Math 458/558 Mathematical Finance 1 Fall 2020

Instructor
Brian Hassard, hassard@buffalo.edu.
My office hours are Mon 3-4, Wed 3-4, and by appointment. Send me email and I'll respond with a zoom link.

Times/Location
Lectures M W F 10:20AM - 11:10AM starting Aug. 31, online. Before the first class, you will receive email with access instructions. Please check your email 5-10 mins. before the scheduled class time.

Course Description
Introduces the mathematical theory and computation of modern financial products used in the banking and corporate world. Derives and analyzes mathematical models for the valuation of derivative products.
Requisites: Prerequisite MTH 241 (Calculus 3), co-requisite MTH 306 (elementary differential equations.) Familiarity with (or willingness to learn to use) a spreadsheet.

Topics(tentative)
- Introduction: cash flows, investments and markets, comparison, arbitrage, dynamics, risk, pricing, hedging, random cash flow streams, derivative securities.
- Mean-variance Portfolio Theory: asset return, random variables, random returns, portfolio mean and variance, Markowitz minimum variance portfolio, two-fund theorem, inclusion of a risk-free asset, one fund theorem.
- Capital Asset Pricing Model (CAPM): market equilibrium, market lines, performance evaluation, CAPM as a pricing formula.
- Models and Data: data and parameter estimation.
- Models of Asset Dynamics: binomial lattice model, introduction to stochastic differential equations (random walks, Ito's lemma).
- Basic Options Theory: basic options, put-call parity.
- Black-Scholes Equation for Option Pricing: derivation of the Black-Scholes equation, analytical solutions for special cases.

Homework
There will be both WeBWorK homework and "paper" homework.
WeBWorK at http://ww2.math.buffalo.edu/webwork2/2020_8_MTH458_Hassard/ will become available each Sunday within a few minutes of midnight. The normal due date will be three weeks later, a few minutes before midnight on Monday.
Paper HW will be posted on http://www.nsm.buffalo.edu/~hassard/458/ and submitted via gradescope at https://www.gradescope.com/. When the instructor sets up the first HW assignment on gradescope, you will receive instructions from gradescope. Use a cam-scan application on your cell phone or tablet to scan
your HW to a pdf, and email the pdf to yourself. Then visit gradescope course MTH458 and upload your HW.

Exams

There will be two in class exams during the term and a final during final exam period. Material covered in the exam is anything in the book or presented in lecture. Exams are closed book.

You will need a computer with webcam. For UB minimum computer requirements, see http://www.buffalo.edu/ubit/service-guides/hardware/getting-started-with-hardware/purchasing-or-using-an-existing-computer.html which lists a webcam.

The Math department is developing and implementing new measures to prevent cheating on exams administered remotely. The precise technologies and logistics of exams given this Fall may differ from previous experience.

Grades

Exams 1 and 2 will each count 20%, the final 35%, paper homework 10% and webwork homework 15% towards the course total points. Plus and minus letter grades will be assigned, based on the course total points. In each a course total of 90 points is a guaranteed 'A', 80 points is at least a 'B', 70 a 'C' and 60 a 'D'. The grades will likely be somewhat better than with this scheme.

Students taking the course for graduate credit will be assigned additional or more difficult homework and exam questions. 458 and 558 will have independent letter grade assignments.

Incomplete

If any situation arises that will prevent you from completing the course, contact me by email to request an incomplete. It will be granted provided the situation is beyond your control AND you have completed 50% or more of the course with an average grade of 50% or greater. undergraduate grading policy

Accommodations

If you have a diagnosed disability (physical, learning or psychological) which will make it difficult for you to carry out the course work as outlined, or requires accommodations such as recruiting note takers, readers or extended time on exams and/or assignments, please advise me during the first two weeks of the course so that we may review arrangements for accommodations.

Academic Honesty

You are expected to adhere to the letter and spirit of academic honesty. You can discuss assignments with other students, but the details of the solution as submitted are originally yours. Suspected violations of academic integrity, for example Chegg cheating or misrepresenting Slater solutions as your own, will be investigated with the assistance of the UB Office of Academic Integrity.

Dates

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<thead>
<tr>
<th>Mon Aug 31 First day of class</th>
<th>Fri Nov 6 Test 2</th>
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<tbody>
<tr>
<td>Fri Sept 25 HW1 due</td>
<td>Fri Nov 20 HW3 due; Nov. 25-28 is break</td>
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<tr>
<td>Fri Oct 9 Test 1</td>
<td>Fri Dec 11 Last day of class</td>
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<tr>
<td>Fri Oct 23 HW2 due</td>
<td>Fri Dec 18 8:00AM - 11:00AM Test 3</td>
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