Syllabus

FE530: Introduction to Financial Engineering

School of Business

Stevens Institute of Technology

Spring 2023

Instructors: Dr. Majeed Simaan

Course Website: https://sit.instructure.com/courses/64833
Meeting Times: Tuesday 06:30 PM - 09:00 PM

Classroom Location: BC 319 (**capacity** **(https://sit.teamdynamix.com/TDClient/1865/Portal/KB/ArticleDet?ID=79491)**)

Contact Info: **msimaan@stevens.edu (mailto:msimaan@stevens.edu)**

(mailto:msimaan@stevens.edu) Hybrid Office Hours: 03:00-05:00 PM at BC 629 or via Zoom: **https://stevens.zoom.us/j/95467100917** **(https://stevens.zoom.us/j/95467100917)** (**note:** if you would like to come in person to my office hours, please send me an email beforehand to confirm)

Prerequisite(s): see below

COURSE DESCRIPTION

Building on mathematical models of bond and stock prices, the course leverages the two theories in different directions: Black-Scholes arbitrage pricing of options and other derivative securities on the one hand and Markowitz portfolio optimization and the Capital Asset Pricing Model on the other hand. Models based on the no-arbitrage principle can also be developed to study interest rates and their term structure. These are three major areas of mathematical finance, all having an enormous impact on the way modern financial markets operate. The course presents the topics at an introductory level aimed at senior undergraduate students, not only mathematics but also business management, finance, or economics.

STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to
1. understand basic financial concepts in FE, e.g., time value of money and no-arb pricing
2. build discrete-time models, e.g., binomial trees
3. develop continuous-time models, e.g., Brownian motion
4. value different asset classes and derivatives
5. perform statistical and numerical analysis

PREREQUISITES

Prerequisites include elementary calculus, probability, and some linear algebra. For calculus, students are expected to have experience with derivatives and partial derivatives, finding maxima or minima of differentiable functions of one or more variables, the Taylor formula, and integrals. Topics in probability include random variables and probability distributions, in particular, the binomial and normal distributions, expectation, variance and covariance, conditional probability, and independence. Familiarity with the Central Limit Theorem would be a bonus. In linear algebra, the student should be able to solve systems of linear equations, add, multiply, transpose and invert matrices, and compute determinants. For a reference in probability theory, see Probability Through Problems by Marek Capinski and Tomasz Jerzy Zastawniak.

TENTATIVE COURSE SCHEDULE

#	Week	Topic	Readings	Assignment
1	Jan 24, 2023	Introductory Class		
2	Jan 31, 2023	A Simple Market Model	Ch. 1 from CZ	**Refresh Probability Knowledge**
3	Feb 7, 2023	Risk-Free Assets	Ch. 2 from CZ	
4	Feb 14, 2023	Portfolio Management	Ch. 3 from CZ	**HW1 Update** **Presidents' Day Weekend**
5	Feb 21, 2023	Forwards and Futures Contracts	Ch. 4 from CZ	
6	Feb 28, 2023	Midterm Review	Ch. 5 from CZ	**HW1 Due**
7	Mar 7, 2023	**Exam I**		
8	Mar 14, 2023			**Spring Recess** **No Classes**

9	Mar 21, 2023	Options: General Properties		-
10	Mar 28, 2023	Binomial Model	Ch. 6 from CZ	**Project Proposal Due**
11	April 4, 2023	Binomial Model II	Ch. 6 from CZ	
12	April 11, 2023	Continuous-Time Model	Ch. 8 from CZ	**HW2 Update**
13	April 18, 2023	Black-Scholes Model	Ch. 8 from CZ	
14	April 25, 2023	Final Review + Guest Speaker		**HW2 Due**
15	May 2, 2023	Project Presentation		**Final Project Due**
16	May 9, 2023	**Exam II**		-

Notes:

1. The above schedule is subject to changes. Students will be notified beforehand of any significant changes.

2. CZ refers to the main textbook of the class:

Mathematics for Finance: An Introduction to Financial Engineering 2nd ed. 2011 Edition by Marek Capiński and Tomasz Zastawniak

COURSE MATERIALS

Main Textbook

Mathematics for Finance: An Introduction to Financial Engineering 2nd ed. 2011 Edition by Marek Capiński and Tomasz Zastawniak

Additional Suggested Textbooks:

1. Paul Wilmott Introduces Quantitative Finance (second edition)
2. Risk Management and Financial Institutions (Wiley Finance) 4th Edition by John C. Hull
3. Practical Methods of Financial Engineering and Risk Management: Tools for Modern Financial Professionals by Rupak Chatterjee

COURSE REQUIREMENTS & GRADE ALLOCATION

Type	Weight	Notes
Exam I	25%	The exam will be conducted using open-ended questions and will be held in class during the midterm. Further instructions will be distributed.
Exam II	25%	The exam will be conducted using open-ended questions and will be held in class towards the end of the term. Further instructions will be distributed.
Class Project	20%	Students are expected to work as a team and propose a project idea by the midterm. The projects must build on the tools/ideas that are covered in the class, especially stochastic modeling. Additionally, the teams are expected to work with real data. Detailed instructions will be distributed. **Presentation:** upon submission, teams are expected to present their work and highlight individual contribution and synergy. Presentations will be graded on both the team and individual levels.
Homeworks	20%	There will be two major assignments over the course of the semester.
Participation	10%	Discussions are highly encouraged, including class attendance and general participation. Additionally, attendance will be taken over the course of the semester.

Late Policy

Late submissions are not allowed. Please notify the instructor under special circumstances.

Academic Integrity

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at **http://web.stevens.edu/honor/ (http://web.stevens.edu/honor/)**

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at **www.stevens.edu/honor (http://www.stevens.edu/honor)** .

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at **www.stevens.edu/provost/graduate-academics (http://www.stevens.edu/provost/graduate-academics)** .

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

EXAM CONDITIONS

The following procedures apply to exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Room Conditions on the quiz or exam.

1. Exams consist of open-ended questions. Review materials and related prep questions will be provided beforehand.
2. The exam will be undertaken during the class schedule. Further instructions will be provided.
3. The exam is **individual** and team works are **not** allowed.

LEARNING ACCOMMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit **https://www.stevens.edu/office-disability-services (https://www.stevens.edu/office-disability-services)** . If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at **pgehman@stevens.edu (mailto:pgehman@stevens.edu)** or by phone 201-216-3748.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

INCLUSIVITY

Name and Pronoun Usage

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). CAPS is open daily from 9:00 am – 5:00 pm M-F. Evening hours are available by appointment in the Fall / Spring semesters and up-to-date information regarding the availability of evening appointments can be found by visiting **www.stevens.edu/CAPS (http://www.stevens.edu/CAPS)** . To schedule an appointment, call 201-216-5177.

Due to the pandemic, in-person appointments may be limited until further notice. Up-to-date information about the availability of in-person services can be found at **www.stevens.edu/CAPS (http://www.stevens.edu/CAPS)** . Teletherapy (therapy via secure video platform) is available to registered students physically located in the states of New York or New Jersey. Students located outside of NY /

NJ are encouraged to pursue local treatment through their personal health insurance. To learn more about the process of finding a therapist please visit the CAPS webpage on **Seeking Help Off-Campus (https://www.stevens.edu/directory/counseling-and-psychological-services/seeking-help-campus)** .

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at **care@stevens.edu (mailto:care@stevens.edu)** . A member of the CARE Team will respond to your concern as soon as possible.