

Financial Modeling 2

Course Number: 22:839:662:40
Term and Year: Fall 2017

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Office Hours: Tuesday, 11:25 AM

COURSE DESCRIPTION

The course is designed to teach students the fundamentals of pricing and risk management of derivative assets with the continuous time finance techniques. While the focus of the course is on equity derivatives, the short rate and LIBOR market models are also included in the tentative schedule. The course material is designed to address the demands of the modern quant profession and includes lectures on various models addressing the implied volatility surface phenomenon.

Among the main themes of the course are:

- The sources of value in various derivative securities: developing the correct intuition and avoiding common mistakes.
- Solid use of the math language used to describe models.
- Practical implementation of models: calibration and numerical techniques.

The course is targeted to cover the following main material:

- I. Fundamentals of derivative asset valuation with focus on equity derivatives
- II. Models of the implied volatility smile
- III. LIBOR-based models for interest rate derivatives

The course will be quite intensive and will require concentration and discipline. Every lecture builds upon the material of the preceding lectures. The grading system is designed to stimulate continuous effort during the whole course.

COURSE MATERIALS

- Textbooks:

Required: Stochastic Calculus for Finance II: Continuous-Time Models

Shreve, Steven

Publisher: Springer (December 1, 2010)

ISBN-10: 144192311X

ISBN-13: 978-1441923110

Required: The Volatility Smile
Emanuel Derman, Michael B. Miller, David Park (contributions by)
Wiley; 1 edition (September 6, 2016)
ISBN-10: 1118959167
ISBN-13: 978-1118959169

Other sources may be quoted during the lectures, but only the above materials are required.

- Check Blackboard (blackboard.rutgers.edu) and your official Rutgers email account regularly.

LEARNING GOALS AND OBJECTIVES

- This course is designed to help students develop skills and knowledge in the following area(s):

The course serves to facilitate the MQF goal of “Quantitative Finance knowledge. MQF graduates will have a command of quantitative finance theory and practice.”

- Students who complete this course will demonstrate the following:

“Mastery of fundamental quantitative finance concepts”, a stated MQF objective, in the context of derivatives pricing and risk management.

- Students develop these skills and knowledge through the following course activities and assignments:
regular attendance of lectures, satisfactory or better performance during the series of exams, successful completion of the group assignment

PREQUISITES

Financial Modeling I (22:839:571) and **Stochastic Calculus for Finance** (26:711:563)

ACADEMIC INTEGRITY

Students are responsible for understanding the RU Academic Integrity Policy (https://slwordpress.rutgers.edu/academicintegrity/wp-content/uploads/sites/41/2014/11/AI_Policy_2013.pdf)

I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, “On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment.” Don’t let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

ATTENDANCE AND PREPARATION POLICY

- You are expected to attend all classes. If I am to be absent, my department chair or I will send you notice via email and Blackboard as far in advance as possible. If you are to be absent, report your absence in advance at <https://sims.rutgers.edu/ssra/>. If your absence is due to religious observance, a Rutgers-approved activity, illness, or family emergency/death and you seek makeup work, also send me an email with full details and supporting documentation [within 7 days of your first absence].

- For weather emergencies, consult the campus home page. If the campus is open, class will be held.

CLASSROOM CONDUCT

To facilitate everyone's learning experience, please, do not engage in conversations with your fellow students during the lectures. If you have questions regarding the notation and fundamental questions concerning the material being presented, I would welcome your questions. If you would like to ask more elaborate questions, please, note them and I would be happy to discuss these issues during the office hours. This arrangement would allow for smooth presentation of the material.

EXAM DATES AND POLICIES

There are 3 exams in this course:

Exam 1 (September 26) 8:30 AM - 09:50 AM

Exam 2 (October 24) 8:30 AM - 09:50 AM

Exam 3 (November 14) 8:30 AM - 09:50 AM

Location: regular classroom.

During exams, the following rules apply:

- If you have a disability that influences testing procedures, provide me an official letter from the Office of Disability Services at the start of the semester.

- No cell phones or other electronics are allowed in the testing room.

- **Alternate seating**; do not sit next to another student or in your usual seat.

GRADING POLICY

Course grades are determined as follows:

The final grade will be the result of the weighted average of (curved) grades:

Exam 1 weight 20%
Exam 2 weight 30%
Exam 3 weight 25%
Assignment weight 25%

Any material that is covered during the lectures or is in the assigned sections of the textbooks may be tested during the exams. 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.

Assignment is designed to practice the numerical implementation of the models and provide a ‘practical feel’ for the models. Students will be assigned to groups for the purpose to working as independent teams on the assignment. **Assignment to be submitted by the end of the lecture on December 12. ATTENTION: NO** credit will be given for assignments submitted after the end of the lecture on December 12.

Assignment for extra credit is available that can be applied **ONLY** to **POTENTIALLY** increase the total score to achieve the final **minimum passing grade**. Completion of the assignment for extra credit does **NOT** guarantee a **minimum passing grade**.

- Grade posting: Blackboard

The grading will follow the suggested Rutgers template:

“Your final grade is not subject to negotiation. If you feel I have made an error, submit your written argument to me within one week of receiving your final grade. Clarify the precise error I made and provide all due supporting documentation. If I have made an error, I will gladly correct it. But I will adjust grades only if I have made an error. I cannot and will not adjust grades based on consequences, such as hurt pride, lost scholarships, lost tuition reimbursement, lost job opportunities, or dismissals. Do not ask me to do so. It is dishonest to attempt to influence faculty in an effort to obtain a grade that you did not earn, and it will not work.”

COURSE SCHEDULE

<u>Date</u>	<u>Topic</u>	<u>Items Due</u>
September 5	Philosophy of no-arbitrage pricing and a review of stochastic processes and calculus	
September 12	Stochastic calculus concepts in Finance. Black-Scholes Model I: Derivation and Application	
September 19	Black-Scholes Model II: Advanced Aspects	
September 26	Risk Neutral Pricing I	Exam 1
October 3	Risk Neutral Pricing II	
October 10	Risk Neutral Pricing III. Implied asset price distributions and static hedging	
October 17	Connections between Risk Neutral Pricing and PDEs	
October 24	American options	Exam 2
October 31	Implied Volatility Surface, Local Volatility Model	
November 7	Stochastic Volatility Models	
November 14	Models with Jumps	Exam 3
November 21	RECESS	
November 28	Change of Numeraire Techniques	
December 5	LIBOR Market Model I	
December 12	LIBOR Market Model II	Assignment due date (to be submitted by the end of the lecture)

SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. <https://ods.rutgers.edu>

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 University-Newark Counseling Center: <http://counseling.newark.rutgers.edu/>

If you are in need of *physical health* services, please use our readily available services. Rutgers Health Services – Newark: <http://health.newark.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-Newark Learning Center: <http://www.ncas.rutgers.edu/rlc>
Rutgers University-Newark Writing Center: <http://www.ncas.rutgers.edu/writingcenter>