Econ 879: An Introduction to Dynamic Economics

Rody Manuelli
University of Wisconsin - Madison

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1 Basic Information About The Course

Instructor: Rody Manuelli, email: manuelli@ssc.wisc.edu.

Time and Location: Tu-Th 1:00-3:00 in 7324 William H. Sewell Social Science Building (Morton Room). Given the longer lectures, I plan to teach for about nine weeks. I am planning to finish early (the take home can be late) and there will be no class the week of November 12. For personal reasons, I may be unable to meet during another (to be determined) week.

Office Hours: Monday 10:15 - 11:45.

Textbooks: The lectures will not follow any text. However, they will be based on material taken from a number of sources. They include a number of books that cover basic theory and applications (listed below), and a set of notes prepared by Nancy Stokey for Econ 376 at the University of Chicago (available at http://home.uchicago.edu/~nstokey/course.htm) which I will denote Stokey from now on. Make sure that you check Professor Stokey's website as her notes are being constantly revised. In terms of books, for the most part I will be using bits and pieces of

Brownian Motion and Stochastic Flow Systems (BMSF) , J. Michael Harrison, Krieger 1990.

Investment Under Uncertainty (IUU), Avinash Dixit and Robert Pyndick, Princeton, 1994.

Brownian Motion and Stochastic Calculus (BMSC), Ioannis Karatzas and Steven Shreve, Springer, 1991.

Security Markets (SM), Darrell Duffie, Academic Press, 1988.

Stochastic Methods in Economics and Finance (SMEF), A. G. Malliaris (with W. Brock), North-Holland, 1982.

Comment: BMSC covers the mathematical background at a pretty high level (higher than what is required for the course). The rest contain both some basic math results and economic applications. SOCT has a very nice blend of formal arguments and economic applications and is very enjoyable to read.

Truth in Advertising Statement:

This course is an introduction to dynamic economics. The lectures will be self-contained. Since I do not pretend to know much about the subject, you should view these lectures as a "joint learning process." Do not expect a smooth delivery. This is the way the typical meeting will (most likely) proceed: I will come and try to prove some interesting and wonderful result. However, there is a good chance that I will get lost or stuck in the process. At that point, I would hope that all of the participants together (students and yours truly) will try to find the solution. If the ratio of student contributions relative to my contributions is sufficiently large, you get part of my paycheck in the form of a pizza party at the end of the course.

Grading: There will be some problem sets, (possibly) a presentation and a take-home final exam or a paper. (To be determined in class)

2 Topics (tentative 8/13/07)

1. *Basic Mathematical Background*

   - Probability and Stochastic Processes Concepts. Stokey (chapters 1 and 2). (Here I will review basic ideas in probability. Almost any book covers this. Alternative sources are: *BMSF* (appendix), *BMSC* (chapter 1, a little more advanced), *IUU* (chapter 3), *SMEF* (chapters 1). *SOCT* (chapter 1)
   - Stopping Times and Martingales. Stokey (chapters 1 and 2). Other sources are *BMSC* (chapter 1), *IUU* (chapter 3), *SMEF* (chapters 1 and 2).
   - Brownian Motion. Stokey (chapters 1 and 2), and *BMSF* (chapters 1, 2 and 3), *IUU* (chapter 3), *SMEF* (chapter 1) and *BMSC* (chapters 1 and 2), *SOCT* (chapter 2)

2. *Stochastic Integration and Ito's Lemma.* Stokey (chapter 3) The basic material is also covered in *BMSF* (chapter 4), *IUU* (chapter 3), *SMEF* (chapter 2), *BMSC* (chapter 3), *SM* (chapter 15 and 21). *SOCT* (chapter 3)

3. *Optimal Stopping.* Stokey (chapter 4 and 5), *BMSF* (chapters 5 and 6), *IUU* (chapters 4, 5 and 6), *BMSC* (chapter 4), *SM* (chapter 21 and 22) and *SOCT* (chapters 4, 5 and 6). [Here I will discuss the connection between the Feynman-Kac formula and optimal stopping, as well as financial options.]

- Single Firm Investment Problems.
- Bond Pricing with Default.
- Investment: Flexibility vs. Uncertainty.
- Strategic Investment: Imperfect Competition and Technology Adoption
- Mergers and Acquisitions

4. *Asset Prices*

- Black-Scholes and Derivatives. *SM* (chapter 22)
- Portfolio Choice. *SM* (chapter 23 and 24)
- Equilibrium Asset Pricing. *SM* (chapter 25)
- Interest Rates.

5. *Consumption and Growth*

- Consumption: Permanent Income.
- Growth Models. Notes to be handed out.

I am not sure how much we will cover (probably not everything listed). I will try (if possible) to introduce the applications as we develop the basic tools.