

Financial engineering

Aim

This course introduces the basic derivative contracts (forward/futures contracts and options) and their use in risk management. We discuss simple pricing models, laying down the foundation for more sophisticated approaches. Emphasis is placed on numerical pricing methods and their practical implementation in MATLAB, as well as on the discussion of real life business cases.

Content

- An introduction to linear and nonlinear derivatives.
- Option pricing by BSM.
- Use of derivatives in risk management. Discussion of AIFS and Pine Street business cases.
- Sample path generation for stochastic processes; stochastic and deterministic approaches to discretization.
- Option pricing by lattices and trees.
- Option pricing and risk measurement by Monte Carlo methods.
- Variance reduction and low-discrepancy sequences.
- Option pricing by finite differences.

Bibliography

- P. Brandimarte *Numerical Methods in Finance and Economics: A MATLAB-Based Introduction* (2nd ed.). Wiley, 2006.
- P. Brandimarte. *Handbook in Monte Carlo Simulation: Applications in Financial Engineering, Risk Management, and Economics*. Wiley, 2014.
- HBS Case 205026: Hedging currency risk at AIFS
- HBS Case 201071: Pine street capital