Data Analytics in Finance

FINA 6333 for 2024 Spring

Richard Herron

1 Instructor Information

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Office Location: Hayden Hall 409C
Office Hours: Tuesday, Thursday, and Friday from 5 to 6 PM in my office and on Zoom at https://northeastern.zoom.us/my/herron

2 Course Description

> FINA 6333. Data Analytics in Finance. (3 Hours)
>
> Introduces Python and its use as a financial data analytics tool. Python has become one of the most widely used open-source, cross-platform programming languages. Covers the basics of programming in Python and key libraries (NumPy, Pandas, Matplotlib, etc.) used in data analytics, then focuses on implementing various financial models in Python. Topics include single and multifactor portfolio models, portfolio theory and the efficient frontier, algorithmic trading, options and futures, and value at risk.

You can read all The finance course descriptions here: https://catalog.northeastern.edu/course-descriptions/fina

3 Course Materials

3.1 Textbooks

We will use McKinney (2022) as our main textbook. You can read this free textbook here: https://wesmckinney.com/book/

I suggest you use Welch (2022) for refreshers on finance topics. You can read this free textbook here: https://book.ivo-welch.info/home/

3.2 Laptop

You must bring your laptop to every class.

3.3 Software

We will use JupyterLab to write and run Python code in Jupyter Notebooks. I suggest running Python on your laptop, and I will record a video showing you how to install the Miniconda distribution of Python. You can download Miniconda here: https://www.anaconda.com/download/

You can run Python on DataCamp Workspaces, which is convenient but less flexible than your laptop: https://app.datacamp.com/workspace/overview

You can use Quarto to generate high-quality reports for our projects: https://quarto.org/docs/download/index.html

3.4 Jupyter Notebooks

I will maintain a website of our Jupyter Notebooks here: https://richard-herron.quarto.pub/fina-6333-2024-spring/

3.5 Business News

I suggest you read *The Wall Street Journal* daily to be familiar with current business topics. I will share *WSJ* articles with interesting data and visualizations to discuss in class. You can read the *WSJ* for free via the Northeastern University library here: https://subjectguides.lib.neu.edu/currentnews

4 Course Grades

I will assign course grades according to the weights in Table 1.

Table 1: Course Grade Weights

Component	Weight
Team Projects	75%
Team Reviews	15%
Participation and Professionalism	5%
Pre-Class Quizzes	1%
DataCamp	2%
MSFQ Assessment Exam	2%
Total	100%

I will assign letter grades according to the following schedule: 93.00 and above is an A, 90.00 to 92.99 is an A-, 87.00 to 89.99 is a B+, 83.00 to 86.99 is a B, and so on. I will curve course grades up to meet DMSB guidelines. These guidelines are: for graduate courses, no more than 50% of students receive an A or A-; for undergraduate courses, course grade point averages (GPAs) fall between 3.2 and 3.4. The DMSB forbids extra credit.

I will accept late projects but deduct 0.5% percentage points per hour late. I will deduct these points at the end of the semester because I can only use this Canvas grade book tool once. I will not accept late non-projects because they are low-stakes assignments.

4.1 Team Projects

You will complete three projects in self-selected teams of up to five students. You will keep the same teams all semester, and I will not allow group changes. I will provide project assignments at least one week before each due date.

4.2 Team Reviews

After each project, you will review your teammates on Teammates. You will receive your median peer-review score. You can learn more about Teammates here: https://Teammatesv4.appspot.com/web/front/home

4.3 Participation and Professionalism

Class participation and professionalism help you and your peers learn. I will grade class participation and professionalism to help you think long-term. I will randomly take attendance, but attendance is only a floor on participation and professionalism. Here are my minimum expectations:

1. Participation
    a. Preparedness: Read assigned materials and be ready to discuss them in class
    b. Engagement: Contribute to class discussions
    c. Group Work: Collaborate with peers during group activities
2. Professionalism
    a. Timeliness: Arrive to class on time and stay engaged until the end
    b. Respect: Actively listen when others speak and do not interrupt
    c. Communication: Use professional language in class discussions and course communications

Also, I will encourage you to complete small, *ad hoc* assignments by assigning them low-point values under participation and professionalism.

4.4 Pre-Class Quizzes

I will encourage you to prepare for class with pre-class quizzes. You will take these short, multiple-choice quizzes before our first meeting of the week for weeks with lecture recordings except for the first week. I will drop your two lowest quizzes.

4.5 DataCamp

You will complete four courses and earn 10,000 experience points (XP) on DataCamp. Our free DataCamp plan does not tabulate course XP, so courses are pass-fail. These courses will easily earn 10,000 XP, which I will convert to a percent. You will upload completion certificates to Canvas before each due date. I will send a free six-month DataCamp subscription to your University email address.

