Department of Mathematics  
MICHIGAN STATE UNIVERSITY

MTH 458, Financial Mathematics for Actuaries II, Fall 15  
Instructor: Albert Cohen  
Location and Time: A126 Wells Hall. 12:40 PM to 2:00 PM  
Office: C336 Wells Hall  
Office Hours: Tuesday from 4-7 p.m.  
or by appointment for students whose  
schedules conflict with the regularly-scheduled office hours.  
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Email: acohen@stt.msu.edu  

Text (Course): Derivatives Markets, latest edition  
by Robert L. McDonald Prentice Hall (Pearson)  
Publisher’s Textbook Page  
by Giuseppe Campolieti, Roman N. Makarov CRC Press (Taylor and Francis Group)  

Prerequisites: MTH 361 and STT 441  
Recommended: MTH 235 or MTH 340 or MTH 347H  

Introduction: MTH 458 will help students as they prepare to take a professional actuarial  
exam on financial derivatives.  

In this course, you can expect to learn how to ...evaluate and construct interest rate models.  
Rationally value derivative securities using put-call parity and calculation of European and  
American options. Employ risk management techniques using the method of delta-hedging.  

Our journey together is constructed with the hope that students will interact with each other  
as well as the instructor. The four exams from which the student’s grade are calculated are  
designed to replicate, as best possible, the environment and layout of such a professional exam.  
Specifically, students can expect to encounter word problems and theory questions, to be  
answered under time pressure. The answers required will consist of both written answers and  
all-or-nothing multiple choice answers.  

Please click on the following links for more information on MFE exam requirements from the  
SOA:  

Exam MFE Models for Financial Economics - Main Page  
Exam Updates
Material We Intend to Cover (Please note we will cover as much as possible during the semester!):

- Parts of Chapters 1-8 (review), Chapter 9.
- Chapter 10, (excluding Options on Commodities on page 334.)
- Chapter 11 (Sections 11.1 to 11.4, Appendices 11.A and 11.B.)
- Chapter 12 (Sections 12.1 to 12.5, Appendix 12.A.) Chapter 13, including Appendix 13.B,
- Chapter 14, Chapter 18, Chapter 19 (Sections 19.1 to 19.5.)
- Chapter 20 (Sections 20.1 to 20.6), up to but excluding Multivariate Ito’s Lemma on pages 665-666, and 20.7 (up to but excluding Valuing a Claim on $S^aQ^b$ on pages 670-672 and excluding Finding the lease rate on top one-half of page 669.)
- Chapter 21 (Sections 21.1 to 21.2), excluding What If the Underlying Asset Is Not an Investment Asset on pages 688-690, and 21.3, excluding The Backward Equation on pages 691-692, and excluding the paragraph on page 692 that begins If a probability . . . and through the end of the section.
- Chapter 22 (Section 22.1, but with only those definitions in Tables 22.1 and 22.2 that are relevant to Section 22.1.)
- Chapter 23 (Sections 23.1 to 23.2, pp.744 thru the middle of p.746 only.)
- Chapter 24, Sections 24.1 to 24.5 (up to but excluding Forward rate agreements on pages 806-808.)
- Appendix B.1, Appendix C and including relevant Errata (see publisher web site.)

Unless otherwise stated chapter appendices are not included in the required readings from this text.
1 Conduct of the course

There will be four (4) in class exams. Homework will be routinely assigned and discussed. The student’s semester grade will be computed from the exam scores. Please note that in-class exams contain written and multiple choice questions, but quizzes will be only multiple choice questions. Please also note that quizzes are not announced ahead of time, and are not used for your semester grade, but are rather used as a tool for you to keep up with the assigned homework. Homework is assigned but not graded. Attendance is required to write tests. Please note that, excluding religious observance or medical issues (with doctor’s note), there are no make-ups on exams.

The standards of academic honesty as stated in the Student Handbook will be strictly enforced. Please feel free to collaborate with others on homework; this is the best way to learn. However, write up solutions as your own - do not copy the work of others. You should be able to understand and replicate all that you have written as homework.

Some students qualify for special accommodations such as extra time on tests. Please present documentation supporting such a request as soon as possible, and certainly before the first test. I will assist with all reasonable requests. The grading scheme below has been designed to allow both you and I the greatest flexibility in dealing with missed tests and homework quizzes. No make-up tests will be provided, but as you will see below, the grading scheme is designed to allow for a missed test or a "bad day at the office".

2 Religious Observance Guidelines

From the Office of the Provost:

It bears remembering that it has always been the policy of the University to permit students and faculty/academic staff to observe those holidays set aside by their chosen religious faith. Faculty and staff should be sensitive to the observance of these holidays so that students who absent themselves from class on these days are not disadvantaged. It is the responsibility of those students who wish to be absent to make arrangements in advance with their instructors. Without another simple and dignified way to determine the validity of individual claims, the claim of a religious conflict should be accepted at face value. Please consider the ways in which these planned absences can be fairly and respectfully accommodated. As an institution, we are committed to the value of inclusion, and so our practices must conform to our commitments. I am confident that working together we can continue to build an environment that supports and fosters diversity and inclusiveness.

