EC 744: Economic Dynamics

Prof. Jianjun Miao

Spring 2008

Schedule Thursday 5:30-8:30pm.

Office Hours Wednesday 5:00-6:00pm and Friday 5:00-6:00pm, or by appointment

Contact

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Course Overview This course introduces the theory and application of dynamic optimization and equilibrium analysis in discrete time. It aims at providing necessary techniques for graduate students to analyze economic dynamics. The topics focus on analyzing and solving discrete-time dynamic programming problems in economics and finance. We will put more emphasis on applications by solving many economic examples such as consumption/savings, investment, optimal growth, industry dynamics, job search, recursive utility, portfolio choice, and asset pricing. We will also study computational methods because they become important in economics and finance. We will focus on the discrete state space method (value function iteration) and the projection method. The best way to learn computational methods is learning-by-doing. Thus, students are expected to complete a computation project.

Course Web Site The class material (syllabus, lecture notes, announcements, problem sets, additional readings) will be posted on Course Info. In order to access the course web page you can go to http://courseinfo.bu.edu/courses/08sprggrsec744_a1/. You will be asked to login. Use your BU username and Kerberos password. You can also access the web page directly through Student Link (simply click the course button).

Textbooks Teaching will be based mostly on textbooks. Sometimes, I will produce lecture notes that will be made available on the course web site. The following textbook are required, which can be purchased from internet bookstores such as Amazon or Barnes&Nobel.

- Stokey, N. and R.E. Lucas with E. Prescott, 1989, Recursive Methods in Economic Dynamics, Harvard University Press. (SLP)

The following books are also useful. You may find them from internet bookstores.

- Adda, J. and R. Cooper, 2003, Dynamic Economics: Quantitative Methods and Applications, The MIT Press.
- Barro, R.J. and X. Sala-i-Martin, 2003, Economic Growth, 2nd Ed., MIT Press.
- Dixit, A. and R. Pindyck, 1994, *Investment Under Uncertainty*, Princeton University Press, Princeton, NJ. (DP)
- Judd, K., 1998, Numerical Methods in Economics, Cambridge, MA: MIT Press
- Lundquist, Lars and Thomas J. Sargent, 2004, Recursive Macroeconomic Theory, 2nd edition, MIT Press.
- Miranda, M.J. and P.L. Fackler, 2002, Applied Computational Economics and Finance, MIT Press.

Course Requirements and Grades Class attendance is required. There will be homework every two weeks. Students are required to read textbooks before each class, and are expected to actively participate in classes. The final course performance is based on the following weights:

- Class participation 20%.
- Homework 40%.
- Computation project 40%. Due on May 6.

IMPORTANT It is your responsibility to plan your travel around exams dates. In particular, the date of the final exam is determined by the Registrar and cannot be changed for any reason. All exams are required. If you miss an exam without an acceptable excuse, you will receive a grade of zero. The only exceptions will be for a verified family emergency or for an illness or injury that is confirmed by the University Medical Clinic or other doctor. If you miss an exam for a legitimate reason, you will take a makeup exam.

Academic Conduct It is your responsibility to know and understand the provisions of the CAS Academic Conduct Code (copies are available in room CAS 105). Cases of suspected academic misconduct will be referred to the Dean's Office, and will receive a zero grade for the exam.

COURSE OUTLINE

1 Discrete Time Deterministic Models

SLP Chapters 3-6

1.1 Mathematical Preliminaries

- Metric spaces
- Contraction mapping theorem
- The theorem of the maximum

1.2 Dynamic Programming under Certainty

- Bellman equation
- Euler equation

1.3 Applications

- Growth models
- Consumption-savings problem
- Investment with convex adjustment costs

2 Discrete Time Stochastic Models

SLP Chapters 7-13.

2.1 Mathematical Preliminaries

- Measure theory and integration
- Markov processes

2.2 Stochastic Dynamic Programming

- Bellman equation
- Euler equation
- Policy functions and transition functions

2.3 Numerical Methods

- Discrete state space method
- Projection method

2.4 Applications

- Optimal growth
- Consumption-savings problem
- Industry investement
- Investment with convex/nonconvex adjustment costs
- Optimal stopping problem (job search)
- Recursive utility
- Portfolio choice and asset pricing

2.5 Convergence of Markov Processes

- Strong convergence
- Weak convergence

Schedule

	Thursday	
Week 1	01/17	Introduction
Week 2	01/24	DD DP
Week 3	01/31	DD DP
Week 4	02/07	DD DP
Week 5	02/14	DD DP
Week 6	02/21	DS DP
Week 7	02/28	DS DP
Week 8	03/06	DS DP
Week 9	Spring Recess	
Week 10	03/20	Numerical Method
Week 11	03/27	Numerical Method
Week 12	04/03	Numerical Method
Week 13	04/10	DS DP
Week 14	04/17	DS DP
Week 15	04/24	DS DP
Week 16	05/01	Convergence
Week 17	05/02-05/05	Study Period
Week 18	05/06	Project Due

Notes:

- DD DP: discrete time deterministic dynamic programming
- DS DP: discrete time stochastic dynamic programming