AED Economics 8200  
Frontiers of Applied Economics  
– Advanced Computational Methods in Economics

Spring Semester 2017 – Second Session

Introduction

AED Econ 8200 is a doctoral level course in applied economics. It carries four graduate credits. The second session of this course introduces students to advanced computational methods in solving dynamic stochastic economic problems, including robust decision making, structural estimation, high-dimensional dynamic stochastic programming, and parallel computing.

Objectives

Upon completion of this course, students will be able to
  • Handle problems of decision making under uncertainty
  • Build and solve dynamic stochastic general equilibrium models
  • Solve high-dimensional dynamic stochastic economic problems using advanced computational methods

Instructor

Yongyang Cai, Associate Professor
Office: Agricultural Administration 326
Office Hours: 1-2pm Monday, 10:30-11:30am Wednesday, or by Appointment
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Prerequisites

This course is designed for PhD students in economics, agricultural, environmental and development economics, and public policy. I assume that students are comfortable with calculus, linear algebra, and statistics. Prerequisites are AED Economics 7110 and 7120, or consent of the instructor.

Format

Two lectures per week (Tuesday & Thursday, 11:30-1:35), Agricultural Administration 247

Coursework and Evaluation

Assignments: Students will be required to complete one project applying advanced computational methods to solve economic problems. Students could complete their projects in small groups (a group with more than two students must obtain approval from the instructor), but all students will be required to present their projects. The project proposals are due on 03/24 (you are highly recommended to discuss your project ideas with the instructor). Topics of the projects should be related to numerical solutions to dynamic
stochastic economic models in any economic fields. Its required software, GAMS, is available on a server (its link is available on the computer screen) that you can access through Desktop Remote Connect or Microsoft Remote Desktop. You can also submit your code to NEOS: https://neos-server.org/neos/solvers/index.html

Course Grading: This course will be graded according to the following weights:
- Class participation: 20%
- Project proposal: 20%
- Final project presentation: 30%
- Final project report with code/data: 30%

Textbooks

No textbook is required. Detailed lecture notes will be distributed freely to course participants. Useful readings include:


Course Policies

Any student who feels s/he may need an accommodation based on the impact of disability should contact me privately to discuss your specific needs.

From the Code of Student Conduct, “Plagiarism is the representation of another’s works or ideas as one’s own; it includes the unacknowledged word for word use and/or paraphrasing of another person’s work, and/or the inappropriate unacknowledged use of another person’s ideas”. Plagiarism is a violation of the Code of Student Conduct and is considered academic misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct (COAM). If COAM determines that you have violated the University’s Code of Student Conduct, the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

Course Topics

Week #8: Dynamic Stochastic Economic Modeling & GAMS
• Introduction to Dynamic Stochastic Economic Modeling
• Introduction to GAMS
• Related Readings: Cai (2010); Judd (1998); McCarl et al (2014); Miranda and Fackler (2002)

Week #9: Numerical Optimization, Differentiation, Integration, and Approximation
• Using GAMS and numerical optimization to solve a life-cycle model
• Using GAMS and numerical optimization, differentiation and integration to solve a continuous-time dynamic model
• Multi-dimensional complete Chebyshev polynomial approximation

Week #10: Solution Methods for Dynamic Stochastic General Equilibrium
• Traditional methods:
  o Projection
  o Perturbation (linearization/log-linearization)
  o Value/policy function iteration
• NLCEQ: Nonlinear certainty equivalent approximation method
Week #11: Model/Parameter Uncertainty
- Robust decision making, expected welfare maximization
- Min-max regret method
- Bayesian learning in dynamic optimization

Week #12: Structural Estimation and Dynamic Stochastic Game
- Computational methods for structural estimation
- Computational methods for dynamic stochastic game

Week #13: Parallel Computing and Advanced Methods in Dynamic Programming
- Introduction to parallel computing (OpenMP and MPI)
- Parallel dynamic programming
- Application in Dynamic Stochastic Integrated Assessment Models
- Related Readings: Cai and Judd (2014); Cai et al (2015a,2015b);

Week #14: Project Presentations