FIN-503

Advanced derivatives

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Cursus	Sem.	Type
Financial engineering minor	H	Opt.
Financial engineering	MA1, MA3	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Remark

MA3 only

Summary

The course covers a wide range of advanced topics in derivatives pricing

Content

Models of local volatility and stochastic volatility, pricing of European-style option using the implied distribution, numerical methods including pricing of American-style options by simulation and finite difference, exotic derivatives (such as barrier options and cliquets), volatility derivatives (such as variance swaps), and term structure modeling.

Keywords

Derivatives, volatility, numerical methods

Learning Prerequisites

Required courses

- Derivatives
- Introduction to finance
- Investments
- Stochastic calculus

Learning Outcomes

By the end of the course, the student must be able to:

- Describe properties of asset returns and implied volatility surfaces
- Compare and contrast different methods for modeling implied volatility surfaces including local volatility and stochastic volatility
- Implement the pricing models for any European-style option using the implied distribution.
- Design efficient simulation schemes for pricing options with path-dependent payoffs and early exercise features
- Implement simple finite difference schemes
- Explain the decomposition of structured products into their underlying option components; understand the model risk associated with pricing and hedging exotic derivatives and structured product.

- Demonstrate the model-independent pricing of variance swaps; explain empirical results about volatility risk premiums
- Explain the properties of term structure models and be able to price interest-rate derivatives.

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Take feedback (critique) and respond in an appropriate manner.

Teaching methods

Lectures and exercises

Assessment methods

40% combined weight on assignments given during the course
60% final exam - closed-book

Resources

Bibliography

The main textbook for the course is
Jim Gatheral, The Volatility Surface, Wiley, 2006.

In addition, a number of journal articles will be used.

Ressources en bibliothèque

- Find the references at the Library

Moodle Link

- https://go.epfl.ch/FIN-503