Advanced Derivatives
(Cod. 20245)

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1. Course Objectives

The course is aimed at gaining a more advanced knowledge of financial derivatives. In the first half of the course the basic principles of no arbitrage valuation are bridged with the trading practices of plain vanilla options and market volatility estimation and pricing. A central role is played by the explanation of the procedure which is currently applied to build a Volatility Index using a portfolio of quoted options. The notion of implied volatility surface and their dynamical evolution is introduced analyzing the class of local volatility market models. The second half of the course will focus on the Heston Stochastic Volatility Model (HSVM). A general pricing methodology for plain vanilla and exotic contracts will be discussed. Then the HSVM will be used to illustrate some practical applications of financial derivatives in investment banking and in the asset management industry. Computer sessions will complement classroom activities.
The lectures held by Pietro Veronesi, Roman Family Professor of Finance, Chicago Booth School of Business will analyze some aspects of the most recent applications of derivatives to the analysis of monetary policy and macro-financial models.

2. Course Structure

- From theory to practice: pricing and trading option contracts
- Market expectations, implied volatility and the volatility index.
- Local volatility modeling
- The limits of the *Black-Scholes* model: stochastic volatility .
- Pricing in stochastic volatility models: a stochastic calculus approach.
- The Heston Stochastic Volatility Model (HSVM)
- Closed-form formulas in the HSVM
- Direct modelling of implied volatility evolution

3. Course Material

- The course material includes academic papers, slides and lecture notes available on the you@B web space.
- Further reading, we suggest a classical text-book on advanced option pricing: J. Gatheral, The Volatility Surface: A Practitioner's Guide, Wiley, 2006;

4. Exam

Student evaluation will consist of a final written exam. Students have the option to complete an assignment during the course. The optional assignment, accounts for 40% of the final mark, while the final written exam accounts for 60% of the final mark.

Each workgroup for the Assignments, composed at most by six people, must send an email to claudio.tebaldi@unibocconi.it with the indication of the group members and the specific subject they intend to analyse before **October 25th**. The assignment must be produced by each group in pdf format and contain the full name and identification number for each group component. The assignment is due by **January 6th 2017** and is delivered by e-mail to claudio.tebaldi@unibocconi.it

The grade obtained in the group assignment remains valid until the September 2016 exam session. In any later session the final exam is worth 100% of the final mark.

The final written exam may consist of both theoretical questions and exercises. According to the general rules at Bocconi, any final work that is marked and receives a mark higher than 18 cannot be refused.

5. Structure of Teaching Sessions

Session	Date	Inst	Subject
1	06/09/15	CT	Option strategies and the Implied Volatility surface
2-3	07/09/15	CT	The Bredeen-Litzenberger formula
4	08/09/15	CT	VIX as a portfolio of options
5	13/09/15	CT	Put Call Parity and Dividend Risk Trading
6-7	19/09/15	PV	TBA
8	20/09/15	PV	TBA
9	22/09/15	CT	Black and Scholes the replication argument revisited
10	27/09/15	CT	Calibration of local volatility models: Dupire formula
11-12	28/09/15	CT	Volatility as a source of risk: the volatility risk premium
13	29/09/15	CT	Pricing in the presence of stochastic volatility
14	04/10/15	CT	The Heston Stochastic Volatility Model (HSVM)
15-16	05/10/15	DM	Monte Carlo method: theory and variance reduction
17	11/10/15	CT	A new approach to option pricing and hedging
18-19	12/10/15	DM	Pricing European and Exotic derivatives via Monte Carlo
20-21	26/10/15	DM	Implementing the Heston Stochastic Volatility Model
22-23	2/11/15	DM	Closed form pricing
24	9/11/15	DM	Option Pricing by Fourier Transform