

# Advanced Financial Models (L24)

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This course is an introduction to financial mathematics, with a focus on the pricing and hedging of contingent claims. It complements the material in Advanced Probability and Stochastic Calculus & Applications.

The course will cover a selection of topics including:

- *Discrete-time models.* Arbitrage, martingale deflators, the fundamental theorem of asset pricing. Numéraires, equivalent martingale measures. Forwards, options, futures, bonds, interest rates. Attainable claims, market completeness. The Breeden–Litzenberger formula. Fourier pricing. American claims.
- *Continuous-time models.* Admissible strategies. Absolute and relative arbitrage. Existence of replicating strategies. Pricing and hedging via partial differential equations. The implied volatility surface. Dupire’s formula. Stochastic volatility models. The HJM approach to term structure. Merton’s problem.

## Prerequisites

Familiarity with measure-theoretic probability will be assumed.

## Literature

1. M. Baxter & A. Rennie. *Financial calculus: an introduction to derivative pricing.* Cambridge University Press, 1996.
2. M. Musiela and M. Rutkowski. *Martingale Methods in Financial Modelling.* Springer, 2006.
3. D. Kennedy. *Stochastic Financial Models.* Chapman & Hall, 2010.
4. D. Lamberton & B. Lapeyre. *Introduction to stochastic calculus applied to finance.* Chapman & Hall, 1996.
5. S. Shreve. *Stochastic Calculus for Finance: Vol. 1 and 2.* Springer-Finance, 2005.

## Additional support

Four examples sheets will be provided and four associated examples classes will be given. There will be a one-hour revision class in the Easter Term.