Department of Mathematics & Statistics
Concordia University

MACF 402 (MAST 729/MAST 881), Sec. A
Mathematical & Computational Finance II
Fall 2023

Instructor: Prof. F. Godin, Office: LB 921-05 (SGW), Phone: (514) 848-2424, Ext. 3494
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Office Hours: Tuesdays, 15:00-16:00, and Thursdays, 15:00-16:00.

Class Schedule: Tuesdays and Thursdays, 16:15-17:30. Regular in-class teaching.
Mid-term break: no class between October 10, 2023, and October 15, 2023.

Text: **There is no required text. Lecture notes, slides, and exercises are self-contained.**

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 either R or Python. We shall cover the following topics:

- Overview 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, Greek letters, hedging;
- American options valuation (PDEs, simulation & regression, dynamic programming);
- Interest rate models;
- Other topics (time permitting).

Course Evaluation: **Undergraduates:** Assignments (21%), Midterm Examination (30%), and the Final Examination (49%).
Graduates: Assignments (11%), Midterm Examination (30%), the Final Examination (49%), and a Project (10%).

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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]*

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