Syllabus for Econ 525a:  
Advanced Macroeconomics I (first half)

Course Objectives: The purpose of this half-course is twofold: first, to introduce students to computational tools for conducting numerical analysis of dynamic economic models; second, to introduce students to macroeconomic models with heterogeneous actors, which will serve as examples for the illustration of the computational tools.

Contact Information  
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Course web site: http://www.econ.yale.edu/smith/econ525a  
Office hours: Tuesdays from 10AM to noon

Course Meetings: The course meets on Mondays and Wednesdays from 1:30PM to 2:50PM in Room 108 (28 Hillhouse) until Monday, October 22.

Prerequisites: This course is designed for graduate students in economics who have taken first-year graduate courses in microeconomics, macroeconomics, and econometrics. No prior knowledge of either numerical methods or computer programming is assumed, but some familiarity with a programming language would prove helpful.

Course Requirements: The best (and really the only) way to learn numerical methods is to use them in actual problems. Accordingly, students must complete a series of problem sets that give them practice in using computational tools.

Texts: The lectures will be largely self-contained, but there are several good texts that provide useful complements to the material on numerical analysis taught in the lectures. An especially valuable book is: Numerical Recipes in Fortran 77: The Art of Scientific

Other useful books include:


APPENDIX LIST OF TOPICS

Week 1

Introduction (built around some simple examples from economics, including the stochastic-growth model and a canonical consumption-savings model).

General considerations in numerical analysis: convergence, roundoff error, truncation error.

Numerical differentiation.

Root-finding in one or more dimensions: bisection, secant method, Newton’s method, fixed-point iteration, Gauss-Jacobi, Gauss-Seidel, Brent’s method.

Suggested readings:

Chapters 1, 5.7, and 9 in Numerical Recipes; Appendix 2A, Chapter 3, and Chapter 5.6 in Miranda and Fackler; Chapters 1, 2, 5, and 7.7 in Judd.


Week 2

Minimization in one or more dimensions: golden section search, Brent’s method with or without derivatives, simplex method, Newton-Raphson, variable metric methods.

Suggested readings: Chapter 10 in Numerical Recipes; Chapter 5 in Miranda and Fackler; Chapter 4 in Judd.
Week 3

Interpolation and approximation of functions: linear interpolation in several dimensions, cubic splines, polynomial interpolation, orthogonal polynomials.

*Suggested readings:* Chapters 3 and 6 in *Numerical Recipes*; Chapter 5 in Miranda and Fackler; Chapter 6 in Judd.

Week 4

Numerical integration: cubic spline integration, Gaussian quadrature, Monte Carlo integration, integration of multivariate normal densities.

*Suggested readings:* Chapters 4 and 7 in *Numerical Recipes*; Chapter 5 in Miranda and Fackler; Chapters 7 and 8 in Judd.

Week 5

Numerical dynamic programming: value iteration, Euler equation methods, rules of thumb, perturbation methods, parameterized expectations, linear-quadratic (first-order) and second-order methods.

*Suggested readings:*

Chapters 7, 8, and 9 in Miranda and Fackler; Chapters 12, 13, 16, and 17 in Judd.


Coleman, W.J. II (1990), “Solving the Stochastic Growth Model by Policy Function Itera-


**Weeks 6 and 7**

Computation of dynamic equilibrium models with heterogeneous actors.

*Suggested readings:*


