EC 588
COMPUTATIONAL TECHNIQUES IN ECONOMICS
Spring 2015

Instructor: Orhan Torul

Time and Location: T 56 @ NBZ 13 & Th 5 @ NBZ 12
Finance Lab at Natuk Birkan Bldg. will also be used occasionally

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Office Hours: W 14:00-15:00 or by appointment, NB225A

Course Website: Boğaziçi University Department of Economics → Courses → EC 588

Course Objectives

This is a graduate level elective course in the M.A. Program in Economics. The primary objective of the course is to familiarize graduate students with advanced applied econometric and computational techniques. Throughout the course, our initial focus will be on several major data sources and the use of econometrics softwares, along their applications. Next, we will concentrate on computational solutions for different general equilibrium models, as well as on the formulation and execution local and global approximation techniques. In particular, we will study the solution methods for system of non-linear equations (e.g. in order to compute the deterministic steady-state of general equilibrium models). Next, we will discuss the rationale and applications of local approximation techniques (e.g. Schmitt-Grohe and Uribe algorithm) to study moderate fluctuations around deterministic equilibria, (e.g. as in the business cycle fluctuations). Then, we will concentrate on deterministic and stochastic value function iteration, along with their simulation applications, in order to be able to attack questions that require global approximation methods (e.g. as in discrete jumps in optimal decision rules).

Requirements

Satisfactory grades from EC 503 Macroeconomics I and EC 504 Macroeconomics II are the *unofficial* prerequisites of this course.

Reference Textbooks

- *"Dynamic Economics: Quantitative Methods and Applications'* by Jerome Adda and Russell W. Cooper, MIT Press, August 2003. (A+D hereafter)
- *"Numerical Methods in Economics'* by Kenneth L. Judd, MIT Press, September 1998. (Judd hereafter)
- *"Dynamic General Equilibrium Modeling: Computational Methods and Applications"*, 2^{nd} Edition by Burkhard Heer and Alfred Maussner, Springer Press, August 2009. (H+M hereafter)

Grading Policy

Your overall grade will be calculated based on your grades from problem sets, pop quizzes and class participation, an advanced research proposal (accompanied with its estimation/computational code) by the end of the semester (during the last sessions). The weights are going to be as follows:

- **Problem Sets**: 60%
- **Pop Quizzes + Class Participation**: 5% + 5%
- **Research Proposal and Presentation**: 30%

As a reminder, the standard catalog grading protocol accepted at Boğaziçi University is as follows:

Grade Scale			
Letter Grade	**Interpretation**	**Weight**	**Grade Percentage**
AA	Excellent	4.0	90%
BA	Good-Excellent	3.5	85-89%
BB	Good	3.0	80-84%
CB	Passing-Good	2.5	75-79%
CC	Passing	2.0	70-74%
F	Failed	0.0	0-59%

Yet, I reserve the right to modify criteria for letter grades.

Last day for withdrawal from the course is **April 9, 2015, Thursday**.

- **Research Proposal and Presentation (*Tentative Deadline*: Mid May, 2015)**: All students are required to write down a **detailed** research proposal, the basis of which you have to clear with me by **March 15, 2015**. This suggests if your initial proposal is not accepted and/or needs to be considerably revised, your **final** draft should be accepted by the suggested clearance deadline.

Your proposal should consist of a part related to the estimation and/or computation methods we discuss throughout the course and their topic should preferably be on one of the contemporary studies on the frontier. You are also required to prepare a presentation for your research proposal. Your proposal should be formatted and written properly, and typed in LaTeX.

- **Problem Sets:** There will be a number of problem sets (around 6), all of which will be graded, each with equal weight. Problem sets are will be posted online, and their due dates will be announced on the course web site along with problem sets. Your answers to the problem sets should be similar to short academic notes: formatted and written properly, and typed in LaTeX.

- **Attendance**: Regular attendance is expected and *very strongly* recommended. Students who do not attend classes regularly may not only lose all credit from unannounced quizzes, but also could get lower grades due to poor class participation.

Communication

E-mail will be used as the primary means of communication outside the classroom, and I will be sending e-mails whenever necessary to inform you on updates regarding the course. Please make sure that the e-mail address you have with the Registrar's Office is up-to-date so that you will not miss any of the announcements.

Accommodations

Students who require special accommodations for exams must get in touch with me within the first two weeks of class.

Academic Integrity

The graduate program of the Department of Economics is conducted within the framework of the Student Discipline Regulations of the Turkish Council of Higher Education (TCHE, Yükseköğretim Kurulu, YÖK in Turkish), and rules accepted by the Boğaziçi University Committee on Ethical Conduct.

