

Derivatives

Module 4, 2017-2018

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TAs: TBA

Course description

The course is an introduction to the theory and practice of financial engineering. It will cover the non-arbitrage pricing of forward and futures contracts, Black-Scholes-Merton model for option pricing, hedging and replication of derivatives and other important topics. The material will be particularly relevant to students interested in financial markets, securities trading and structured products development involving derivatives.

After the course students are supposed:

- understand the basics of derivative contracts pricing
- calculate the prices and marked-to-market forwards and options
- to know Black-Scholes model in details
- understand how to hedge derivative position
- to get practical aspects about pricing in derivatives markets

Course requirements, grading, and attendance policies

Prerequisites: 1) Calculus. 2) Probability, statistics. 3) An introductory finance course

Grading: The final grade will be based on: 1) 3 homework problem sets (30%). 2) final in-class exam (70%). The final exam will be in LibreOffice electronic tables.

Course contents

- **Introduction to Financial Engineering**
- **Forward and Futures contracts:** Arbitrage arguments. Pricing by arbitrage. Investing, trading, hedging, and arbitrage applications. Foreign exchange, equity, and commodity markets.
- **Interest Rate Review:** Interest rate curve. Compounding period. Forward interest rate. Swaps.
- **Introduction to Options:** Option basics. Model-free properties of option prices. Arbitrage relationship. The binomial model of asset price dynamics. Risk neutral valuation.
- **The Black-Scholes Model:** Modeling stock price behavior. Geometric Brownian motion. Lognormal distribution. Risk-neutral valuation. The Black-Scholes-Merton option pricing formula.
- **Hedging:** Option hedging. Greeks. Synthetic replication and hedging of options. Option hedging. Delta hedging. Greeks. Portfolio Insurance.
- **Volatility:** Implied volatility. Implied distribution. FX and equity smiles. The volatility surface and term structure. Historical versus implied volatility.
- **Structured Products:** Capital protected and Yield enhancement products. Quanto.

Description of course methodology

- Lectures
- Quizzes

Course materials

Required textbooks and materials

- Lecture notes
- John Hull, “Options, Futures, and Other Derivatives”

Additional materials

- Paul Wilmott on Quantitative Finance

Academic integrity policy

Cheating, plagiarism, and any other violations of academic ethics at NES are not tolerated.