PhD Coding Lab

Syllabus

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Course's objective

In the **Coding** or Programming **Lab** we develop the playbook of the modern applied and quantitatively minded economist whose ambition is to go beyond classic linear regression analysis. Many empirical research articles in the best journals feature these days a mix of economic modelling, explorative data analysis, and estimation strategies that exploit directly the structure of the initial model. The first objective of this module is to enable students to appreciate better such research designs, which requires a certain familiarity with what have become standard computational methods (such as recursive computations, i.e. dynamic programming). Developing a working knowledge of these techniques could then lead the student to apply them in the context of their own research, in order to go beyond the constraints imposed by classic regression analysis.

We will focus first and foremost on algorithms developed in concrete economic settings (e.g. labour supply, job search), so that students can implement these in the language of their choice. For practical purposes, we illustrate implementations usually in `R` and, if there is sufficient demand, in `Julia` when computation speed is of the essence.

A preliminary list of topics includes dynamic programming using backward induction and value function iterations (e.g. in the context of dynamic labour supply or job search theory), efficient simulation methods, and multi-way fixed effect estimation and its empirical challenges (e.g. in the context of workers sorting into firms). These are but examples, and students are invited to propose their own practical problems and solution approaches.

Outline

- Static labour supply: an exercise in root finding (e.g. Newton's method).
- `Dynamic Programming`, often in the context of job search models
  - finite horizon problems (`Backward Induction`)
    - how to eat cake
    - dynamic labour supply
  - infinite horizon problems (`Value Function Iterations`)

        - A model of growth
    - Papers from the literature:
        - McCall, J.J. (1970, QJE). "Economics of Information and Job Search", *The Quarterly Journal of Economics*, 84, 1, 113-126. `VFI`
        - Shimer, R. (2005, AER). "The Cyclical Behavior of Equilibrium Unemployment and Vacancies", *The American Economic Review*, 95, 1, 25-49. An empirical Search and Matching model. `VFI`
        - Chetty (2008, JPE). "Moral Hazard versus Liquidity and Optimal Unemployment Insurance", *Journal of Political Economy*, 116, 2, 173-234. A simple McCall model with search effort.
- `Multi-way Fixed Effects` (AKM), with applications to worker sorting on the labour market.
    - Card et al. (2013, QJE), "Workplace heterogeneity and the rise of West German wage inequality", *The Quarterly Journal of Economics*.

Course materials

Lectures' notes and other materials are available on AMeTICE.

Validation

A programming exercise in the form of a homework.

Complementary references

Quantecon: Open source computational tools (lectures, web book, code) for economics.