MTH 5000: Applied Forecasting of Financial Data

Spring 2026

Course Section: IND CHA1; **Number of Credits:** 1

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Meeting Time & Location: Online or In Person at a Predetermined time and room.

Course sessions will be divided between lecture/discussion, demonstrations, and coding laboratory sessions to gain hands-on experience.

Attendance Policy: While flexibility is an important part of this course, a consistent structure is necessary to support the learning of the entire class. Regular attendance is an essential component of the course, and students are expected to attend all scheduled class meetings. Your participation contributes not only to your own learning, but also to the progress of your peers. If an unexpected situation may arise and you are unable to attend a class session, please communicate as soon as possible so that arrangements can be made and you can stay on track with course expectations.

Course Description: This independent study is a semester-long, project-based course focused on the acquisition, visualization, and forecasting of financial time series data. Students will learn how to access stock market data using publicly available APIs, preprocess and visualize the data, and apply statistical and machine learning-based time series techniques to forecast stock prices and trends.

The course emphasizes hands-on learning and reproducible analysis. By the end of the study, students will complete a comprehensive data analysis project that demonstrates their ability to retrieve real-world financial data, explore its structure, and develop forecasting models with appropriate evaluation and interpretation.

Optional Texts: Hyndman, Rob J., and George Athanasopoulos. *Forecasting: Principles and Practice*. 3rd ed. Melbourne: OTexts, 2021.

Evaluation Criteria: Each student is required to submit a report on selected topics from the independent study. This report should clearly explain the mathematical and statistical methods used, demonstrate a strong understanding of the project goals, and reflect the student's individual contributions. The report should be well organized, mathematically rigorous, and written in a professional academic style.

In addition to the final report, students will be assessed on their ongoing contributions to the team project. This includes their level of engagement in collaborative work, their ability to explain material, and their willingness to support the group's progress.

In addition to delivering a fully functioning program, students will submit a collaborative presentation at the end of the semester. This presentation should clearly communicate the project's objectives, methods, and results, and demonstrate the student's understanding of the material. Students should be prepared to answer questions and explain their choices. Final letter grades will be assigned based on overall performance across the semester, considering the quality of written work, depth of understanding, consistency of effort, collaboration, professionalism, and the final presentation and report.

Academic Integrity and Use of Artificial Intelligence: Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism, and collusion in dishonest acts undermine the college's educational mission and the students' personal and intellectual growth.

Artificial intelligence tools (such as ChatGPT, coding assistants, and similar platforms) may be used **as learning aids**, not as substitutes for your own work. You may use AI to help clarify concepts, check understanding, generate examples, debug code, or explore alternative explanations. But you may not submit AI-generated work as your own or use AI in place of your own thinking and effort. If you are unsure whether a use is appropriate, ask before submitting. Any misuse of AI will be treated as academic misconduct.

Accommodations for Students with Disabilities: Baruch has a continuing commitment to providing reasonable accommodations for students with disabilities. Students with disabilities who may need accommodations to fully participate in this class should contact Student Disability Services (NVC 2-272, phone: 646-312-4590, disability.services@baruch.cuny.edu) unless you already have an accommodation letter on CUNY Accommodate (https://cuny-accommodate.symplicity.com). As accommodations are not retroactive, SDS should be contacted as soon as possible. All discussions between students and Student Disability Services remain confidential. Additional information can be found online at https://www.baruch.cuny.edu/studentaffairs/ossd/disabilityServices.htm.

Learning Goals, by the completion of this independent study, students will be able to:

- Retrieve real-time and historical stock market data using stock market APIs (e.g., Alpha Vantage, Yahoo Finance, or similar).

- Clean, preprocess, and structure time series data for analysis.

- Create informative visualizations of stock price movements, returns, and trends.

- Understand and apply fundamental time series concepts, including stationarity, seasonality, and autocorrelation.

- Implement and compare time series forecasting methods, including:
  - Moving averages and exponential smoothing
  - ARIMA/SARIMA models
  - Introductory machine learning approaches for time series forecasting

- Evaluate forecasting performance using appropriate error metrics.

- Communicate results through a final presentation summarizing the project.

This syllabus is subject to change as the term progresses.

Course Schedule

Class	Weeks	Topics	Meeting Type
	1/25	NO CLASS	
1	2/1	Introduction, Expectations, and Course Goals	ONLINE
2	2/8	Foundations of Time Series Data	ONLINE
	2/15	NO CLASS	
3	2/22	Accessing and Retrieving Financial Data	ONLINE
4	3/1	Data Preprocessing, Exploration, and Visualization	ONLINE
5	3/8	Time Series Forecasting Frameworks	ONLINE
6	3/115	Classical Forecasting Methods I: (Moving Averages, ETS)	ONLINE
7	3/22	Classical Forecasting Methods II: (ARIMA/SARIMA)	ONLINE
8	3/29	Forecasting Methods III (Intro ML Approaches)	ONLINE
	4/5	NO CLASS	
9	4/12	Model Selection	ONLINE
10	4/19	Model Validation I (Diagnostics)	ONLINE
11	4/26	Model Validation II (Interpretation & Limitations)	ONLINE
12	5/5	Rehearsal Presentation	IN PERSON
13	5/7	Final Presentation (Reports Due)	IN PERSON