For student discipline regulations by the TCHE (YÖK), see (in Turkish): bit.ly/yokdisiplin

For the ethics code accepted by Boğaziçi University, see: bit.ly/bounethics

EC 103 Orientation to Economics course also discusses basics of integrity. For a brief refresher, see bit.ly/ec103notes

Copyrights

Tentative Course Outline

Data in Macroeconomics

- Discussion on Select Data Sources:
  1. Panel Study of Income Dynamics (PSID)
  2. Survey of Consumer Finances (SCF)
  3. Federal Reserve Economic Data (FRED)
  4. International Finance Statistics (IFS)
  5. World Values Survey (WVS)

  – Olivetti, Claudia; Silverman, Dan, Hong Jay; and David Wiczer (2010), "How to Access Standard Data Sources", mimeo

Introduction to Applied Econometrics

- Basics of `STATA`
  – Lecture Notes on `STATA`
- Basics of `EVIEWS`
  – Lecture Notes on `EVIEWS`
  – Christiano, Lawrence J., Eichenbaum, Martin and Charles Evans (1999), "Monetary Policy Shocks: What Have We Learned and to What End?", Handbook of Macroeconomics, 1(1) , 65-148.
  – "Christiano, Lawrence J., Eichenbaum, Martin and Robert Vigfusson (2003),"What Happens After a Technology Shock", mimeo.

Introduction to Computing

- Introduction to `MATLAB`
  – Handley, Kyle (2009), "`MATLAB` Mini Course Notes", mimeo
- Deterministic Steady-State Derivation of Stochastic DSGE Models
  – Lecture Notes on DSGE Models
  – Chapter 5 in Judd.

- Basics Computational Approximation of Finite Markov Chains and Principles of Local Approximation Techniques
  - Lecture Notes on Autoregressive Processes and Local Approximation Techniques
  - Chapter 3 in A+C, Chapters 1, 2, 5, 6 and 7 in Judd.
- Local Approximation Techniques and Perturbation Methods for the Numerical Analysis
  - Schmitt-Grohe and Uribe (2004, JEDC)
- Introduction to `DYNARE`
  - "`DYNARE`: Reference Manual Version 4" by Adjemian et al. (2014).
  - "`DYNARE` User Guide" by Tommaso Mancini Griffoli (2007-2008), mimeo
  - Fernandez-Villaverde, Jesus (2005), "Real Business Cycle Models", mimeo
- Introduction to Global Approximation Techniques and Essentials of Value Function Iteration
  - Lecture Notes on Value Function Iteration and Heterogeneous-Agent Models
  - Chapter 2 in A+C, Chapters 12, 13, 16, and 17 in Judd

Incomplete Markets with No Aggregate Uncertainty

  - Aiyagari, S. Rao, (1994), "Uninsured Idiosyncratic Risk and Aggregate Saving," *Quarterly Journal of Economics*, 109, 659-684.
  - Huggett, Mark (1993), "The Risk-Free Rate in Heterogeneous-Agent Incomplete-Insurance Economies," *Journal of Economic Dynamics and Control*, 17, 953-969.
  - Rios-Rull, Victor (1999), "Computing of Equilibria in Heterogeneous-Agent Model", Chapter 11 in "Computational Methods for the Study of Dynamic Economics" by Marimon, Ramon and Andrew Scott (1999).

Incomplete Markets with Aggregate Uncertainty

  - Krusell, Per and Anthony A. Smith Jr., (1998), "Income and Wealth Heterogeneity in the Macroeconomy," *Journal of Political Economy*, 106(5), 867-896.

Calibration versus Estimation

  - Canova, Fabio (1994), "Statistical Inference in Calibrated Models", *Journal of Applied Econometrics*, 9, 123-145.
  - Kydland, Finn E. and Edward C. Prescott (1996), "The Computational Experiment: An Econometric Tool", *Journal of Economic Perspectives*, 10, 69-85.

- Hansen, Lars Peter and James J. Heckman (1996), "The Empirical Foundations of Calibration", *Journal of Economic Perspectives*, 10, 87-104.
- Sims, Christopher A. (1996), "Macroeconomics and Methodology", *Journal of Economic Perspectives*, 10, 105-120.
- Dridi, Ramdan, Alain Guay and Eric Renault (2007), "Indirect Inference and Calibration of Dynamic Stochastic General Equilibrium Models", *Journal of Econometrics*, 2, 397-430.