

**MACF 402 (MAST 729/881), Sec. A**  
Mathematical & Computational Finance II  
*Fall 2022*

**Instructor:** Dr. C. Hyndman, Office: LB 921-15 (SGW), Phone: (514) 848-2424, Ext. 5219  
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**Office Hours:** TBA

**Class Schedule:** Tuesdays and Thursdays, 16:15-17:30 in LS-105.

**Text:** **There is no required text. Lecture notes, slides, and exercises are self-contained. Course material can be supplemented with material available on reserve or electronically through the library website. A reference/reading list will be provided on Moodle.**

**Outline:** This course focuses on computational aspects, implementation, continuous-time models, and advanced topics in Mathematical and Computational Finance. Multiple assignment problems will require programming in R. We shall cover the following topics:

- Elements of advanced probability theory;
- Brownian motion and stochastic calculus;
- Continuous-time finance and the Black-Scholes model;
- Monte-Carlo simulation methods for option valuation, variance reduction techniques;
- Partial Differential Equation (PDE) valuation methods: heat equation, numerical solution;
- Volatility: historical volatility, implied volatility surfaces and stylized facts, non-Gaussian option pricing models;
- Risk management, risk measures, the Greeks, hedging;
- American options valuation (PDEs, simulation & regression, dynamic programming);
- Interest rate models;
- Other topics (time permitting).

**Course Evaluation:** Assignments (40%), Midterm Examination (20%), and the Final Examination (40%).

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

### **Academic Integrity and the Academic Code of Conduct**

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: <https://www.concordia.ca/conduct/academic-integrity.html>" [*Undergraduate Calendar, Sec 17.10.2*]

### **Behaviour**

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

### **Use of Zoom**

**Note: Zoom is included as an institutionally-approved technology. This means we have been assured of the privacy protections needed to use freely within the classroom.**

Zoom might be used in this course to facilitate learning at a distance. It may be used to record some or all of the lectures and/or other activities in this course. If you wish to ensure that your image is not recorded, speak to your instructor as soon as possible.

Also, please note that you may not share recordings of your classes and that the instructor will only share class recordings for the purpose of course delivery and development. Any other sharing may be in violation of the law and applicable University policies, and may be subject to penalties.

### **Intellectual Property**

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the [Academic Code of Conduct](#) and/or the [Code of Rights and Responsibilities](#). As specified in the [Policy on Intellectual Property](#), the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

### **Extraordinary circumstances**

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#) the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.