Università degli Studi di Roma Tor Vergata
PhD in Economics, Law and Institutions
PhD in Economics and Finance

Optimisation

2019-20 Session

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Course Outline

Section 1.   Static optimisation

Optimisation with several variables. Global optima, concavity and convexity. Non-negativity constraints. Constrained optimisation. Quasi-concave functions. Envelope theorems. Inequality constraints. The Kuhn-Tucker theorem.

Section 2.   Dynamic optimisation under certainty

Dynamic deterministic systems. Alternative approaches to dynamic optimization. Optimal control. Pontryagin's Maximum Principle. Bellman's Principle of Optimality. Applications in economics and finance: intertemporal optimization; investment behaviour; consumption and saving; management of environmental resources.

Section 3.   Dynamic optimisation under uncertainty

Martingales and their applications in economics: PDV capitalization rules, intertemporal stochastic optimisation. Stochastic processes. The Markov property. Wiener process and Brownian motion. Itô processes. Mean-reverting processes. Itô's Lemma. Jump processes. Irreversibility and stochastic investment under uncertainty. Optimal timing of real investment decisions.

Section 4.   Dynamic programming

Introduction to dynamic programming. Non-stochastic and stochastic dynamic programming. Applications: growth, consumption and investment.

References

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Malliaris, A.G., and Brock, W.A., *Stochastic Methods in Economics and Finance*, Amsterdam, North-Holland, 1982.

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