



**FIN 620
Advanced Financial Data Analytics
Spring 2024**

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Class Time & Location: CAB:2020, M 6:00 pm - 8:50 pm

Prerequisites: FIN 616 or instructor's approval, and familiarity with at least one programming language
e.g., C, Java, Python, R or MATLAB

Office Hours: M 4:00-6:00 pm

Course Overview

The financial services industry contains numerous data driven applications. For example, large financial institutions utilize Python in tandem with other established technologies to build, enhance, and maintain portions of their core IT and modeling systems. There are also many hedge fund and asset management firms that make heavy use of Python programming when it comes to efficient financial application and data analytics development. Establishing a quantitative view and mastering analytical approaches are critical nowadays for students and professionals in the finance industry. This course will provide essential skills in financial data analytics.

In this course we will delve into the application of data analysis, statistics, and mathematical techniques to quantitative finance. It will heavily focus on the utilization of the Python programming language to implement present day asset pricing models, asset allocation algorithms, and derivative prices. We will also explore topics in the emerging area at the intersection of quantitative finance and machine learning.

More advanced reading materials will be given to graduate students pursuing this course.

Get ready to dive into the exciting world of Python, where all our exercises will take place. No worries if you're new to Python—I've got you covered with essential materials to kickstart your journey. However, it's crucial to put in some dedicated practice and ramp up your pace. This will ensure a smoother experience in the course and help you avoid any potential challenges. Let's make this Python adventure enjoyable and rewarding together! 🐍🇺🇸

Course Materials

In this course, we will cover materials from a variety of sources. Therefore, I list some recommended book and resources. Most likely, you can obtain most of the materials free or with a nominal fee.

Recommended Resources:

- A. **Quantitative Finance with Python: A Practical Guide to Investment Management, Trading, and Financial Engineering** (Chapman and Hall/CRC Financial Mathematics Series) 1st Ed. By Kris Kelliher ISBN: 978-1032014432
- B. **Empirical Asset Pricing; The cross section of Stock Returns**. By Turan Bali, Rovert Engle, and Scot Murray. [You can access the pdf via our Library. ISBN: 9781118095041]
- C. An open source book that thoroughly discusses deep learning techniques along with python implementations. A great book if you are interested in deep learning: Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola: **Dive into Deep Learning**
- D. **Python for Finance: Analyze Big Financial Data**, by Yves Hilpisch, ISBN: 9781491945285
- E. **Derivatives Analytics with Python: Data Analysis, Models, Simulation, Calibration and Hedging**. By Yves Hilpisch, ISBN: 9781119037996

Learning Outcomes

By the end of the course, you will be able to:

- Analyze financial data using tools such as Python and Python libraries.
- Apply advanced data analytics tools in routine financial data analysis tasks.
- Apply the concept of mathematical finance for derivative pricing and portfolio management.
- Synthesize algorithms and data from public sources to produce business results and knowledge
- Evaluate the current state-of-the-art quantitative finance tools.

Course Website

Please go to CANVAS. The Canvas site is where most course materials are posted. Make sure you have an NJIT UCID and password so that you are able to access Canvas. I will use Canvas to post announcements and supplemental materials throughout the semester. **So, please be sure to check the site (canvas.njit.edu) frequently. Please contact helpdesk (973-596-2900) for problems associated with Canvas.**

Course Deliverables/ Final Grade Components

Your grade for this course will be based on the following components:

<u>Component</u>	<u>Weight</u>	<u>Total</u>
1. Class Participation		
Attendance	10%	
Class Discussion	10%	
2. Python Assignments (Four/Five)	40%	40%
3. Final Project		
Progress Report (Due 8 th Week)	15%	
Final Report (Due Final Week)	25%	40%
TOTAL		= 100%

Final Grades

Grades are a reflection of the level of understanding of course content. Therefore, to achieve the grade of A or B in this class expect to:

- Be prepared. This means actively participating in discussions, exercises, and activities to further understanding.
- Turn in all course deliverables in a timely and professional manner.

