FRE-GY 6073
Introduction to Derivative Securities
Fall 2021

Thursdays, 6:00 pm to 8:30 pm
(First meeting: Thursday, September 2nd)
Rogers Hall Room 214

Instructor

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Teaching Assistant

TBA

Office

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Weekly Recitation/Problem-solving Session

There will be optional sessions (led by Leon) on Tuesday afternoons (time TBD), starting on Tuesday, September 7th.

Office Hours

Tuesdays and Wednesday afternoons (time TBD).

Course Overview

Modern-day pricing theory of derivative securities was launched in the 1950's. It drew motivation from the foundational concepts of modern portfolio theory (MPT), introduced by Harry Markowitz in his famous 1952 paper, "Portfolio Selection." The seminal 1973 paper by Fischer

Black and Myron Scholes ("The Pricing of Options and Corporate Liabilities") led to the key realization of "risk-neutral" valuation: The fact that under certain modeling assumptions the price of a derivative does not depend on the expected return of its underlying asset.

Over the years an elegant set of mathematical arguments recast the risk-neutral approach (and its validity) using the powerful notion of an "equivalent" probability measure on the underlying's set of outcomes. In addition, more practical tools were developed to gain intuition for the method, identify its range of applicability, and extend its implementation to many different types of derivative instruments.

This introductory graduate course presents the theory of "arbitrage-free" pricing of derivative securities. All the analysis will be conducted in "continuous time," and in this setting our main mathematic toolkit will be "stochastic calculus" and the related concept of a "stochastic differential equation (SDE)." This toolkit will be developed from its starting point and be guided our knowledge of basic probability and calculus.

A productive approach to the subject blends pricing/hedging theory with frequent references to "real-world" situations: trading or investment problems that recommend the use of derivatives. A deeper dive leads to questions of derivatives "replication," which will lead us to an understanding for how practitioners interpret deploy pricing models.

We will introduce derivative products across the different asset classes (equities, interest rates, foreign exchange) to explore both the unifying elements and the type-specific aspects of the pricing problem.

Upon completion of the course the students will understand the economic rationale for derivative products, the way in which probabilistic models for the "underlying assets" are formulated to begin the pricing calculation, and the mathematical arguments linking those models to the price behavior (and eventual valuation) of the derivative.

Prerequisites

Matriculation in the Financial Engineering MS Program or permission of the FRE Department.

Textbook

Arbitrage Theory in Continuous Time (Third Edition) by Tomas Bjork.

Readings

Articles about derivatives-related strategies from financial publications (e.g. Barron's, The Wall Street Journal).

Homework

There will be four homework assignments. Collaboration on homework is encouraged, but you must write up and turn in solutions individually.

Exams

There will be a midterm exam and a final exam (both open book/notes).

Grading

Homework assignments: 35%
Mid-term: 25%
Final: 40%

Letter Grades

Letter Grade	
A	>= 92.5%
A-	>= 87.5%
B+	>= 82.5%
B	>= 75%
B-	>= 72.5%
C+	>= 67.5%
C	
C-	

Resources

Course materials: NYU Classes (nyu.edu/its/classes).
Databases, journal articles, and more: Bern Dibner Library (library.nyu.edu).
NYU Virtual Business Library (guides.nyu.edu/vbl).
24/7 technology assistance: Tandon IT Help Desk (soehelpdesk@nyu.edu, 646-997-3123).
NYU IT Service Desk (AskIT@nyu.edu, 212-998-3333).

Policy on Academic Misconduct

A. Introduction: The **NYU Tandon School of Engineering** encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of

others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission have been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the **Moses Center for Students with Disabilities** (212-998-4980, mosescsd@nyu.edu) for further information. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for assistance.

Inclusion Statement

The **NYU Tandon School of Engineering** values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me at any time.