A cemmap Masterclass

Dynamic Programming – Theory, Computation and Empirical Applications

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8-9 December 2015 at CILIP, London

Programme

Day One: Tuesday 8 December 2015

10.30 – 11.00 *Registration and Coffee*

11.00 – 12.30 **Lecture 1: Introduction to Dynamic Programming and Structural Estimation**

12.30-13.30 *Lunch*

13.30-15.00 **Lecture 2: Discrete Decision Problems: Alternative Approaches to Structural Estimation**

15.00 – 15.30 *Break*

15.30 – 17.00 **Lecture 3: Empirical Application of discrete decision problems: Demand for Cars**

Day Two: Wednesday 9 December 2015

09.00 – 09.30 *Coffee*

09.30 – 11.00 **Lecture 4: Continuous and discrete-continuous decision problems**

11.00 – 11.15 *Break*

11.15 – 12.45 **Lecture 5: Empirical Applications of discrete-continuous decision problems: Consumption and Savings, Labor supply and Retirement**

12.45 – 13.45 *Lunch*

13.45 - 15.15 **Lecture 6 and 7: Solving and estimating games of incomplete information**

15.15-15.30 *Break*

15.30-17.00 **Lecture 6 and 7 (continued)**

Lecture plan

Day One

Lecture 1: Introduction to Dynamic Programming and Structural Estimation

Lecturer: John Rust, Bertel Schjerning

Part I: Introduction to Structural Estimation: The Limits of Inference with Theory

Part II: Introduction to structural estimation and discrete decision problems.

- The nested fixed point algorithm (NFXP)
- Counter factual simulations and implied demand (bottom up approach)
- Empirical example: Engine replacement

Lecture 2: Discrete Decision Problems: Alternative Approaches to Structural Estimation

Lecturer: Bertel Schjerning

Part I: Mathematical Programming with Equilibrium Constraints (MPEC)

Part II: Sequential Estimation: Nested Pseudo Likelihood and CCP estimator

Part III: Structural Estimation of Discrete Markov Decision Models by Sieve Approximations

Lecture 3: Empirical Application of discrete decision problems: Demand for Cars

Lecturers: Fedor Iskhakov, John Rust and Bertel Schjerning

Part I: Background DSGE models and stationary/non-stationary Recursive Competitive Equilibria (RCE)

Part II: A Dynamic Model of Vehicle Ownership, Type Choice, and Usage

Day Two

Lecture 4: Continuous and discrete-continuous decision problems

Lecturer: Fedor Iskhakov

Part I: Solving and Estimating model with continuous choice using EGM

- EGM method and its generalizations in one and multiple dimensions
- Comparison of solution and estimation methods: VFI vs EGM, and EGM/NFXP vs MPEC
- Example: Consumption and savings with income uncertainty and liquidity constraints

Part II: Solving and Estimating Discrete-Continuous Choice Models using DC-EGM

- Generalization of EGM for discrete-continuous problems
- Example: Consumption and savings model with retirement

Lecture 5: Empirical Applications of discrete-continuous decision problems: Consumption and Savings, Labor supply and Retirement

Lecturer: Fedor Iskhakov

Part I: Background on solving labor supply models with consumption

Part II: Dynamic programming model of consumption and savings, human capital, labor supply and retirement in Australia

Lecture 6 and 7: Solving and estimating games of incomplete information

Lecturers: Fedor Iskhakov, John Rust and Bertel Schjerning

Part I: Static Games

- Methods: NFXP, MPEC, CCP estimator and Nested Pseudo Likelihood
- Examples: Simple static games

Part II: Finding all Markov Perfect Equilibria of Finite State Directional Dynamic Games

- Method: Recursive Lexicographical Search
  Main example: Bertrand price competition with leapfrogging investments