Computational Finance
Introduction

Dr. P. Parczewski

FSS 2020

Team

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Secretary:

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Research group:

Stochastic Numerics (Prof. Dr. Neuenkirch)

Lecture

- Lecture:

  Wednesday 10:15 in B6, A 302 First lecture: 12.02.20

- Tutorial:

  Thursday 13:45 B6, A 302 First tutorial: 27.02.20

- expected deadlines for homework:

  26.02, 11.03, 25.03, 22.04, 06.05, 27.05

Webpage

https://www.wim.uni-mannheim.de/neuenkirch/lehre/aktuelle-veranstaltungen/computational-finance-fss-2020/

- Slides
- Exercise sheets
- Lecture notes (in progress ... will be published on webpage in parts)
- Password in the lecture!

Examination

- Oral examination, dates: June
- requirements for admission to the examination: 50% poinst of the exercises

Requirements: (basic) finance mathematics

- Computational Finance = numerical methods for finance mathematics

- essential problem: option pricing

$$\texttt{fair price} = \sup_{\tau \in \mathcal{E}} \left\{ \mathbb{E}_{\mathbb{Q}} \left[e^{-r\tau} V(S, \tau) \right] \right\}$$

where

$\mathbb{E}$: admissible trading strategies

$S = (S_t)_{t \in [0,T]}$: price process of the asset

V: option payoff

r: riskless rate

$\mathbb{E}_{\mathbb{Q}}$: expectation with respect to a suitable probability measure

explicit formulas are rare!

Contents

Models

- binomial model
- Black-Scholes model
- Heston model
- ...

Methods

- trees & backward iteration
- PDEs & finite differences
- Monte Carlo and Quasi Monte Carlo
- characteristic functions & FFT
- ...

Literature

Monographs:

- P. Glasserman: Monte Carlo Methods in Financial Engineering
- D. Higham: An Introduction to Financial Option Valuation – Mathematics, Stochastics and Computation.
- R. Seydel: Tools for Computational Finance
- S. Shreve: Stochastic Calculus for Finance.
  Volume I: The Binomial Asset Pricing Model
  Volume II: Continuous-Time Models
- P. Wilmott: Derivatives