

MATH 622 - Mathematical Finance II
W 6:40 PM - 9:30 PM, Room: PH-111
[Course website](#)

Instructor: Triet Pham, Office: Hill Center Room 207, Email: triet.pham@rutgers.edu

Office Hours: T 2:00 - 3:30 pm, W 4:00 - 5:30 pm and by appointment.

Course grader: Ruofan Yan, Email: 1989yrfyrf@gmail.com

Office Hours: T 9:30 - 10:30 am

Textbook: Shreve, *Stochastic Calculus for Finance II: Continuous-Time Models*.

Reference: Karatzas and Shreve, *Brownian motion and Stochastic Calculus*.

Course Objectives: This course continues the development of the mathematical theory of derivative security pricing begun in Mathematics Finance I and, in addition, focuses on applications to financial models. Topics covered include exotic options (such as barrier, lookback, and Asian options), stopping times, American-style (early exercise) options, McKean's formula for the perpetual American put, change of numeraire and risk-neutral measure, interest rate models, bonds and options on bonds, term-structure models (Heath-Jarrow-Morton model, forward LIBOR model, swap market model), Black's formulae for caps and swaptions. The course ends with an introduction to jump models, including compound Poisson, jump diffusion, and Lévy processes, stochastic calculus and change of measure for jump processes, and option pricing with jump processes.

Course Outline:

This is a tentative outline. As the course progresses, we may adjust the pace and / or the material if necessary.

WEEK 1: Review of Math Finance 1, Forwards and Futures, Girsanov theorem, fundamental theorem of asset pricing, Text: Shreve 5.2, 5.3, 5.4, 5.6

WEEK 2: Dividend paying stock, Text: Shreve 5.5 Connection with PDE, Text: Shreve 6.2, 6.3, 6.4.

WEEK 3-5: Stopping times Text: Shreve 8.2 Running maxima of Brownian motion; pde's formulae for barrier, look-back, and Asian options. Text: Shreve, Chapter 7.

WEEK 5-6: Optimal stopping and the American Option. Text: Shreve, Chapter 8

WEEK 7-8: Models with jumps and stochastic calculus for jump processes. Text: Shreve, Chapter 11.

WEEK 9-10: Change of Numeraire and Its Applications. Forward prices, random interest rates. Text: Shreve, Chapter 9. Week 9: 9.1,9.2,9.3. Week 10: 9.3, 9.4.

WEEK 11-14: Term-Structure Models for Interest Rates; Affine yield and HJM Models, Forward LIBOR and pricing caplets. Text: Shreve, Chapter 10. Week 11: 10.1,10.2, Week 12: 10.2, 10.3, Week 13: 10.2, 10.3, Week 14: 10.3, 10.4.

Grade Breakdown:

Homework: 10 %; Attendance: 10 %, Quiz: 5 %, Midterm 1: 20 %; Midterm 2: 20 %; Final: 35 %

Academic Honesty: As a Rutgers University student, you have agreed to abide by the University's 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.

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>

No cellphone policy: There will be absolutely no cellphone use allowed during lecture. The student who uses cellphone in class for whichever reason will be asked to leave the lecture and lose the attendance / quiz score of that day.

Important Dates:

First midtermMarch 1, 2017
Second midterm April 12, 2017
Final ExamTuesday, May 9 , 4-7 PM, SEC 210

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 professionals 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 campus 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.