

Dynamic Methods and Applications

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Syllabus

In the first part of this course, students get acquainted with one of the most important techniques for forward-looking decision making, the method of dynamic programming, and with some of its manifold applications in microeconomics, macroeconomics and finance – first in deterministic, then in stochastic settings.

The second part is devoted to dynamic optimization in continuous time, addressing calculus of variations, Pontryagin's Maximum Principle, dynamic programming, and controlled diffusion processes.

Applications covered in the lectures include models of economic growth, individual savings, asset pricing, portfolio choice, and real options. Further applications are addressed in the problem sets.

The main reference for part 1 of the course is:

- Nancy L. Stokey and Robert E. Lucas (with Edward C. Prescott), *Recursive Methods in Economic Dynamics*, Harvard University Press 1994

For part 2, these textbooks are useful:

- Atle Seierstad and Knut Sydsæter, *Optimal Control Theory with Economic Applications*, North Holland 1987
- Morton I. Kamien and Nancy L. Schwartz, *Dynamic Optimization: The Calculus of Variations and Optimal Control in Economics and Management*, Elsevier 1991
- Avinash K. Dixit and Robert S. Pindyck, *Investment under Uncertainty*, Princeton University Press 1994

Finally, the following books cover both discrete and continuous time:

- Angel de la Fuente, *Mathematical Methods and Models for Economists*, Cambridge University Press 2000
- Daron Acemoglu, *Introduction to Modern Economic Growth*, Princeton University Press 2009