Structured Products

MAF, Module 9, 2017-2018

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Course information

Course Website: https://my.nes.ru

Instructor's Office Hours: by assignment

TAs: n/a

Course description

The course can be considered as a continuation of a Derivative course with the goal to cover advance topics of Financial Engineering. The course will be very applied, and all calculations will be implemented in Jupyter notebooks (Python). The material includes Monte Carlo simulation, Structured Products and Interest rate derivatives.

Course requirements, grading, and attendance policies

Prerequisites:

1. Derivatives
2. Python Programming

Grading:

1 homework	**30%**
Project	**70%**

Software and tools: Jupyter notebook, LibreOffice

Course contents

- Monte Carlo (MC) simulation
  - Principles of Monte Carlo
  - Pricing Derivatives by MC

  - Variance Reduction
  - Applications: Exotic derivatives pricing

- Fixed income Structured Products
  - Callable and putable bonds. Black's model.
  - Fixed Income structured notes. Range accrual and Step-up notes

- Multi-asset derivatives
  - Modelling correlation between financial assets
  - Quanto. Application: Hedging risk exposure of oil company.

- Interest rate derivatives
  - Modeling interest rates: BGM model
  - Application: Pricing balanced guaranteed IR swap

- Securitization
  - Modelling prepayments and defaults
  - Pricing balanced guaranteed IR swap

Description of course methodology

- Lectures
- Homeworks

Sample tasks for course evaluation

Called Bond:
Consider a 5-year fixed rate bond with principle of $100 and coupon 4% per year payable semiannually. This bond is callable at 2-year time with strike price of $100. Assuming that the quoted volatility for the forward yield over period from 2 to 5 years is 20% and flat yield curve at 4% compounded continuously, compute the current price of above callable bond.

Course materials

Textbooks and materials

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

Academic integrity policy

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