

**MATH 628 -Topics in Mathematical Finance: Advanced Risk and Portfolio
Management (ARPM)
W 5:10 - 6:30 pm, Room: HILL 705
[Course website](#)**

Instructor: Triet Pham, Office: Hill 508, Email: tph140@math.rutgers.edu
Office Hours: MTh 3:00-5:00 pm and by appointment.

ARPM Website: [Advanced Risk and Portfolio Management](#)

Course Objectives: The Advanced Risk and Portfolio Management (ARPM) course consists of two components: a six day boot camp from August 13 to August 18, 2018 in New York City (<https://www.arpn.co/bootcamp/>) and a once a week seminar course on campus in the Fall semester. Final grades will be assigned at the end of the course based on the students' attendance on both and performance on an assigned project that utilizes the tools and concepts from the ARPM program.

Master's Degree Essay Requirement: This course satisfies the master's degree essay requirement. For more information see [here](#)

Course Outline:

Please note that this is a tentative outline. As the course progresses, 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 - 3 : Financial Engineering for Investment

The standard financial engineering materials on risk-neutral valuation for derivatives (Black-Scholes, martingales, etc.)

Non-linear actuarial pricing (distortion measures, risk premium arguments, etc.)

Company/deal valuation, typically more tied to the investment banking and strategic consulting professions (discounted cash flows, comparable analysis, etc.).

The connections between valuation, instrument-specific sensitivities (the "Greeks") and the different risk factors in the market.

The techniques (Monte Carlo full repricing, analytical approximations, etc.) to model the value of the different instruments at the future investment horizon, in addition to their present value.

Week 4-6: Data Science for Finance

Introduce all machine learning/artificial intelligence models as generalizations of linear factor models, omnipresent (and mis-used) across finance

Connect the estimation/calibration of all machine learning/artificial intelligence models with classical and Bayesian econometrics

Address backtesting and model/estimation risk in the context of decision theory

Translate machine learning/artificial intelligence inference into market view processing: distributional stress-testing for risk management and portfolio/business construction for portfolio management.

Week 7-9: Quantitative Risk Management

The financial aspects of risk management (risk aggregation, model risk, stress-testing, back testing, exposure computation, risk attribution, etc...)

The mathematical aspects of risk measurement (dependence, copulas, dispersion, etc...)

Covers the above topics in a unified framework across the financial industry: asset management, banking, and insurance; and for both fund risk management and enterprise risk management.

Week 9-12: Quantitative Portfolio Management

The financial aspects of portfolio management (risk-return trade-off, optimal execution, dynamic rebalancing, performance attribution, etc...)

The mathematical aspects of portfolio construction (optimization, views processing, etc...).

Covers the above topics in a unified framework across the financial industry: asset management, banking, and insurance. This module addresses both portfolio construction for funds (asset management) as well as business allocations for enterprises (banking and insurance).

Grade Breakdown:

Weekly project: 50 %

Final report : 30 %

Final presentation : 20 %

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.

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:

The final presentation is during the last day of class. The final report is by the end of Friday of the following week.

[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 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.