3 Evaluation

Your course average will be calculated as follows: There will be four (4) semester tests. Each semester test will consist of questions to be answered during an 80 minute class. Each test will be graded on a scale of 0 – 100. Each test will contain some written and some multiple choice questions. **Depending on the pace of the class, I reserve the right to convert Semester Test #4 into a take-home exam, due in class on or before the original date listed in Section 5 below.** There is no final exam, but I will be available during the scheduled final exam period to discuss the semester material. There will be homework assigned, but not collected, during the class. It is highly encouraged to attempt all of the assigned homework. In class quizzes will contain approximately two multiple choice, questions drawn from class notes and homework assigned. Students will be able to consult their previously written homework answers and notes. These quizzes and assigned hw will not be directly used to calculate your semester grade, but the material covered in those will be valuable in preparing for in-class tests. Your semester grade will be composed via

- Highest in-class exam: 50 pts
- Second Highest in-class exam: 30 pts
- Third Highest in-class exam: 20 pts
- Lowest in-class exam: 0 pts

and the grade cutoffs are

- QPA of 4.0: 90 pts
- QPA of 3.5: 85 pts
- QPA of 3.0: 80 pts
- QPA of 2.5: 75 pts
- QPA of 2.0: 70 pts
- QPA of 1.5: 65 pts
- QPA of 1.0: 60 pts.

These cutoffs are guarantees. I may choose to lower some of these cutoffs slightly, but they will not be increased. Thus, it is theoretically possible for all students to earn a 4.0.

Finally, attendance on non-exam class days is not mandatory, but it is has been my experience that attendance is key to passing actuarial courses. Certainly, the material is quite dense at times, and it is my job to help you work through both ideas and details in class.
4 Suggestions to the student

If you want extra help, I will be happy to talk with you. My office location, telephone extension, and e-mail address are listed above. I will be happy to schedule a time to talk outside of class.

You should also find each other to be valuable resources. Working together is encouraged. Much work in mathematics and science rewards a collaborative approach – indeed, evidence suggests that working together enhances learning. Just be certain that when a problem has been solved, everyone understands and writes up his or her own solution. Explaining to others can help your own learning. In other words, I suggest that you are joining a community, and should care about your fellow students. Do not permit friends to neglect their work and do poorly. The educational model most likely to lead to success is a caring and supportive one, not a highly competitive one.

Use your time effectively. This is a class that will serve you the rest of your career, whether it is in Actuarial Science, Mathematics, or Finance. It is also a labor-intensive class that will require your attention and time. Use of this time can be enhanced by:

Effective notetaking. Think in class, don’t just take notes. It helps to go over your notes after class to identify what is important. Leave room to add details later.

Reading ahead. Lectures are important, but certainly do not cover everything and can include only a sample of examples. You need to read the text. Try to work out suggested problems and fill in missing steps as you read. Formulate questions before coming to class.

Consistent effort. Do not put off review and study until test time! Distributing your effort is more effective than cramming just before a test.

Doing problems. Do more problems than are suggested. Write your solutions neatly so that they are useful for review later.

If this seems like a good bit of work, that’s because it is. In the words of Michael Jordan:

“If you do the work, you get rewarded. There are no shortcuts in life.”
5 Important Dates

Dates for all tests will are indicated below. The QPA requirements above are designed to suggest that one missed or poorly written exam is not the end of the world.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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</thead>
<tbody>
<tr>
<td>Wednesday 09/02/2015</td>
<td>Classes Begin. Students should go to regularly scheduled Monday classes on the first day.</td>
</tr>
<tr>
<td>Monday 09/07/2015</td>
<td>Labor Day University closed</td>
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<tr>
<td>Wednesday 09/09/2015</td>
<td>Online open add period for fall semester ends at 8pm.</td>
</tr>
<tr>
<td>Thursday 09/10/2015 to Wednesday 09/16/2015</td>
<td>Students go to Undergraduate office, C212 Wells Hall for Mathematics enrollment changes. (Late adds, drop to lower course, section changes)</td>
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<tr>
<td>Wednesday 09/16/2015</td>
<td>Last day to late add a course or change sections within a course.</td>
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<tr>
<td>Monday 09/28/2015</td>
<td>Exam 1</td>
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<tr>
<td>Monday 09/28/2015</td>
<td>End of 100% Tuition Refund Period</td>
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<tr>
<td>Wednesday 10/21/2015</td>
<td>Middle of Semester. Last day to drop a course without a grade being reported.</td>
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<tr>
<td>Wednesday 10/21/2015</td>
<td>Exam 2</td>
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<tr>
<td>Monday 11/16/2015</td>
<td>Exam 3</td>
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<tr>
<td>Thursday 11/26/2015 to Friday 11/27/2015</td>
<td>Thanksgiving Break</td>
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<tr>
<td>Monday 12/07/2015</td>
<td>Exam 4</td>
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<tr>
<td>Friday 12/11/2015</td>
<td>Last day of classes.</td>
</tr>
<tr>
<td>Thursday 12/17/2015 - 12:45-2:45 p.m.</td>
<td>Discussion Period. Please see grading scheme.</td>
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Although these dates are fixed, the topics covered in each exam may vary slightly, depending on what we have covered in lecture up to that point. Before each exam, there will be up to one class of review where we will go over worked out problems.