Western Science

Department of Statistical and Actuarial Sciences

FM 4521B/9521B
Advanced Financial Modelling
Course Outline

1. Course Information

Term: Winter 2023
Venue: WSC 240
Day/time: Tuesday (1130 – 1230) and Thursday (1130 – 1330)

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this 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 a course for failing to have the necessary prerequisites.

2. Instructor Information

Instructors	Email	Office Hours	TA Hours
Dr Rogemar Mamon	rmamon@stats.uwo.ca	Appointment is necessary. Tuesday (1:45 – 2:45PM) and Thursday (12:45 – 2:00PM)	TA hours will be posted. TAs will hold help sessions @ WSC 209 to assist students in clarifying assignment questions and to aid students in understanding solutions to practice exercises/problem sets.

Important
Students must use their Western (@uwo.ca) email addresses when contacting the instructor. Email messages from non-UWO account will NOT be read.

***The subject of your email should have the format:* FM 4521B or 9521B (insert "at most 4 words about your query")**; failure to do so will cause a delayed response. The instructor will endeavour to respond to email messages within 48 hours.

3. Course Syllabus, Schedule, Delivery Mode

Continuous-time models, Brownian motion, stochastic integrals, Ito's lemma. Black-Scholes-Merton market model, arbitrage and market completeness, Black-Scholes PDE, risk-neutral pricing and martingale measures. Greeks and hedging, extensions of Black-Scholes model, implied volatility, American option valuation. Vasicek and Cox-Ingersoll-Ross interest rate models.

Antirequisite(s): The former Financial Modelling 4521F/G.

Prerequisite(s): A minimum mark of 60% in either Financial Modelling 3520A/B, or Financial Modelling 3613A/B and a minimum mark of 60% in Statistical Sciences 2857A/B.

Extra Information: 3 lecture hours.

Course Weight: 0.50

Key Sessional Dates:
Classes begin: 09 January 2023
Reading Week: 18 - 26 February 2023
Classes end: 10 April 2023
Exam period: 13 - 30 April 2023

Note: TAs will hold in-class tutorials in the week of 06-10 Feb 2023 to help students' preparation for Assignment 1 and Midterm Exam 1. All other TA help sessions will be held outside class times.

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, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

4. Course Materials

Main Text: John Hull (2021). *Options, Futures, and Other Derivatives*, 11th edition. Pearson Prentice Hall. **(ISBN: 978-0136939979 and 978-1292410654)**

Reference: Jaksa Cvitanic and Fernando Zapatero (2004). *Introduction to the Economics and Mathematics of Financial*
Markets. MIT Press, Cambridge, Massachusetts.

The course will cover the following chapters of John Hull's textbook:
14: Wiener Processes and Ito's Lemma
15: The Black-Scholes-Merton Model
13: Binomial Trees (on American option valuation)
17: Options on Stock Indices and Currencies
18: Futures Options and Black's Model
19: The Greek Letters
20: Volatility Smiles and Volatility Surfaces
23: Estimating Volatilities and Correlations
26: Exotic Options
31: Equilibrium Models of the Short Rate
32: No-arbitrage Models of the Short Rate

Students are responsible for checking the course OWL site (http://owl.uwo.ca) 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.

All course material will be posted on OWL: http://owl.uwo.ca.

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.

Technical Requirements
Technical requirements for the course if delivery will be online: stable internet connection and computer with working microphone and/or webcam.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignments (2)	20%	[Due dates: 16 February 2023 and 09 March 2023]
Midterm Tests (2)	35%	[In-class Exam 1: 28 February 2023 & In-class Exam 2: 21 March 2023]
Final Exam	45%	[To be determined by the Registrar's Office]

Accommodated evaluations
If you miss a course requirement due to an excused absence (see also Section 6) then the weight of that assessment will be moved to the final exam. If the absence is not excused, then you will receive a grade of zero with no option to submit late or alternate work.

Rounding of marks statement
Across the Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement

Final grades on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

6. Student Absences

If you miss a course component (i.e., assessment worth any percentage of the overall course grade), then 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 Examination
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).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

6. Accommodation and Accessibility

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 University's list of recognized religious holidays (updated annually) at

https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Accommodation Policies
Students with disabilities are encouraged to contact Accessible Education, 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.

7. Academic Policies

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

In accordance with policy,

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 their official university address is attended to in a timely manner.

All electronic devices will NOT be permitted on tests and exams except for a non-programmable calculator that does not make any sound.

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.

If for health and safety reasons this course will have to be continued via online delivery format: Tests and examinations will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

https://remoteproctoring.uwo.ca.

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 (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Learning-skills counsellors at the Student Development Centre (https://learning.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, https://westernusc.ca/services/.