Finance 5350: Computational Finance

Fall Semester, 2020

Course Information

- Dates: August 31 - December 18, 2020
- Time: MW 3:00 - 4:15 PM
- Room: Huntsman Hall 260
- Course Canvas
- Course GitHub Page

Instructor Information

- Tyler J. Brough
- Office Hours: TBD & By Appointment
- Office: BUS 512
- Email: tyler dot brough at aggiemail dot usu dot edu

Syllabus

Course Description

This is a course on computational financial modeling using the Python programming language. Topics in computational finance as well as financial computing will be covered. Students will learn computational modeling with applications in finance from corporate finance, investments, risk management. Foundational concepts from computer science and software engineering will be introduced. Upon completion of the course students will have a new analytical framework for thinking about financial problem solving as well as a deep practical skill set in computational modeling.

Course Delivery Mode

This course is listed as a blended face-to-face course. There will be both online and in-person elements to this course. The online content will be both synchronous and asynchronous. I will post some prerecorded lectures on certain topics on the Canvas page that I expect you to watch and fully digest. This is the asynchronous portion of the course. Most lectures will be screencasts using Zoom video conferencing software. These will be accessible from the Canvas page. This is the online synchronous portion of the course. I will record these lectures, but you are expected to participate in them live while they are given. There will

also be times that I meet with you in smaller project teams face-to-face to guide you and help in completing your course projects.

Note: This is not the first time that I have taught this course in this modality. It is actually very well suited for this mode of delivery. I feel that with this course we can not only adapt to the situation presented by COVID19, but that we can thrive!

Note: It is entirely possible that all coursework will be moved online campus-wide during the semester. If that happens we will be well prepared for the situation and adapt quite well to that scenario.

These are unique times. I ask for your patience and cooperation as well as offering mine to each of you. If we are adaptive, patient, flexible, and determined I am certain that we can have a wonderful learning experience together this semester.

Prerequisites

- STAT 2300 or better
- Math 1100/1210 Calculus
- Finance 3200 and 3400
- **OR** approval of the professor

Students must be prepared to program in Python for computational assignments. No prior programming experience is assumed or required.

Textbooks

I will provide Jupyter notebooks, handouts, and other readings for course material. So, there is no ***strictly required*** textbook for the course, but I do suggest the following for learning Python programming:

- Python Crash Course by Eric Matthes

- Python for the Absolute Beginner, 3rd Edition by Mike Dawson

- Python for Data Analysis by Wes McKinney

Assessment and Grading

Students will be assessed according to the following:

- Preparation, Participation & Citizenship (15%)
- Weekly homework problems (15%)
- Four computational projects (60%)

Software

Finance 5350 is taught using the Python programming language and the so called *scientific stack*, a set of core numerical computing packages written and maintained by various third parties.

Anaconda Python 3 Edition The main focus of the course is the Python programming for financial modeling. We will be using the Anaconda Python Distribution, which is free:

- Anaconda Python Distribution

We will heavily use both git and github. Installation instructions and some tutorials will be provided.

For Finance 5350 we will learn modern document preparation tools:

- Jupyter Notebook
- Pandoc
- LaTeX
- Markdown

I will be giving just-in-time tutorials for each of these tools as we need them. (Both synchronous and asynchronous).

NOT Microsoft Word! Word is not allowed in Finance 5350!

Slack We will use Slack this semester for communication. You can download an app for your phone, or download a desktop app for your laptop. You can also use Slack in the browser. I will be inviting you each during the first week of class to the channel at (fin5350-usu.slack.com).

Schedule of Topics

This is a list of topics that will be covered in this course (not necessarily in order):

- Python Basics
  - Jupyter Notebooks
  - Atomic data types
  - Object references
  - Collection types
  - Logical operations
  - Control flow statements
  - Arithmetic operations
  - Input/output
  - Writing functions

- Scipy & Numpy
  - Packages and Modules
- Software Design
  - Object-oriented programming
  - Design patterns
  - Agent-based modeling
- The Monte Carlo Method
  - Monte Carlo integration
  - Monte Carlo option pricing and delta-hedging
  - The stationary bootstrap

Important Dates

- *First day of class:* Aug 31
- *Labor day:* Sep 7
- *Thanksgiving holiday:* Nov 25 - 27
- *Last day of class:* Dec 18
- *Final exams:* Dec 14 - 18