Masters of Quantitative Finance  
COURSE NUMBER: 22:839:662  
COURSE TITLE: Financial Modeling II

COURSE DESCRIPTION

This course deals with the sources of value in various derivative securities. After the successful completion of the course you will learn:

- the correct intuition and avoid common mistakes;
- solid understanding of the math language used to describe models;
- practical aspects of hedging exposure and risk management;
  Practical implementation of models: aspects of calibration and numerical techniques.

COURSE MATERIALS

Required Text

<table>
<thead>
<tr>
<th>Author</th>
<th>Shreve, S.</th>
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<tbody>
<tr>
<td>Title</td>
<td>Stochastic calculus for finance II: continuous-time models. Springer.</td>
</tr>
<tr>
<td>ISBN-10</td>
<td>0387401016</td>
</tr>
<tr>
<td>ISBN-13</td>
<td>978-0387401010</td>
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Slides and handouts distributed via Blackboard also constitute a part of the required material.

Tentative Topics and Schedule

The tentative topics and schedule for the course (the dates are in brackets)

II. (9/11, 9/18) Trading strategies and accumulated portfolio gains - Itô integral; Itô (stochastic) calculus; language of SDEs.
III. (9/25, 10/2, 10/9) Our first derivation of the Black-Scholes - PDE. BS intuition about the source of value of derivative securities. ‘Greeks’ and their dynamics. Hedging techniques: delta, gamma, vega - hedging. Beating the market: first introduction to the concept of ‘implied volatility’;

[First computer assignment: hedging in the B-S world]


V. (10/16, 10/23) Fundamental asset pricing theorems. What if we cannot perfectly replicate? Risk-neutral pricing as an approximation. The pricing kernel - risk neutral density representation of a derivative’s price. Monte Carlo pricing. [Second computer assignment: Monte Carlo pricing]

a. Midterm exam (tentative date: 10/30)

VI. (11/6, 11/13) Linking risk-neutral pricing to partial differential equations: the Feynman-Kac theorem. PDE approach and finite difference methods. [Third computer assignment: numerical solution of pricing PDEs]


The above schedule is tentative: the actual coverage (as well as the discussed financial mathematics details) will depend on the difficulty level and pace which is both sufficiently challenging and comfortable for students participating in the class.

Your feedback is always welcome!

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**Grading**

The grading will be done based on 1 midterm exam (which will take place during the semester), a series of computer group assignments, and a cumulative final exam.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
<td>25%</td>
</tr>
<tr>
<td>Computer Assignments</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
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NO extra credit is permissible. The above listed items constitute the entire graded coursework.

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**ATTENTION!**

There is a myth that a student can never be awarded a failing grade for a course in his/her planned final semester before graduation. This is a dangerous misconception! Intended graduation does NOT make students immune from failing grades. All students are graded fairly based exclusively on their academic performance in the course – no other circumstances (like intended graduation, job offers, visa considerations, etc.) can influence the grade of the student. Financial Modeling II is a demanding course because it is meant to teach you a lot of valuable skills and the material requires advanced mathematics. I believe that you have the potential to succeed in the course but it will demand a lot of effort. I put this cautionary notice here exactly because I want all of my students to succeed! Good luck!
Exams

The exam dates will be announced in class at least two weeks in advance. Particular relevant details about the exam material (composition, type of problems) will be communicated during the lectures. All exam and final grades may be curved – the curving will depend on the performance of the students taking the class.

During the exams, the following rules apply:

- One one-sided A4 size formula sheet is allowed for the midterm exam
- One two-sided A4 size formula sheet is allowed for the Final Exam (alternatively, two one-sided A4 size formula sheets)
- No smart phones, tablets, or laptops are allowed in the testing room. Financial and regular calculators are allowed for computation purposes only (not as formula/data storage devices).

Alternate seating: please, do not sit in your usual seat.

Attendance policy: Attendance is required

If you are to be absent, report your absence at https://sims.rutgers.edu/ssra/.
If you cannot attend an exam due to religious observance, a Rutgers-approved activity, illness, or family emergency/death and you seek a makeup exam, please, send me an email and supporting documentation within 7 days of your first absence. Standard practices for make-ups apply: NO make-up exams will be given without a written excuse from the Dean’s office.

Academic Integrity

Cheating is prohibited and can be grounds for dismissal from the university: any student caught cheating will, at a minimum, receive a grade of zero for the item in question. Please, note that Rutgers University Honor Pledge states: “On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment.” Students are responsible for understanding the RU Academic Integrity Policy (http://academicintegrity.rutgers.edu/files/documents/AI_Policy_2013.pdf).

Support Services

If you are a military veteran or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. http://veterans.rutgers.edu/

If you are in need of mental health services, please use our readily available services. Rutgers Counseling and Psychological Services – New Brunswick: http://rhscaps.rutgers.edu/

If you are in need of physical health services, please use our readily available services. Rutgers Health Services – New Brunswick: http://health.rutgers.edu/

If you are in need of legal services, please use our readily available services: http://rusls.rutgers.edu/

If you are in need of additional academic assistance, please use our readily available services. Rutgers University-New Brunswick Learning Center: https://rlc.rutgers.edu/