MATH 86: MATHEMATICAL FINANCE

Syllabus: Winter 2023
Instructor: John W. Welborn
Location: TBD
Email: John.W.Welborn@dartmouth.edu
Tue/Thu: 2:25 – 4:15 PM
Office Hours: By Request
Wed X-Hour: 5:30 – 6:20 PM

COURSE DESCRIPTION
Financial derivatives can be thought of as wagers on uncertain future financial events. This course will take a mathematically rigorous approach to understanding the Black-Scholes-Merton model and its applications to pricing financial derivatives and risk management. Topics will include arbitrage-free pricing, binomial tree models, measure theory, Ito calculus, the Black-Scholes analysis, derivatives pricing, volatility modeling, and hedging.

PREREQUISITES
MATH 20 and MATH 40, or MATH 60; MATH 23; and COSC 1 or the equivalent.

COURSE TEXTBOOKS

GRADING:
- Problem Sets: 20%
- Midterm Exam: 25% (2/7/23 @ 10:10 AM)
- Final Project: 20%
- Final Exam: 35% (3/10/23 @ 3:00 PM)

EXAMS
The midterm (25%) and final exam (35%) will be open book and open note. Students must do their own work and adhere to the Academic Honor Principle. Students who require testing accommodations must contact me as soon as possible and provide the appropriate documentation.

FINAL PROJECT
Your final project (20%) may be on any topic related to mathematical finance. Students are encouraged to consider either an empirical or theoretical project. Potential topics include local volatility modeling, exotic options pricing formulae, numerical methods, and jump diffusion processes. Projects will be graded on novelty, quality, technical proficiency, and research.

PROBLEM SETS
There will be 4 problem sets due throughout the term. Each assignment is worth 5% of your final grade. For each assignment, you may work in groups of up to 3-4 other students. To complete the assignment, upload a single, clear, and legible PDF document to Canvas.
## FOUNDATIONAL READING

ACADEMIC HONOR PRINCIPLE
Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in and out of the classroom. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Any student who submits work which is not his or her own, or commits other acts of academic dishonesty, violates the purposes of the college and is subject to disciplinary actions, up to and including suspension or separation. All students must follow the Academic Honor Principle.

MENTAL HEALTH
The academic environment at Dartmouth is challenging, our terms are intensive, and classes are not the only demanding part of your life. There are a number of resources available to you on campus to support your wellness, including your undergraduate dean (http://www.dartmouth.edu/~upperde/), Counseling and Human Development (http://www.dartmouth.edu/~chd/), and the Student Wellness Center (http://www.dartmouth.edu/~healthed/).

STUDENT ACCESSIBILITY NEEDS
Students requesting disability-related accommodations and services for this course must notify me as early in the term as possible. This conversation will help to establish what supports are built into my online course. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (SAS; student.accessibility.services@dartmouth.edu; SAS website; 603-646-9900) and to email me their SAS accommodation form. We will then work together with SAS if accommodations need to be modified based on the online learning environment. If students have questions about whether they are eligible for accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

RELIGIOUS OBSERVANCES
Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please contact me before the end of the second week of the term to discuss accommodations.