Econ 881-32 Quantitative Dynamic Model

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This course covers practical numerical techniques to solve single-agent and industry-level quantitative dynamic models. We will cover important topics in both discrete time and continuous time setups. We will touch upon approximate dynamic programming methods in order to overcome the "curse of dimensionality" problems in realistic applications.

The applications of these techniques center around three broad areas: (1) Solving a dynamic discrete choice model: we look at individual learning, firm innovation, and entry/exit. (2) Solving a dynamic continuous choice model: we look at individual consumption/saving and firm investment/borrowing. (3) Solving a basic continuous time dynamic programming problem: consumer search and product innovation. (4) The application to industry evolution bridges models of competitive industry dynamics w/ models where granular firms are important for aggregate outcomes

Textbook: Applied Computational Economics and Finance, Miranda and Fackler (Chapters 1-6)
Numerical Methods in Economics, Judd (optional, good reference)
Various papers
Homework: This is a class of learning-by-doing. We will cover key concepts and some sample codes in class, but you are also expected to work on the 5-6 problem sets that require you to solve various numerical problems.

Lecture 1: Basics of Solving a Linear/Nonlinear Equation (**Lecture 1**) (More on Norms and Condition Number)
Homework 1 (**Homework 1**) (Due Sep 10th, Please upload via Sakai)
Lecture 2: Optimization and Numerical Integral (**Lecture 2**) (More on Stochastic Optimization)
Homework 2 (**Homework 2**) (Due Sep 17th, Please upload via Sakai)
Lecture 3: Dynamic Discrete Choice Model: Setup and Computation Basics (**Lecture 3**)
Lecture 3: Going over the application of Rust (1997) -- Aw et al (2011) (Details, Appendix) (Lecture 3 code, see Sakai)

Lecture 4: Keane and Wolpin (1994) with application in Crawford and Shum (2005) (**Lecture 4**) (Lecture 4 code, see Sakai)
Homework 3 (**Homework 3**) (Due Oct 1, Please upload via Sakai)

Lecture 5: Functional Approximation (**Lecture 5**) (Lecture 5 code, see Sakai)

Lecture 6: Dynamic Continuous Choice Model: Collocation Method (**Lecture 6**) -- Midrigan and Xu (2010) (Details, Lecture 6 code, see Sakai)
Homework 4 (**Homework 4**) (Due Oct 15, Please upload via Sakai)

Lecture 7: Basics of Continuous Time Dynamic Programming (**Lecture 7**)

Lecture 8: Applications of Continuous Time DP (**Lecture 8**)

Lecture 9: Finite Difference Method for Continuous Time DP -- (Going over the basics of http://www.princeton.edu/~moll/HACTproject.htm)
Please check suggestive answers of the homework in "Resources" folder of Sakai