

Macro III

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Course Description:

This course tries to do two main things. First it presents computational methods that are useful for solving dynamic optimization problems and for computing equilibria. Second, it considers papers that use computational methods. The spirit of much of the course will be to build confidence in using computational methods and to understand how economists have used these methods to tackle interesting problems.

Requirements:

Students will be given several homework problems that involve computation. These will involve submitting programs and the results of these programs. Students may work in two-person teams to do all assignments. Teams will be asked to present homework results in class.

Students will also be asked to present papers which use computational methods. The relevant papers for this part of the course are listed in the “Applications” section of the course outline. Presentations can be done in two-person teams. A typical presentation will involve presenting the main question of the paper, the framework, any important theoretical results, details of the computational algorithm employed and finally some description of results.

Some References:

Numerical Methods in Economics- Judd (1998)

Dynamic Economics: Quantitative Methods ... - Adda and Cooper (2003)

Dynamic General Equilibrium Modelling: ... - Heer and Maussner (2005)

Numerical Recipes in Fortran- Press et al (1992)

Handbook of Computational Economics (1996)

OUTLINE:

1. Background Readings

Judd (1998, CH 1), Rust (1997 and 1994), Bona and Santos (1996)

2. Dynamic Programming

Finite horizon problems

Infinite horizon problems

Reference: Bertsekas (1976), Stokey and Lucas (1989), Rust (1996), Judd (1998) and White (1978)

3. Computation of Solutions to DP Problems

a Finite DP Problems

- * Finite Horizon
- * Infinite Horizon
- * Howard's Algorithm

b Continuous DP Problems

- * Working on Bellman's Equation
 - Discrete Methods
 - Smooth Methods
- * Working on Euler Equations

c Quadrature and Discretizing a Markov Process

d Simulating Optimal Decision Rules- befriending a random number generator

Reference: Tauchen (1986), Tauchen and Hussey (1991), Judd (1998), Rust (1996), Santos (2000a, 2000b)

4. Computing Equilibria in OG Models

a time domain methods

b recursive methods

c approximating about a steady state

Reference: Judd (1998, Ch 16), Huggett (1996), Rios Rull (1996) and we will discuss Krueger and Kubler (2005) later on

5. Estimating a Model via Simulated Method of Moments

Theory Papers: Pakes and Pollard (1989), Duffie and Singleton (1993)

Textbook style Reference: Adda and Cooper (2003)

6. Applications

a Inequality: Storesleten, Telmer and Yaron (2004), Heathcote, Storesleten and Violante (2005a) and Huggett, Ventura and Yaron (2006)

Background Papers: Deaton and Paxson (1994), Heathcote, Storesleten and Violante (2005b), Cochrane (1991), Attanasio and Davis (1994)

b Social Insurance: Huggett and Parra (2006), Krueger and Kubler (2005)

c Sovereign Debt and Default: Arrelano (2003)

d Bankruptcy: to be determined

e Other: to be determined

References:

- Arrelano (2003), Default Risk and Income Fluctuations in Emerging Economies, University of Minnesota, manuscript.
- Bertsekas (1976) Dynamic Programming and Stochastic Control.
- Bona and Santos (1997) The Role of Computation in Economic Theory, *Journal of Economic Theory*; 72; 241- 81.
- Cooper and Adda (2003) *Dynamic Economics: Quantitative Methods and Applications*, MIT Press.
- Deaton and Paxson (1994) Intertemporal Choice and Inequality, *Journal of Political Economy*, 102, 437-67.
- Heathcote, Storesleten and Violante (2005a) Cross Sectional Implications of Rising Wage Inequality
- Heathcote, Storesleten and Violante (2005b) Two Views of Life Cycle Inequality
- Huggett (1996), Wealth Distribution ..., *JME*, 38, 469- 94.
- Huggett and Parra (2006), How Well Does the US Social Insurance System Provide Social Insurance?, manuscript.
- Huggett, Ventura and Yaron (2006) Sources of Lifetime Inequality, manuscript.
- Judd (1998) *Numerical Methods in Economics*; MIT Press.
- Krueger and Kubler (2005), Pareto Improving Social Security Reform, *AER*, 96, 737- 55.
- Pakes and Pollard (1989) The Asymptotics of Simulation Estimators, *Econometrica*, 57, 1027- 58.
- Press et al (1992) *Numerical Recipes in Fortran*, Cambridge University Press; Second Edition.
- Rios Rull (1996), Life Cycle Economies and Aggregate Fluctuations, *RES*, 63, 465- 90.
- Rust (1994), Structural Estimation of Markov Decision Processes, in *Handbook of Econometrics*, volume 4. (file available on John Rust's webpage)

Rust (1996) Numerical Dynamic Programming in Economics; in Handbook of Computational Economics; ed. Amman, Kendrick and Rust; Elsevier Science.

Rust (1997) Dealing with the Complexity of Economic Decisions. (file available on John Rust's webpage)

Santos (2000a) Numerical Solution of Dynamic Economic Models, in Handbook of Macroeconomics.

Santos (2000b) Accuracy of Numerical Solutions Using the Euler Equation Residual, *Econometrica*, 68, 1377- 1402.

Stokey and Lucas (1989), Recursive Methods in Economic Dynamics.

Tauchen (1986), Finite State Markov Chain Approximations ..., *Economics Letters*, 20, 177-81.

Tauchen and Hussey (1991), Quadrature Based Methods for Obtaining Approximate Solutions to Nonlinear Asset Pricing Models, *Econometrica*, 59, 371- 96.

White (1978) Finite Dynamic Programming, John Wiley.