outcome.
FINAL EXAM is comprehensive (i.e. covers material of the entire course) and will be given at the time and location set by the department.
CLASS ATTENDANCE is not monitored but encouraged.
AUDITING is allowed with a prior permission of the instructor only. Auditors are expected to fulfil the same course requirements as registered students.
If you are **RE-TAKING** the course to fulfil a requirement for the doctoral admission, you must notify me since your grade will not be registered automatically.

Programming and Computation

The course involves a significant component of programming and computation. Homework will include computational questions. The final exam may ask about computational methods and techniques (although I will not ask you to "write" codes in the exam).
Significant heterogeneity in prior knowledge of programming is likely and experience is not a prerequisite. "How to program" will not be covered in class but TAs will provide an introductory session on programming. Matlab is provided for free via group license at the

University and it is the common language in the course. Students are free to use any programming language in completing assignments.

List of Course Topics

Part I : Foundations of Dynamic Macro Models

1. **Introduction**
   - Macro models and ingredients, some basic concepts (growth accounting, balanced-growth path, utility theory, IES, homothetic preference, CRRA preference, production function, CRS), aggregation theorem
   - TA session: programming primer
2. **A Simple Exchange Economy and Competitive Equilibrium**
   - Arrow-Debreu competitive equilibrium, Pareto efficiency, sequential markets equilibrium, equivalence theorem, Negishi's algorithm, welfare theorems
   - Krueger Ch 2
   - LS preface, Ch 7
   - Negishi, T. (1960) "Welfare Economics and Existence of an Equilibrium for a Competitive Economy," Metroeconomica, 12, 92-97.
   - Kaldor, N. (1963) "Capital Accumulation and Economic Growth," In Proceedings of a Conference Held by the International Economic Association, Lutz and Hague Eds.
3. **Neoclassical Growth Model and Introduction to Discrete-time Dynamic Programming and Calibration**
   - Optimal growth, competitive equilibrium, recursive formulation, introduction to dynamic programming, basic calibration
   - Computational methods: value function iteration, guess and verify, Euler equation approach, shooting algorithm
   - TA session: math review, Markov chain and discretization, practical DP
   - Krueger Ch 3
   - Cooley Ch 1
   - LS Ch 3
   - SLP Ch 2
4. **Theory and Practice of Dynamic Programming and Computation Methods**
   - DP math and theory, contraction mapping theorem, Blackwell's sufficient conditions, theorem of maximum, principle of optimality
   - Liner quadratic dynamic programming (time permitting)
   - Krueger Ch 4 and 5

- SLP Ch 3, 4 and 5
- LS Ch 2 and 4 (Ch 5)
- Cooley Ch 2

Part II : Applications (topics may vary depending on the progress)

5. **Models with Risk**
   - Revisit with risks Arrow-Debreu equilibrium, sequential market equilibrium and neoclassical growth models, Markov process
   - Applications: asset pricing, real business cycle models
   - Krueger Ch 6
   - LS Ch 8
6. **Growth Theory**
   - Solow Model, Ramsey-Cass-Koopmans Model, Endogenous Growth Models
   - Krueger Ch 9
7. **Overlapping Generation Models**
   - Two-period models, pure exchange economy, money in equilibrium, Ricardian equivalence, OLG with production, OLG with risk
   - Krueger Ch 8
   - LS Ch 9 and 10
   - Blanchard and Fisher Ch 3 and 4
8. **Search, Matching and Labor Market**
   - McCall's search model, Diamond-Mortensen-Pissarides matching model
   - Pissarides Ch 1,2 and 3
   - LS Ch 6 and 29
9. **Models of Incomplete Markets, Self-insurance**
   - Bewley-Aiyagari-Huggett-Imrohoroglu models
   - Models of income and wealth distribution, data and measurements
   - LS Ch 17 and 18

TA Review sessions: tentative schedule

Attendance is not mandatory but highly recommended. I will take the knowledge that TA will provide in review sessions as given in the lectures. Here's a tentative schedule for the sessions. Please check ITC-LMS for an updated schedule.

1. Programming primer (October 7, Wed)
   - Those who have no or limited programming experience are STRONGLY

encouraged to attend this session.

- It is recommended Matlab (available for free for UT students) is installed on your computer beforehand, which you should bring to a review session.

2. DP Math and Computation review (TBD)
   - Metric space, convergence of sequence, correspondence
   - Markov process, discretization
   - More on DP (interpolation, etc)
3. Homework review sessions (typically a day after a submission deadline)