Finance 5330: Financial Econometrics

Spring Semester, 2021

Course Information

- Course Dates: January 19 - May 5
- Course Time: TR 16:30 - 17:45 PM
- Course Room: Huntsman Hall 322
- Slack Channel
- Course Canvas

Instructor Information

- Tyler J. Brough
- Office Hours: By Appointment
- Office: BUS 512
- Email: tyler.brough@aggiemail.usu.edu (please use this one and NOT my other one!)

Syllabus

Course Description

This course is a project-based introduction to financial data analysis. The core of the course consists of four modules each centered around a fundamental econometric method. The lectures for each module will consist of the foundational theory for the method as well as the necessary mathematical, statistical, algorithmic, and computational tools and techniques that will support its implementation for your projects.

The mode of the course is applied data analysis rather than theoretical econometrics. The focus is on becoming facile with implementing data analysis techniques for professional applications rather than on conducting proofs of theory for academic research. Foundational theory will be presented as necessary, but even then the focus will be on developing deep intuition and understanding more than mastering abstract mathematical techniques.

This course will call on you to develop three primary modes of thinking that will serve you in your career as a financial data analyst:

1. **Arbitrage Logic:** this course is first and foremost a ***finance*** course. Arbitrage is the central underlying concept all of economics and finance. Developing skills in arbitrage reasoning is a central goal of the course. This

aspect of reasoning will be mainly developed by the areas of application for the projects.

2. **Computational Logic:** this course takes an approach to data analysis that puts computation front and center. Developing computational skills will reinforce not only the mathematical and statistical aspects of data analysis, but also the financial aspects. Computational thinking helps break a problem down and find a practical path to successful implementation. Important techniques from computational mathematics, computational statistics, and computational finance will be introduced.
3. **Statistical Logic:** the main focus of the course will be learning to think statistically about problems in financial data analysis. All meaningful problems in finance and data analysis are necessarily embedded in conditions of uncertainty. There exists a core statistical logic that is distinct from the mathematical. Learning to develop this mode of thinking is an essential step in the life of any successful financial data analyst. We will find that statistical reasoning is essential for proper financial reasoning.

These three ways of thinking are not independent. Quite to the contrary, we will find that they are strongly mutually reinforcing.

Prerequisites

- ECN 4330 or equivalent
- ***Strong economic and statistical logic***
- Some programming experience with R, Python, Julia, Matlab, or similar

Textbooks

The only *required* textbook is the following:

- Financial Econometric Modeling by Hurn, Martin, Phillips, and Yu.

Other books that we may draw from:

- Futures Markets by Duffie.
- Understanding Futures Markets by Kolb & Overdahl.
- Computational Statistics Handbook with MATLAB by Martinez & Martinez
- Market Risk Analysis Volume III: Pricing, Hedging and Trading Financial Instruments by Carol Alexander
- Market Risk analysis volume IV: Value-At-Risk Models by Carol Alexander

Methods of Teaching and Learning

This course will be delivered in a *blended face-to-face* model. With as small as our class is, I am hoping to be able to meet in person most class sesssions. We will also meet over Zoom for synchronous lecture delivery at times. These sessions will be recorded and posted to the course Canvas page for your review.

Assessment and Grading

Students will be assessed according to the following:

- Class Preparation, Participation and Citizenship (20%) - Let me emphasize that no student can earn an A in the course who does not take this component of their grade seriously! You must participate and help create a positive learning experience for others.
- Project I (20%) - Linear regression, loss functions, and futures portfolio hedging
- Project II (20%) - Cointegration, error-correction, and pairs trading
- Project III (20%) - GARCH, filtered historical simulation, and value-at-risk
- Project IV (20%) - Trading strategies, forecasting, and tests of superior predictability

Feedback and Resubmissions There is no predetermined point schedule for grades. This is a graduate level course. I will assume that you are a muture internally-motived student. I will grade your projects according to a rubric. You may resubmit your work to be reassessed as many times as you like. I will give you direct feedback on your work during office hour counseling sessions rather than posting scores to Canvas. You must take the initiative to meet with me. If you do, I will make time to work with to improve your work until you feel comfortable submitting it for final grading.

Slack All class communication will take place using Slack, a messaging system that replaces email. Students will be invited to the Fin 5330 Slack channel prior to the first week of class.

Clients for most computing and mobile platforms can be downloaded from the Slack website, or students may use the web client via a desktop browser.

Programming I will be presenting code in the Julia programming language throughout the course. Occasionally, I might present some code in Python or R. You are expected to complete your projects in one of these programming languages.

NB: I reserve the right to alter this list as the course progresses. I will announce any such changes in class and on the course Slack channel.

Import dates:

- **Jan 19** - First day of classes
- **Apr 08** - Friday class schedule
- **Apr 27** - Last day of classes
- **Apr 29 - May 05** - Final examinations