FRE-GY-6901,
Fixed Income Algorithmic Trading
Spring 2021 (2nd Half)

Instructor Information

- Prof. Sudeep K. Lahiri
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- [Instructor office hours]: TBD
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- **[Pronouns] -** he/him/his

Course Information

- [Course number and section]
FRE-GY-6901

- [Course Title]
Special Topics: Fixed Income Algorithmic Trading (1.5 credits)

- [Course Description]
This is an introductory course on Algorithmic Trading in Fixed Income Securities, building upon some pricing models used in fixed-income and utilizing certain other techniques used in signal processing and factor modeling. The course begins with an overview of markets and basic algorithmic trading techniques employed across equities and fixed income. The course focusses on methods used in fixed income like state-space models and automated hedging techniques. Aspects of risk management and regulatory expectations are also provided at the end, with a brief mention of enhancements using artificial intelligence.

Theoretical concepts learned through the course will be put to practice through programming projects and other assignments. Understanding will be assessed through quizzes and a final exam.

- [Co-requisite or prerequisite, if any]
FRE-GY-6411
Working knowledge of no arbitrage pricing theory, statistics, data analysis, and preferred choice of a *convenient* programming language like MATLAB or Python.

- [Face-to-face class meeting days and times]

None

- [Class room number and building]

Online

- [Virtual (online) meeting days and times, if any]

Online Lectures:
  - Every Friday (6PM-8:45PM, NYT), 2nd Half of Spring 2021 (04/03/21 – 5/15/21)
  - Other help sessions: TBD

Course Overview and Goals

This is an introductory course on Algorithmic Trading in Fixed Income Securities, building upon some pricing models used in fixed-income and utilizing certain other techniques used in signal processing and factor modeling. The course begins with an overview of markets and basic algorithmic trading techniques employed across equities and fixed income. The course focusses on methods used in fixed income like state-space models and automated hedging techniques. Aspects of risk management and regulatory expectations are also provided at the end, with a brief mention of enhancements using artificial intelligence.

Upon completion of this course, students will be able to:

Theoretical concepts learned through the course will be put to practice through programming projects and other assignments. Understanding will be assessed through quizzes and a final exam. Following are expected to be the key takeaways:
- Understanding of Fixed-Income Markets and evolution in Algorithmic Trading
- Understanding of State Space Models
- High-Level view of Algorithmic Trading strategies along with Risk Management

Course Requirements

Class Participation

Mandatory online-attendance in weekly Lectures

Assignments
Mandatory and timely submission of completed assignments

Tests & Quizzes

Projects may be suggested at each lecture along with Home Work. A main take-home Quiz (30% of course-grade) will be conducted at the end of the course.

Assigned Readings

Provided at each lecture.

Grading of Assignments

The grade for this course will be determined according to the following formula:

Assignments/Activities	% of Final Grade
[Example: Class participation]	[20%]
[Example: Quiz]	[30%]
[Example: HomeWorks (per Lecture)]	[30%]
[Example: Projects]	[20%]

Letter Grades

Letter grades for the entire course will be assigned as follows:

Letter Grade	Points	Percent
A	4.00	Example: 92.5% and higher
A-	3.67	Example: 90.0 – 92.49%

B+	3.33	Example: 87.5% - 89.99%
B	3.00	Example: 82.5% - 87.49%
B-	2.67	Example: 80% - 82.49%
C+	2.33	Example: 77.5% - 79.99%
C	2.00	Example: 70.0% - 77.49%
F	.00	Example: 69.99% and lower

View Grades

Grades notified per the procedures of NYU Tandon.

Course Schedule

Topics and Assignments (Every Friday 6-8:45PM NYT, *tentative dates*)

Week/Date	Topic	Reading	Assignment Due
[Week 1, 04/03/21]	Introduction	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture.
[Week 2, 04/10/21]	Overview of Markets	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture.

[Week 3, 04/17/21]	State Space Models	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture.
[Week 4, 04/24/21]	Factor Models	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture.
[Week 5, 05/01/21]	Risk Management	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture. Take-home Quiz provided
[Week 6, 05/07/21]	Applications and Hedging	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture. Quiz-Due
[Week 7, 05/15/21]	Hedging, Market Trends, and Future Work	Lecture Notes (pptx)	Assignments and Projects provided in the Lecture. Quiz Solution & Final Grades

Tests and Quizzes

- Quiz (30%) – Take-home Quiz (due after a week)

Course Materials

Required Textbooks & Materials

- No Text-Book required. Several books suggested as text-books or reference reading materials

Resources

- **Access your 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)
- **Obtain 24/7 technology assistance:** Tandon IT Help Desk (soehelpdesk@nyu.edu, 646.997.3123)
  NYU IT Service Desk (AskIT@nyu.edu, 212-998-3333)

Policies

Academic Misconduct

A. Introduction: The 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 or 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.