ACTL30004
Advanced Financial Mathematics I

Subject Guide, First Semester 2014

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Subject Outline

Objectives

The so-called “no-arbitrage” concept has a simple origin but has led to a sophisticated theory of derivative pricing, that is used daily in the real world. For instance, a prospective buyer of an option may find that the price asked for by a bank is too high, or a speculator may find that there are profits to be made with certain option contracts, and not with certain others.

Options have been around for a long time, and can be found in all kinds of guises in a variety of financial contracts. In particular, all insurance contracts contain options, many not identified as such. For instance, any guarantee offered by an insurer (death/survival benefit, minimum rate of return or interest rate, conversion rates,...) is an option held by the insured. Pricing these options proceeds in pretty much the same was as pricing traded options on shares. This is why actuaries need to know about option pricing.

We will look at the binomial model, the Black-Scholes model, interest rate models and credit derivatives.

Contents

There is no required textbook, all lecture notes will be available on the LMS. The topics covered are:

- Derivative securities.
- The behaviour of security prices: the binomial models.
- Pricing derivatives using the binomial model.
- Introduction to stochastic calculus.
- Pricing derivatives in the Black-Scholes model.
- Interest rate models, discrete and continuous.
- Credit models

Suggestions of various books will be available on the LMS.

Specimen questions

We will discuss these in class. Solutions will be posted on the LMS in pdf and EXCEL format as appropriate.
Assessment

A 60-minute mid-semester test (20%) and a 2-hour end-of-semester examination (70%). The exam will test understanding of the material. An assignment 10%. The mid-semester will be in on Tuesday 7th week, 15th April.

Practical Information

This subject has three class hours per week.

Video lectures will be posted online together with lecture notes. These videos should be viewed BEFORE class. We will discuss the material in the lecture during class.

All of the material will be available from the ACTL40004/ACTL90003 page in the Learning Management System (LMS), at

http://www.lms.unimelb.edu.au/

Exemption

Students who perform at a suitably high level in this subject and in Financial Mathematics III will be recommended for exemption from the professional subject CT8. The overall mark for the exam parts of the subject is used for exemption purposes.

Other Resources

The website of the Institute of Actuaries and the Faculty of Actuaries (UK) contains past exam papers and solutions for their Subjects 109 and CT8 (109 was the predecessor of CT8 and dealt with almost the same topics). Go to

http://www.actuaries.org.uk/students/exams/preparing/exam_papers

(The solutions are in the “Examiners’ reports”.) It is recommended that you use this resource. Not all questions in those exams relate to this subject, but you will easily be able to find out which ones are relevant.