MATH 485 - Introduction to Mathematical Finance
TTh 6:40 - 8:00 PM, Room: HILL 005
Course website

Instructor: Triet Pham, Office: Hill 508, Email: tmp140@math.rutgers.edu
Office Hours: MTh 3:00 - 5:00 pm and by appointment.

Grader: Jianhao Xi Email: jx157@scarletmail.rutgers.edu

Textbook: Mathematics of Finance by Stampfli and Goodman.
Reference:

1. Mathematics for Finance by Capinski and Zastawniak.
2. An Elementary Introduction to Mathematical Finance by Sheldon Ross.
(Capinski and Zastawniak is available at Rutgers library in electronic copy)
3. Course notes

Course Objectives: In this course we will study the mathematical theory and financial concepts used to model and analyze financial derivatives. Topics that we will go over include binomial tree, continuous time stock and interest rate models, option pricing, Black-Scholes formula and hedging. We will also go over the mathematical concepts of martingales and Brownian motion, which are fundamental in understanding these financial models.

Course Outline:

Please note that this is a tentative outline. As the course progesses, we may adjust the pace and / or the material if necessary. It may be that we do not cover the last few topics. There will also be additional notes posted on the course website.

WEEK 1: Introduction to financial markets and derivatives. Ideas of replication and no arbitrage pricing for forward contracts and the one-period model. Probability review. Text: Sections 1.2, 1.3, 2.1.

WEEK 2: Risk neutral measure, pricing and the fundamental theorem of asset pricing for the one period model. Text: Sections 2.2–2.4.

WEEK 3: Multi-period, binomial tree models, I: Pricing European options by backward induction. Text: Sections 3.1, 3.2. See also 4.1, 4.2 for your information.

WEEK 4: Multi-period binomial tree models, II; pricing American options and exotic options. Text: Sections 3.2, 3.3. See also 4.3 for your information.

WEEK 5: Martingales in discrete time. Text: Class notes.

WEEK 6: Hedging and arbitrage. Sections 2.5, 2.6, 3.7. Also revisit 1.2 and 1.3 for your information.

WEEK 7: Continuous time models: Central limit theorem and limit of binomial trees. Brownian motion and geometric Brownian motion. Text: Class notes. Sections 5.1 and 5.2.

WEEK 8: The Black-Scholes model and the Black-Scholes pricing formula. Text: Sections 5.4 and 5.5.

WEEK 9: Analytic approach to Black-Scholes: Stochastic differentials, Ito's rule, continuous time martingales. Text: Class notes, Sections 6.1—6.4.

WEEK 10: The partial differential equation approach to pricing. Application to other options. Text: Sections 6.5 and 6.6.

WEEK 11: Review of the continuous time models, Brownian motion, Ito's formula, Black-Scholes model, Black-Scholes PDE.

WEEK 12: Hedging: delta and other greeks. Text: Chapter 7.

WEEK 13: Interest rates, forward rates, zero-coupon bonds, swaps. Text: Sections 8.1 – 8.3.

WEEK 14: Interest rate models and pricing. Text: Sections 8.4, 8.5.

Grade Breakdown:

Homework: 15 %
Midterm 1: 25 %
Midterm 2: 25 %
Final: 35 %

Calculator policy: Scientific calculators are permitted (and probably needed) in the exams.

Cell phone policy: No cell phone use shall be permitted in class. Violation of this policy may result in the user being asked to leave the class room.

Missing exams policy: Absence from an exam must be discussed prior to the actual exam date with the instructor and with valid reason. If an emergency happens on the exam date, the student must show proof of the emergency to the instructor. In this case, the final exam result shall be used in place of the missed exam. Unexcused absence from an exam will result in a zero in that exam.

Academic Honesty: As a Rutgers University student, you have agreed to abide by the Universitys academic honesty policy, as stated in http://academicintegrity.rutgers.edu. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Extra help: All students are strongly encouraged to come to my office hours to discuss homework problems or any aspect of the course. I am also available by appointments if the office hours do not

fit into your schedule. Sending me emails regarding your questions is also an excellent way to get a prompt response.

University Attendance Policy: Students are expected to attend classes regularly, according to what is stated in http://sasundergrad.rutgers.edu/academics/courses/registration-and-course-policies/attendance-and-cancellation-of-class

Important Dates:

You can also check the final exam schedule here

Student-Wellness Services:

Just In Case Web App

http://codu.co/cee05e

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / https://ods.rutgers.edu/

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation:

https://ods.rutgers.edu/students/documentation-guidelines.

If the documentation supports your request for reasonable accommodations, your campuss disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at:

https://ods.rutgers.edu/students/registration-form.

Scarlet Listeners

(732) 247-5555 / http://www.scarletlisteners.com/

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.