

Econ 5315/3315
Financial Econometrics
Spring 2023

Instructor: Professor Kao, email: chih-hwa.kao@uconn.edu

Time and Location: Lecture MW 11:15-12:05, Lab: F 11:15-12:05; MONT 111.

Office Hours: Tuesday 2:30–4:00 or by appointment (email for a time), Oak 309; Or with Zoom (meeting id: 927 4411 6992, passcode: 410379)

TA/Grader: Keuncheol Lee, keuncheol.lee@uconn.edu

Office Hours: Monday 3-5, Oak 336A

Course Description

Introduction to the mathematics of finance. Bond math: the yield curve, interest continuous and discrete interest, coupon bonds. Hedging and replication applied to forward contracts and swaps. Complete markets, risk neutral probabilities. The binomial tree model and option pricing. Mean and variance portfolio optimization (Markowitz theory). Continuous time models and the Black Scholes formula. This is a master and an advanced undergraduate level class. It uses the full range of mathematical tools, including theoretical reasoning (proofs), modeling, useful simplifying approximations, and computing. Students will write basic programs in R.

Prerequisite: Solid backgrounds in calculus and probability/statistics.

Computing

The assignments will require some lightweight computing in R. Previous experience with R specifically is not needed. The R package is available as a free download. Students will learn the R they need, often through provided code templates, as the course progresses.

Learning Goals

- gain experience with tools of applied math: linear algebra, multi-variate calculus, elementary probability, lightweight computing
- understand the basic ideas of financial modeling and decision making
- understand the role of risk neutral pricing
- gain practice developing and analyzing simple mathematical finance models
- learn and master some of the basic tools and techniques of mathematical finance
- acquire knowledge and skills that can help in job and career search

Reading List

The main references used in the course are

(S1) Shreve, S. (2004a), *Stochastic Calculus for Finance I: The Binomial Asset Pricing Model*, Springer.

(S2) Shreve, S. (2004b), *Stochastic Calculus for Finance II: Continuous-Time Model*, Springer.

(B) Blyth, S. (2014), *An Introduction to Quantitative Finance*, Oxford.

(L) Luenberger, D. G. (2014), *Investment Science*, Oxford.

Grading: There will be three exams (40%), class participation (10%), quizzes (20%), and homework problem sets (30%). All homeworks are due at the Friday lab. Assignments should be hardcopy (handwritten or typed and printed). You are encouraged to use LaTeX to typeset your homeworks. Hand in code and output for coding parts of assignments. Neatness and readability count. Points may be subtracted for work that is hard to read, for poor grammar, for excessive crossouts, etc.

Courseware

We will be using PIAZZA where we will make all course announcements, assign homework and readings, post homework assignments, lecture slides, exam practice problems, and solutions throughout the semester. Piazza is also the best place to ask any question you have about course material or logistics.

Attendance: If you miss a class, it is your responsibility to obtain a copy of the lecture notes for that class from another student. You are also responsible for any announcements about changes to the schedule/requirements/policies. Please do not take this course if you cannot arrive on time every day.

Course Outline

1. The Binomial Pricing Model: S1, Chapter 1; B, Chapter 8; L, Chapter 12.
2. Probability Theory: S1, Chapter 2; B, Chapter 1
3. American Derivative Securities: S1, Chapter 4
4. State Prices: S1, Chapter 3.
5. Interest-Rate Dependent Assets: S1, Chapter 6; B, Chapter 1
6. Brownian Motion: S2, Chapter 3
7. Stochastic Calculus: S2, Chapter 4;
8. Risk-Neutral Pricing: S2, Chapter 5

Installing R and RStudio

First, download and install R from <http://cran.r-project.org/>. Second, download and install RStudio by visiting <http://rstudio.org/download/desktop> and clicking the link listed under “Recommended for Your System.”

Policy Against Discrimination, Harassment and Related Interpersonal Violence and the Statement on Absences from Class Due to Religious Observances and Extra-Curricular Activities: <http://provost.uconn.edu/syllabi-references/>

Academic integrity: The UConn academic integrity policy applies in this class. Unless explicitly stated in writing on the assignment, all homework in this class is individual. Students may not hand in work they have acquired from another source. Students are may not allow their homework to be copied for the purpose of cheating. This applies to written work and coding.