



Financial Modelling I, 2018-2019 FM3520B, Section 001

Course Outline

Instructor Information:

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Office hours: TBA

Course Information:

Course Description: This course is a first course in modern financial mathematics: pricing and hedging derivatives securities. We will work in a discrete time setting throughout this course: finance in continuous time is covered in FM4521B and FM3613B. Discrete-time market models, option pricing and replication, risk-neutral valuation and martingale measures, and the fundamental theorem of asset pricing. Discrete-time interest rate models, duration, convexity, and immunization. Black-Scholes, Value-at-Risk, Mean-Variance portfolio analysis, Capital Asset Pricing Model, Simulation.

Prerequisites: Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in the course, you may be removed from the course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from the course for failing to have the necessary prerequisites.

The prerequisites for this course are:

- 1) A minimum mark of 60% in **one of** BUS4413A/B, FM2557A/B, or the former AS2557A/B,
- 2) A minimum mark of 60% in SS2857A/B.

Co-requisites: None.

Anti-requisites: The former SS3520A/B.

Lecture hours: Mon, Wed, Fri @ 1:30-2:20pm in WSC240.

Course Material:

Required textbook:

Robert L. McDonald (2013), *Derivatives Markets* (3rd Edition), Pearson Education, ISBN: 978-0-32154-308-0. Chapters 9-14, 18-21, and 23-25.

Recommended textbooks:

John Hull (2015), *Options, Futures, and other Derivatives* (9th Edition), Pearson Prentice Hall, ISBN: 978-0-13-345631-9. Chapters 1, 2, 5, 10-13, 22, and 31.

Jaksa Cvitanic and Fernando Zapatero (2004), *Introduction to the Economics and Mathematics of Financial Markets*, MIT Press, ISBN: 978-0-262-03320-6. Chapters 1, 3, and 5-8.



Course Objectives:

After completing this course, students understand the fundamental economic and mathematical aspects of financial markets in a discrete-time setting. In particular, students will be able to:

- Use put-call parity to determine the relationship between prices of European put and call options and to identify arbitrage opportunities.
- Calculate the value of European and American options using the binomial model.
- Identify situations where the values of European and American options are the same.
- Interpret option sensitivities, the Greeks.
- Explain and demonstrate how to control risk using the method of Delta-hedging.
- Pricing via risk-neutral valuation and replicating securities using binomial trees.
- Understand the fundamental theorem of asset pricing.
- Compute the Value-at-Risk for assets and portfolios of assets.
- Work with and apply discrete-time interest rate models and understand concepts like duration, convexity, and immunization.
- Construct a Black-Derman-Toy binomial model matching a given time-zero yield curve and a set of volatilities and use this for pricing derivatives.

For actuarial science students please note that this course is one of the CIA accreditation courses. This course, together with FM4521B, cover the learning objectives required in the section of Financial Economics in SOA/CAS Exam MFE. More information regarding SOA can be found here: <https://www.soa.org/education/exam-req/edu-exam-mfe-detail.aspx>.

Methods of Evaluation:

Test: There will be three in class test (combining multiple choice with open-ended questions) each 1 hour long and counting for 15% of the final grade. These test are tentatively scheduled as follows:

First test: Monday, February 4.

Second test: Monday, March 4.

Thirde test: Monday, March 25.

Final Exam: One final exam, 3 hours long, counting for 55% of the total grade. The final exam will be scheduled by the Registrar's Office.

Evaluation: Students will be evaluated on the basis of the three one-hour tests and a final exam. The final mark will be based on a weight of 15% per test and 55% for the final exam.

No electronic devises may be in your possession during test or exams except for a simple scientific calculator.

Course work evaluation prior to course dropping deadline:

Effective September 2016, a new Senate regulation has come into effect. It states that students must receive an evaluation of course work totaling 15% of their final grade at least one week prior to the deadline for withdrawal without academic penalty. The "drop" deadline is March 7, 2019. Course work (i.e., assignment) results returned in class or elsewhere by March 4 meets this requirement. There is no obligation for an electronic posting on OWL or other site. A student's failure to collect such items by March 4 does not constitute grounds for any appeal



Email Communication:

You are welcome to communicate with your instructor by email, but email communication should only be used to provide them with information or to ask a question that requires a brief response. For more lengthy discussions and for discussions on lectures/course material please see your instructor during their scheduled office hours or by appointment. If you do email them, please use your UWO account, as these are often the only emails read (as emails sent from other addresses often get spammed).

Attendance:

Classroom attendance is viewed as an important part of the learning process. Students are advised that excessive absenteeism may result in the student being disbarred from the final exam (see Western Academic Calendar).

Course Website Information:

The instructor will provide weekly summary of lectures and list of topics to be covered the following week. These will be available on the course website on OWL (<http://owl.uwo.ca>). This is the primary method by which information will be disseminated to students. Students should check regular for news and updates. You are responsible for the lecture materials you miss if you are unable to attend the class.

Department Policy on Missed Course Requirements and Student Health and Wellness

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your Dean's office as soon as possible, and contact your instructor immediately. If accommodation is approved by your Dean's office, your instructor will be notified, then it is your responsibility to make alternative arrangements with your instructor. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: http://www.stats.uwo.ca/accommodation_medical.pdf. A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility. The form can be found at: <http://www.stats.uwo.ca/medicalform.pdf>. Or, request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services.

Missed Midterm or Test: The policy of the department of Statistical and Actuarial Sciences is that there will be no make-up exams for a missed midterm. For those that do legitimately miss a midterm and provide the required supporting documentation, the standard practice will be that the weight of the midterm will be reassigned to the final exam. If your reason is not deemed valid, then you will receive a mark of 0.

Student Health and Wellness: As part of a successful student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page



<http://www.music.uwo.ca/>, and our own McIntosh Gallery <http://www.mcintoshgallery.ca>. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>. Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html. To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.

Accessibility: Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

Support Services: Learning-skills counsellors at the Student Development Centre (SDC) (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling. Additional student-run support services are offered by the USC, <http://westernusc.ca/services>. The website for Registrar Services is <http://www.registrar.uwo.ca>.

Classroom Environment:

The Department has adopted a "Mutual Expectations" policy governing the classroom environment and all work submitted by students. The full text of the policy can be found at: http://www.stats.uwo.ca/mutual_expectations.pdf. In summary, the policy was developed under the premise that all interactions between students and faculty should be governed by the principles of courtesy, respect and honesty. Students who are in emotional/mental distress should refer to: Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Canadian Institute of Actuaries University Accreditation Program:

This course is accredited under the Canadian Institute of Actuaries (CIA) University Accreditation Program (UAP). Achievement of the established exemption grade in this course may qualify a student for exemptions from writing certain preliminary exams. Please note, a combination of courses may be required to achieve a single exemption. Please see the following link for full details: <http://www.cia-ica.ca/membership/uap/information-for-students>.