

Course Outline
Financial Engineering

Autumn 2009

Lecturer: Prof. Valerio Potì
Room: TBA
Office Hours: TBA

Email: valerio.poti@dcu.ie

Assessment: 25% continuous assessment, 75% final exam

Module objectives:

1. To introduce students to financial engineering
2. To introduce students to the theory and practice of derivatives pricing and hedging from a financial engineering perspective
3. To explore applications of financial engineering to portfolio management, risk management and corporate finance

The objective of this module is to study the wide array of tools and techniques that have evolved to manage and transfer risks. The emphasis will be on how elementary payoffs can be combined, either statically or dynamically, to create more complex structures and, conversely, how complex financial contracts and other bundles of payoffs can be decomposed into more elementary ones. This perspective will allow the treatment of both pricing and hedging problems under a unified framework. Financial payoffs will be the main focus but the theoretical framework and the engineering techniques developed during the course should be useful also to analyse and manage risks arising from non financial exposures.

References:

The course textbook will be the following:

S., Neftci, Principles of Financial Engineering, 2nd edition, Elsevier, 2008.

Students are encouraged to read the reference material in the textbook before the lecture. Other references, mainly academic articles and technical documents released by regulators and financial institutions, will be recommended during the course.

Lecture notes will also be available on-line on the “Teaching” page of the lecturer’s website, www.valeripot.com, the day before each lecture.

Other useful references may be the following:

Cuthbertson, K and D. Nitzsche, 2001, Financial Engineering and Risk Management, Wiley (available in the Biblioteca di Dipartimento).

J. Hull, Options, Futures, and Other Derivative Securities, Prentice-Hall, 2009 and earlier editions.

Jackson M. and M. Staunton, 2001, Advanced Modelling in Finance Using Excel and VBA, Wiley (great handbook to learn about programming for finance, learn this stuff and you'll see the difference in your future salary!).

P. Boyle & Feidhlim Boyle, Derivatives: The Tools That Changed Finance (Hardcover), Risk Books, 2001 (a gem of a book on derivatives and their uses, a joy to read, so popular that the authors bought the copyright back from the publisher and now is freely available for download from the book website, at <http://www.thederivativesbook.com/contents.html>).

Tentative Course Outline and Readings

Lecture 1

Introduction: financial contracts as bundles of elementary payoffs, static vs. dynamic replication

Readings: Neftci (2009), Ch 1

Lecture 2

Engineering linear payoffs: forwards (currency forwards, forward loans, FRAs, etc), repos, futures, swaps (especially IRSs)

Readings: Neftci (2009) Ch 3-5 and Ch 13 (Appendix on yield curve and bootstrapping)

Lecture 3

Engineering option payoffs I (static replication): spreads and combinations, directional vs. volatility strategies, exotics

Readings: Neftci (2009) Ch 8.1-2, Ch 10 and Ch 21 (except 21.4-5)

Lecture 4

Risk Neutral Valuation: the Fundamental Theorem of Asset Pricing, linear pricing, martingale properties of arbitrage-free prices

Readings: Neftci (2009) Ch 11.1-5

Lecture 5

Arbitrage-free asset price dynamics: applying the Fundamental Theorem of Asset Pricing to generate arbitrage-free binomial trees, option pricing applications using binomial trees, mention of Monte Carlo simulations, dynamic replication and delta hedging

Readings: Neftci (2009) Ch. 7.5-6 and Ch 11.6-8

Lecture 6

Putting all together: design, creation, pricing and hedging of structured products

Readings: Neftci (2009) Ch. 17