With less preparation and participation expect the grade of C or lower.

I have had students be very casual in taking a class for the first part of a term. Then, as the class nears the end, the student realizes a bad grade may be in the future and asks for an extra-credit opportunity or extensions to due dates. This is usually done with a **sad face, a soft voice, and a remorseful heart**. Please know now that such opportunities are not fair to the other students. So, the grading system established in this syllabus is final and no other opportunities exist. This means that each student should take this class seriously from the first week.

Final course grades will be based on the following scale:

Grading Scale

A	90.00-100
B+	87.00-90
B	80.00-86
C+	77.00-79.00
C	70.00-76.00
F	0.00-70.00

Late Assignments

All assignments/projects are expected when due, as stated in your syllabus. Except for valid reasons for late assignments, you will be penalized accordingly: For the first day, you will be penalized 40% of your total point. You will be penalized 20% of your points for each additional day. If you are late for more than four days, you will receive 0 points.

If there is a severe illness or an emergency situation (Valid Reason). In these cases, legitimate documentation of the emergency must be presented and approved by the office of the Dean of Students before extensions will be granted.

Email Etiquette

This is a business course, and the expectation is that you will conform to appropriate business letter writing practice in all of your email to me. The following are the basics.

- Put the course name (e.g. course name or course number) in the subject line
- Identify the subject of the e-mail with a brief but descriptive summary of the topic: include a proper salutation and the assignment details such as the title, homework, or test.
- Proofread your e-mail for proper sentence structure, capitalization, spelling and punctuation.
- Conclude the e-mail message with a proper closing (e.g. Regards, Sincerely) and your full name.

(Note: Do not e-mail requests for additional grade points unless there is an error in the grading. Please note that any grade discrepancies must be addressed within 2 weeks of the assignment due date. Grades are not 'given out' by the professor; they are 'earned' by the student. So, make sure that you 'earn' a grade that you can live with.)

Academic Integrity

Learning is both an individual and a cooperative experience. Asking for and giving help freely in appropriate settings helps you learn. However, you should present only YOUR work as your own. University rules and standards define and prohibit "academic misconduct" by all members of the academic community including students. You are asked and expected to be familiar with these standards and abide by them.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Accommodations

Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure equal educational opportunities for all students regardless of their disability. If you are in need of accommodations due to a disability please contact Scott Janz (oars@njit.edu), Associate Director of the Office of Accessibility Resources & Services (OARS), Kupfrian Hall 201, to discuss your specific needs. A Letter of Accommodation Eligibility from the OARS authorizing your accommodations will be required. Accommodations need to be requested in advance and will not be granted retroactively.

Final Comments

I reserve the right to change any aspect of this syllabus or the course schedule at any time, as the need arises. Students registered for this course assume full responsibility for reading and understanding the course policies as stated above.

Course Schedule

The topics are tentative. Updates will be provided if necessary.

#	Week of:	Course Topics	Due
1	Jan 22	Introduction Quantitative Finance, and Theoretical Underpinnings of Quant Modeling Theories.	
2	Jan 29	Intro to Python, GitHub, NumPy, Array, Pandas, Matplotlib	
3	Feb 5	Working with Financial Datasets	Python assignment
4	Feb 12	Estimation, Inference, and Hypothesis Testing	
5	Feb 19	Analysis of Cross-Sectional Data	Python assignment
6	Feb 26	Analysis of Time Series Data	
7	Mar 04	Panel Data Estimation	Python assignment
8	Mar 11	Spring Recess	
9	Mar 18	Portfolio Theory	Project Progress Report
10	Mar 25	Factor Models and Asset Pricing Test	
11	Apr 01	Modelling Volatility	
12	Apr 08	Introduction to Machine Learning, Different Machine Learning Models	Python assignment
13	Apr 15	Dealing with High Dimensional Data	
14	Apr 22	Dealing with Text Data: News, Tweets, Reddit, NLP Techniques, and Web Scrapping.	Python assignment
15	April 29	Deep Portfolio Management	
	May 5		Final Project Due