4.6 MSFQ Assessment Exam

MSFQ students will take the MSFQ assessment exam in this course, which is necessary for the MSFQ program to maintain accreditation. Non-MSFQ students will not take this exam, which will not be part of their course grades.

5 Flipped Classroom, Remote Attendance, and Class Recordings

I will "flip the classroom" this semester, which means each week:

1. Before class, I will record a short, focused lecture

2. Before class, you will:
    a. Read the textbook
    b. Watch the lecture
    c. Take a quiz
3. During class, we will:
    a. Quickly review the lecture
    b. Work practice exercises together
4. After class, you will:
    a. Review your notes
    b. Complete courses and earn XP on DataCamp
    c. Complete projects

I do not plan to allow remote attendance. Instead, I will record lectures and practice exercises. Watching these recordings is not a substitute for participation and professionalism.

6 My Expectations and Recommendations

1. Follow the flipped-classroom guidance above
2. Use DataCamp to practice and test your knowledge
3. The regular-semester guidance is to spend about eight to ten hours per week studying outside of class
4. Seek my help early and often!
    a. I will respond to email questions as best I can. However, hard questions require discussions, so I may ask you to visit me during office hours to discuss them.
    b. I prefer you ask questions on Canvas Discussions if your questions are not personal. My answers often interest other students. Also, other students may answer your question before I do.
5. The DMSB forbids me from offering extra credit, so I will not respond to emails asking for extra credit.

7 Academic Honesty

Northeastern University is committed to the principles of intellectual honesty and integrity. I expect you will not copy the work of others, have others do work for you, or use unauthorized aids beyond what is allowed on assignments, projects, quizzes, and exams. This expectation includes using artificial intelligence (AI) programs, such as ChatGPT and in-person or electronic collaboration with students inside and outside the classroom. This expectation also

includes using calculators not specifically approved by the professor. If in doubt, ask me for guidance.

Any student caught cheating on any assignment, project, quiz, or exam will receive zero points and fail this course. Any student caught cheating will also be reported to the Office of Student Conduct and Conflict Resolution (OSCCR). This report will result in an information-only meeting or a full administrative hearing at the discretion of OSCCR. Additional penalties as prescribed by the University also may apply.

If you have any doubts about academic honesty and integrity, please refer to the University's Academic Integrity Policy: https://osccr.sites.northeastern.edu/academic-integrity-policy/

You can also refer to the Code of Student Conduct: https://osccr.sites.northeastern.edu/code-of-student-conduct/

8 Students with Disabilities

Students needing disability accommodations should visit the Northeastern University Disability Resource Center (DRC).

9 Title IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender identity, in educational programs and activities that receive federal financial assistance. Faculty members are "responsible employees" at Northeastern University, meaning they must report all sex or gender-based discrimination allegations to the Title IX Coordinator. More on Title IX here: http://www.northeastern.edu/ouec/

10 Schedule

Table 2 provides our tentative schedule.

Table 2: Tentative Schedule

Week	Date	Topic	DataCamp	Project	Note
1	1/8	McKinney Ch. 2 – Python Language Basics, IPython, and Jupyter Notebooks			

Week	Date	Topic	DataCamp	Project	Note
2	1/15	McKinney Ch. 3 – Built-in Data Structures, Functions, and Files	Introduction to Python		1, 2
3	1/22	McKinney Ch. 4 – NumPy Basics	Intermediate Python		2
4	1/29	McKinney Ch. 5 – Getting Started with pandas			
5	2/5	Herron – Web Data, Log and Simple Returns, and Portfolio Math	Data Manipulation with Pandas		2
6	2/12	McKinney Ch. 8 – Data Wrangling: Join, Combine, and Reshape	Joining Data with Pandas		2
7	2/19	Project Work		1	1, 3
8	2/26	McKinney Ch. 10 – Data Aggregation and Group Operations			
	3/4	Holiday			4
9	3/11	McKinney Ch. 11 – Time Series	Earn 10,000 XP		2
10	3/18	Herron – Trading Strategies			
11	3/25	Project Work		2	3
12	4/1	Herron – Multi-Factor Models			
13	4/8	Herron – Portfolio Optimization			5
14	4/15	Herron – Simulations			1
15	4/22	Project Work		3	6

Note 1: Monday holiday
Note 2: DataCamp courses and XP are due on Fridays at 11:59 PM
Note 3: Midterm projects and reviews are due on Fridays at 11:59 PM
Note 4: Full-week holiday
Note 5: MSFQ assessment exam in class during the second meeting of the week
Note 6: Final project and review are due on Tuesday at 11:59 PM

References

McKinney, Wes (2022). *Python for Data Analysis*. 3rd ed. O'Reilly Media, Inc.
Welch, Ivo (2022). *Corporate Finance*. 5th ed. Ivo Welch.