

CEPAR Research Workshop

Primer on Continuous Time Modelling and Optimal Decisions

This brief primer is intended to provide coverage of the basic concepts underlying Continuous Time Modelling and Optimal Decisions. The level of mathematics is not too rigorous and the emphasis is on the intuition and basic applications. It lays the foundation for a deeper study of more advance texts and research articles. It is presented as a workshop series including both lectures and student exercises.

Proposed Schedule: 6 sessions 2-4pm on Mondays: 16 April, 23 April, (no session on 30 April), 7 May, 14 May, 21 May, 28 May

Topic 1: Models for Asset Valuation

Brownian motion: arithmetic, geometric, mean reversion, Ito formula, jump processes, introduction to valuation
Shimko Chapter 1, Dixit Pages 1-15

Topic 2 Valuation of Cash Flows

Differential equations, Laplace transforms, discount rate, recursive techniques
Shimko Chapter 2, Dixit Pages 16-22

Topic 3: Valuation of Derivative Securities

No- arbitrage, forward contracts, European options, equilibrium valuation, American options
Shimko Chapter 3, Dixit Pages 22-32

Topic 4: Optimal Decision Strategies (I)

Maximization, Principle of the Maximum, multiple state variables, inter-temporal strategies, portfolio selection
Shimko Chapter 4

Topic 5: Optimal Decision Strategies (II)

Optimal control, stopping, smooth pasting, irreversible investment, continuous control, impulse control, barrier control
Dixit Pages 32-47

Topic 6: Optimal Decision Strategies (III)

Generalization: mean-reverting processes, finite horizon, characterization of optimal paths, long run stationary distributions, reflecting barriers, Kolmogorov forward and backward equations
Dixit Pages 47-68

References

Finance in Continuous Time: A Primer, David C. Shimko

Art of Smooth Pasting (Fundamentals of Pure and Applied Economics) Avinash Dixit

Presenter: [Professor Michael Sherris](#) is a Chief Investigator in CEPAR. His research interests include longevity risk modelling and management. He has taught finance and investment courses to students and industry professionals since the mid 1980's.