Western Science

Department of Statistical and Actuarial Sciences

FM3520A (Financial Modelling)
2022-2023 Course Outline

1. Course Information

Course Number: FM3520A
Course Name: Financial Modelling
Academic Term: Fall of 2022
Lecture hours: Mon, Wed, Fri @ 12:30-1:30pm
Lecture room: WSC240

Prerequisites: The prerequisites for this course are:
1) A minimum mark of 60% in **one of** FM2557A/B or BUS4413A/B.
2) A minimum mark of 60% in SS2857A/B.

Anti-requisites: The former SS3520A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll it 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.

University Accreditation Program:
This course with a minimum mark of 80%, along with Financial Modelling 2555A and 2557B (minimum mark of 75% in both), can give you an exemption for the IFM exam. Please note that although the IFM is being removed from the SOA preliminary exam system (last sitting is November 2022), the exam credit for IFM is still valuable for the CIA's UAP program.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Dr. Lars Stentoft	lars.stentoft@uwo.ca	WSC 278	519-661-2111 ext.85311	TBD
TA	TBD			TBD

You are welcome to communicate with your instructor by email, but email communication should only be used to provide 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, you must use your UWO account, as these are often the only emails read (as emails sent from other addresses often get spammed).

3. Course Syllabus, Schedule, Delivery Mode

Course Description: This course is a first course in modern financial mathematics and on pricing and hedging derivatives securities. Specific topics covered include: General properties of financial options, binomial pricing model, replication, risk-neutral valuation, and the fundamental theorem of asset pricing; The Black-Scholes option valuation methodology; Option Greeks and risk management; Value-at-risk (VaR) and Conditional VaR; Monte-Carlo simulation to price derivatives and to conduct risk analysis. We will work in a discrete time setting throughout this course - finance in continuous time is covered in FM4521/9521.

Course Objectives: After completing this course, students understand the fundamental economic and mathematical aspects of financial markets in a discrete-time setting and 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, i.e., 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.
- Apply Monte-Carlo simulation to price derivatives and compute risk measures.

Key Sessional Dates:
Classes begin: September 8, 2022
Fall Reading Week: October 31 – November 6, 2022
Classes end: December 8, 2022
Exam period: December 10 – 22

Contingency plan for an in-person class pivoting to 100% online learning
In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online in synchronously mode (i.e., at the times indicated in the timetable). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

4. Course Materials

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

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

Other editions of either of these textbooks may be used but in such cases, it is the students own responsibility to map the relevant chapters.

All course material will be posted on OWL: http://owl.uwo.ca. Students are responsible for checking the course OWL site on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Methods of Evaluation

Test: There will be three in-class 1 hour (50 minutes) long tests (closed book, combined multiple choice and open-ended questions) counting for 15% of the final grade each. These tests are tentatively scheduled as follows:
First test: Friday, September 30.
Second test: Friday, October 21.
Third test: Friday, November 18.
Each test covers the material since the beginning of the term or since the last test.

Final Exam: One final exam, 3 hours long, (closed book, combined multiple choice and open-ended questions) counting for 55% of the total grade. The final exam will be scheduled by the Registrar's Office. The final exam covers all material since the beginning of the term.

No electronic devises may be in your possession during any of the tests or the final exam except for a simple non-programmable scientific calculator.

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. There will be no make-up tests. For those who do legitimately miss a test and provide the required supporting documentation that is approved by Academic Counselling Office, the standard practice will be that the weight of the test will be reassigned to the final exam. If your reason is not deemed valid, then you will receive a mark of 0.

6. Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth 10% or more of the overall course grade:
For work totaling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Absences from Final Examinations
If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

7. Accommodation, Accessibility and other Academic Policies

Religious Accommodation
When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult the University's list of recognized religious holidays (updated annually) at:
https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Accommodation Policies
Students with disabilities should work with Accessible Education (formerly SSD), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mentalhealth) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:
https://www.uwo.ca/health/student_support/survivor_support/get-help.html.
To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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 Accessible Education at (519) 661-2147 if you have any questions regarding accommodations.

9. Additional Information about the University Accreditation Program (UAP) – Canadian Institute of Actuaries (CIA)

Honours Specialization Program in Actuarial Science

If you are in 2nd or 3rd year
If you graduate from with an HSP in Actuarial Science, this course will be one of the courses that you will take in your program that will allow you to be exempt from the preliminary exams of the Society of Actuaries (SOA). This is under the new **CIA program accreditation program.** If your plan is to become a fully qualified actuary working in Canada, then all you would need to do is graduate from your HSP in actuarial science. You would then be eligible for the CIA Capstone Exam. Taking and passing this exam, along with an online module and a practice education course, would make you eligible to become an ACIA (associate of the Canadian Institute of Actuaries).

If you are in 4th year
This course is accredited under the Canadian Institute of Actuaries (CIA) University Course Accreditation Program (UAP) for the 2022-23 academic year. Achievement of the established exemption grade in this course may qualify a student from exemptions from writing certain preliminary exams. **This is the last year of the CIA course accreditation program.**

Major in Actuarial Science
If you are a student in a major in Actuarial Science, the CIA program accreditation program will not apply to you. If your plan is to become a fully qualified actuary, you will need to continue to write and pass the preliminary exams of the SOA. However, for 2022-23 this course is still accredited under the

Canadian Institute of Actuaries (CIA) University Course Accreditation Program (UAP) for the 2022-23 academic year. Achievement of the established exemption grade in this course may qualify a student from exemptions from writing certain preliminary exams. **This is the last year of the CIA course accreditation program.**

Please see the following link for full details:
http://www.cia-ica.ca/membership/university-accreditation-program---home

In addition to the university's internal policies on conduct, including academic misconduct, candidates pursuing credits for writing professional examinations shall also be subject to the **Code of Conduct and Ethics for Candidates in the CIA Education System** and the associated **Policy on Conduct and Ethics for Candidates in the CIA Education System**.
https://www.cia-ica.ca/docs/default-source/2020/220065e.pdf