

12F006

6 ECTS

Continuous-Time Finance

Overview and Objectives

The main purpose of this course is to introduce the machinery of stochastic calculus and show how it can be applied to solve the problem of pricing and hedging financial contracts on continuous-time models, such as options, futures and forwards contracts. By the end of the course, students will have good knowledge of how these products work, how are they used, how are they priced and how financial institutions hedge their risks when they trade the products.

.Course Outline

PART I: Stochastic calculus applied to continuous-time financial models.

Brownian motion. Reflection principle. The Itô integral. Itô's formula. Stochastic differential equations. Feynman-Kac formula. The Black and Scholes model. Girsanov's theorem. Risk-neutral measure. Martingale representation theorem.

PART II: Pricing and hedging options in continuous time.

Arbitrage pricing and hedging theory. Fundamental theorems of asset pricing. Exotic options: Asian, barrier and lookback options. Computation of Greeks. Numerical methods.

PART III: Interest rate continuous-time models.

Change of numeraire. Forward and futures. Term-Structure Models. Affine term structures. Forward rate models. Heath-Jarrow-Morton model. LIBOR market models.

Required Activities

TO BE DETERMINED BY PROFESSOR

Evaluation

Homework assignments (30%) and final exam (70%)

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Materials

Shreve S.E., Stochastic Calculus for Finance II, Continuous-Time Models, Springer Finance Textbook.

Lamberton, D. and Lapeyre, B., Introduction to Stochastic Calculus Applied to Finance, Chapman & Hall, Financial Mathematics Series