Continuous-Time Models in Finance
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SCOPE OF THE COURSE

This course is an introduction to the application of mathematics, mostly stochastic processes, to the task of assigning prices or market values to over-the-counter financial instruments.

PROGRAMME

1. Overview of tools form stochastic processes and basic stochastic calculus

2. Financial instruments:

   - Money market instruments. Time value of money.
   - Derivatives

3. Discrete time market models

   - Basic assets, assets and numeraires.
   - Asset pricing theorem.
   - Tree models for equity and interest rates

4. Continuous time models.

   - Black models: equity, interest rates.
   - Convexity adjustments within Black framework.

5. Hedging of financial derivatives.

6. Volatility smiles:

   - Stochastic volatility models: SABR.
   - Local volatility: Dupire.

Along the course and in class, concepts, techniques and results, will be illustrated with real examples with real data.

The main reference for the course is our own set of lectures notes, but as complementary bibliography we suggest:

- *The Concepts and Practice of Mathematical Finance (Mathematics, Finance and Risk)*, by Mark S. Joshi, Cambridge University Press.

- *Options, Futures and Other Derivatives*, by John Hull, 7th Edition, Prentice Hall.

- *Paul Wilmott on Quantitative Finance*, by Paul Wilmott, 2nd Edition (3 volumen set), John Wiley.