Financial Econometrics
FIN 657, Fall 2024
Goizueta Business School, Emory University

Instructor: William Mann (william.mann @ emory)

Office hours: Wednesdays, 1:00pm – 3:00pm. You can come to my office (512 in the Goizueta building), or log in via Zoom (link is on Canvas). You can also email me with questions.

Course overview: This course surveys statistical techniques for financial and macroeconomic data.

Our major focus will be on time series econometrics, which is the branch of statistics that models how processes evolve over time, and how their values at any two dates are potentially connected to each other. A major application of time series econometrics is developing techniques for *forecasting* data that rely mainly on information about their recent values, rather than economic insights.

We will start with forecasting techniques based on *smoothing*, which are very popular and easy to apply in practice. Then we will switch to model-based analysis with the ARMA framework. This framework delivers comparable forecasts to the smoothing approach, but with a clearer grounding in statistical theory and more opportunities for analysis beyond pure forecasting. Finally, we will cover models of volatility. These can also be divided into smoothing-based and model-based approaches.

Course webpage: If you are enrolled in the course, you should automatically receive access to the course Canvas page. I use Canvas extensively, so please be sure that you have access, and that you are set to receive email notifications about any announcements that I might send.

Technology: The class is in Python, with extensive use of the `statsmodels` library, which in turn is built on the standard libraries `numpy`, `scipy`, and `pandas`. Our specific environment will be iPython notebooks in Jupyter. Our visualizations will use the `pyplot` library in `matplotlib`. We will pull data by API from two sources: FRED for macroeconomic data, and WRDS for financial data.

With that said, our focus is on the tools from `statsmodels`, and on how to replicate them using basic Python code. So you should pay close attention to these aspects of the code examples that I give you. On the other hand, we are not focused on the specifics of Jupyter, the database APIs that we are using, or the visualization tools of `matplotlib`. So you do not need to study these details as closely.

On Canvas is a notebook `Preliminary.ipynb`. Please make sure you can run it before the first class without any errors! If so, then you should be properly configured for the whole course.

Course grade: Your grade will be based on four homework assignments completed **individually.** They are due before the start of class on Nov 5 (HW #1), Nov 12 (#2), Nov 26 (#3), and Dec 10 (#4). Each homework is worth 25% of the overall course grade. You download each homework from Canvas, and submit it back to the same location by 2:30pm (i.e. the start of class) on the dates listed below.

Accommodation: Students who require accommodation for access and participation should make arrangements before the course starts with Emory's Department of Accessibility Services.

Textbook: Because this is a short course, I will not refer to any specific textbook nor ask you to obtain one. All necessary materials will be posted on the Canvas course website.

Honor code: Any instances that appear to violate the Honor Codes of Emory University or its Goizueta School of Business will be referred to the appropriate Honor Council and handled by that body.

Below is a list of topics we will cover in each class, along with the filenames of the slides and notebooks that we will use. These materials are posted on the course Canvas page.

Date	*Plan*

Thursday, October 24	**Overview, moving-average smoothing, seasonal decomposition.**
	`Preliminary.ipynb`
	`Moving-average smoothing.pdf`
	`MA smoothing and seasonal decomposition.ipynb`

Tues, Oct 29 / Thurs, Oct 31	**Forecasting approaches based on exponential smoothing.**
	`Exponential smoothing.pdf`
	`Exponential smoothing.ipynb`

Tues, Nov 5 / Thurs, Nov 7	**AR(1) processes and unit-root processes.**
	`AR1 and unit root.pdf`
	`AR1 and unit root processes.ipynb`
	Homework 1 due before the start of class on Nov 5.

Tues, Nov 12 / Thurs, Nov 14	**The ARMA framework.**
	`ARMA.pdf`
	`ARMA part 1 – Simulation and estimation.ipynb`
	Homework 2 due before the start of class on Nov 12.

Tues, Nov 19 / Thurs, Nov 21	`ARMA part 2 – Model selection.ipynb` `ARMA part 3 – Forecasting.ipynb`
Tuesday, Nov 26	`ARMA part 4 – Trends and seasonality.ipynb` *Homework 3 due before the start of class on Nov 26.*
Thursday, Nov 28	No class (Thanksgiving break)

Tues, Dec 3 / Thurs, Dec 5	**Volatility models.**
	`Volatility modeling.pdf`
	`GARCH.ipynb`

Tuesday, Dec 10	*Homework 4 due before the start of class on Dec 10.*