

ACT370H1S: Financial Principles for Actuarial Science II

Winter 2019

Instructor: Alex Shipilov	Time: M: 11:00 – 12:00 (Tutorials);
TAs: Shuai (Alex) Yang, Penn Liu, Shubo Yan	W: 11:00 – 1:00 (Lectures)
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Welcome to ACT370! In this course, you will be learning about basic theory behind financial derivatives. Such products form an integral part of today's financial markets, and impact anyone working in fields such as actuarial science, financial engineering, economics, or financial regulation. For that reason, it is important that you understand how they work, why they are important and why they are so widely used today. This course is designed to answer these questions, and provide you with the tools you need to enter into more advanced course work.

There are four major themes in this course:

1. Understanding derivative products, including their payoffs, which should mostly be a review from previous actuarial science courses;
2. Understanding derivative characteristics and relationships, including put-call parity and correlation with the underlying variables and parameters;
3. Pricing derivative products under two separate models: the binomial pricing model and the Black-Scholes pricing model, which form the foundation for more advanced financial modeling and pricing theory; and
4. Option Greeks, delta hedging and exotic options.

By the end of this course, you should feel comfortable applying the techniques you learnt to price basic financial derivative products. Actuarial exam writers should be prepared to write roughly the first half of Exam IFM, which is revised and renamed version of Exam MFE (Models for Financial Economics).

Objectives: This course is essentially designed to help you prepare for the Society of Actuaries Exam IFM: Investment and Financial Markets. As such, midterms and exams will to a large extent follow the format of the SOA exams. This course, combined with ACT245 and ACT460, gives you most of the background necessary to write Exam IFM (though some self-study is still required).

Prerequisites: A basic understanding of financial instruments, a solid understanding of the time value of money (to the level of ACT245), an introductory course in probability and statistics (including probability distributions, pdfs, expectations, etc.), and some mathematical maturity.

Tentative Course Outline:

The course will aim to cover the following topics:

- Introduction to Pricing, Financial Instruments, and Derivatives
 - General ideas behind pricing financial products (Arbitrage, Law of One Price, Risk-Neutral Pricing, Utility Theory, Equilibrium Pricing)
 - Review/Overview of basic financial instruments (Forwards, Futures, Bonds, Options)
 - Comparing Call and Put Options, Put-Call Parity

- Binomial Asset Pricing Model
 - Replicating Portfolios and Risk-Neutral Pricing
 - Multiperiod Trees and American Options
 - Assets other than stocks
 - Utility Theory
- Lognormal Stock Price Model and the Black-Scholes Formula
 - Properties of the Lognormal Distribution and its relation to stock prices
 - Black-Scholes Formula for options on stocks and other assets
 - Option Greeks and Delta-Hedging
- Other topics (Exotic Options, Interest Rate Derivatives)

Recommended Textbook: The recommended textbook for this course is:

- Robert L. McDonald, *Derivatives Markets*, 3rd Ed., Pearson, 2013.

This textbook is also useful if you are writing the Society of Actuaries' Exam IFM: Investment and Financial Markets. There is no required textbook for the course, but problems from the book will be referenced for practice.

Grading Scheme: Homework Assignments (20%), Midterm (30%), and Final (50%). There will be three homework assignments throughout the term. The lowest mark will be dropped.

Important Dates:

Problem Set #1.....	February 7, 2019
Problem Set #2.....	February 28, 2019
Problem Set #3.....	March 28, 2019
MidtermMarch 6, 2019
Final Exam	TBD

Office Hours: Alex Shipilov - Mondays 12:30pm – 2:00pm, or by appointment, in 410B at 149 College Street, Stewart Building. Shubo Yan – Thursdays 5:00pm – 6:00pm in SS623B.

Late Policy and Make-up Exams: Late assignments will not be accepted, nor will make-up midterms be granted. If a midterm is missed for a valid medical excuse (accompanied by a valid doctor's note as per University guidelines), the weight of the midterm will be shifted to the final exam. Homework assignments are due at 6pm on the day of the deadline. They can be handed in to Shubo Yan during his office hour on Thursdays. If for some reason you are unable to attend the office hour on the day an assignment is due, you must e-mail me **in advance** to arrange an alternate way to hand in the assignment (note that the deadline will remain the same). If you have any questions about this, please feel free to ask me.

Academic Honesty: Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual

academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto Code of Behavior on Academic Matters (<http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun011995.pdf>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If students have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, they are expected to seek out additional information on academic integrity from their instructors or from other institutional resources.

Canadian Institute of Actuaries (CIA)s University Accreditation Program (UAP): ACT370 is an accredited course under the UAP program. The minimum grade needed to apply for an exemption is 75. For detailed information on UAP, please visit the following webpages:

- UAP description:
<http://www.cia-ica.ca/membership/university-accreditation-program---home>
- List of accredited courses offered by University of Toronto:
<http://www.cia-ica.ca/membership/university-accreditation-program---home/accredited/toronto>
- How to apply for CIA exemptions:
<http://www.cia-ica.ca/membership/university-accreditation-program---home/information-for-candidates>

Note: The CIA will grant credits to students for SOA/CAS examinations based on the achievement of the minimum Grade towards Associateship (ACIA) and Fellowship (FCIA) in the CIA. At the time of this agreement, CIA credits are recognized by the following actuarial organizations towards their respective designations:

- Casualty Actuarial Society (CAS): ACAS, FCAS
- UK Institute and Faculty of Actuaries (IFoA): FIA, AIA
- Institute of Actuaries of Australia (IAA): AIAA, FIAA
- Actuarial Society of South Africa (ASSA): AMASSA, FASSA
- American Academy of Actuaries (AAA): MAAA

The CIA does not guarantee that credits granted to students under the CIA UAP will be recognized by any other actuarial organizations towards their actuarial designations.”