

PSC 585 Dynamic and Computational Modeling

Spring, 2008
TTh 11:00-12:20pm
Harkness 329

Professor A: John Duggan
Office: Harkness 111A
Email: dugg@troi.cc.rochester.edu
Phone: x34999
Hours: by appointment

Professor B: Tasos Kalandrakis
Office: Harkness 109C
Email: akalandr@troi.cc.rochester.edu
Phone: x34902
Hours: by appointment

Dynamic considerations are becoming increasingly important in the study of such political processes as stability of international systems, the conduct of war, legislative policy making, regime change, and the impact of political variables on economic growth and industry dynamics. We provide theoretical and computational tools for the study of such applications. The course covers the basics of dynamic programming and general dynamic games and the main results on Markov chains. The main focus is the study of stochastic games with an emphasis on numerical analysis of models illustrated in a number of applications. The goal of the course is to equip graduate students with analytical and numerical tools that can be used in their future research on applied topics.

Students are expected to have taken the first-year sequence in formal theory, PSC 407 and 408, as well as PSC 584. Some familiarity with a programming language (such as Matlab or R) is a plus, but the dedicated student should be able to acquire basic programming skills needed for the course. Homeworks are a definite possibility.

There are three textbooks for the course, the first two required and the third optional.

- N. Stokey and R. Lucas with E. Prescott (1989) *Recursive Methods in Economic Dynamics*, Cambridge, MA: Harvard University Press.
- M. Miranda and P. Fackler (2002) *Applied Computational Economics and Finance*, Cambridge, MA: MIT Press.
- R. Sundaram (1996) *A First Course in Optimization Theory*, New York, NY: Cambridge University Press.

We break the content of the course into six sections. Note that some of the readings referenced below are mathematically demanding. We will intersperse mathematical background throughout the course and, where appropriate, present simplified versions of the readings. Jean-Jacques Herings will be giving two guest lectures on computational economics during

5. Computation of equilibrium

(a) simplicial methods for fixed points

- R. McKelvey and A. McLennan (1996) "Computation of Equilibria in Finite Games," in, H. Amman, D. Kendrick, and J. Rust, eds, *Handbook of Computational Economics*, Vol. 1, Elsevier: Amsterdam.

(b) static games

- J.-J. Herings and R. Peeters (2001) "A Differentiable Homotopy to Compute Nash Equilibria of n -Person Games," *Economic Theory*, 18: 159–185.
- J.-J. Herings and A van den Elzen (2002) "Computation of the Nash Equilibrium Selected by the Tracing Procedure in n -Person Games," *Games and Economic Behavior*, 38: 89–117.
- T. Turocy (2005) "A Dynamic Homotopy Interpretation of the Logistic Quantal Response Equilibrium Correspondence," *Games and Economic Behavior*, 2005: 243–263.
- J.-J. Herings and R. Peeters (2005) "A Globally Convergent Algorithm to Compute All Nash Equilibria for n -Person Games," *Annals of Operations Research*, 137: 349–368.
- J.-J. Herings and R. Peeters (2006) "Homotopy Methods to Compute Equilibria in Game Theory," working paper.

(c) stochastic games

- J.-J. Herings and R. Peeters (2004) "Stationary Equilibria in Stochastic Games: Structure, Selection, and Computation," *Journal of Economic Theory*, 118: 32–60.

6. Applications

(a) estimation in dynamic models

- V. J. Hotz and R. Miller (1993) "Conditional Choice Probabilities and the Estimation of Dynamic Models," *Review of Economic Studies* 60: 497–529.
- R. Ericson and A. Pakes (1995) "Markov-Perfect Industry Dynamics: A Framework for Empirical Work" *Review of Economic Studies* 62: 53–82.
- V. Aguirregabiria and P. Mira (2002) "Swapping the Nested Fixed Point
E E