

CFRM 501 - Investment Science

Course Syllabus

Contact Information

Instructor: Ryan Donnelly (rdon@uw.edu)

Teaching Assistant (TA): Theodore Zhao (zdzhao16@uw.edu)

Class Schedule: Lecture videos to be posted on Canvas every Monday and Wednesday by midday.

Office Hours (with instructor): Online via Zoom (<https://washington.zoom.us/j/7417254655>) by appointment.

Office Hours (with TA): Online via Zoom (<https://washington.zoom.us/j/5818883959>), Tuesdays 11:00am-12:00pm.

For specific grading concerns contact the grader via email. For administrative concerns contact the instructor via email. Questions related to course content or homework assignments should be posted to the discussion board on Canvas.

Exams

Midterm: November 9, 2020

Final Exam: December 14, 2020

Grading

Homework: 50% (assigned weekly or biweekly)

Homework will be submitted online and must be in the form of a single pdf document. Computational aspects of the homework may be done using any software of your choosing, but it is recommended that you use R or Matlab. Each student is to submit their own original work according to the CFRM Student Honor Code which can be found on the course website. All computer code that is written to complete an assignment must be included as an appendix to the submission. **Late submissions will receive an automatic grade of zero.**

Midterm: 25%

Final Exam: 25%

Materials

Required Textbook (available online from the university library)

Andrew Ang (2014), *Asset Management: A Systematic Approach to Factor Investing*, Oxford University Press

Other References

Zvi Bodie, Alex Kane, Alan Marcus (2017), *Investments*, McGraw-Hill Education

David Luenberger (2013), *Investment Science*, Oxford University Press

Other readings may be assigned as the course progresses.

Participation

While there is no participation component to the course grade, students are encouraged to engage in discussion on the Canvas discussion board. Given the online nature of this course, questions can't be taken immediately during lectures, so the discussion board will be how the TA and myself track aspects of the material which may need to be covered in more detail or further clarified. The discussion board can also be used to ask questions to clarify what is being asked on homework assignments, or to address challenges you are facing in the assignments.

Details

This course is an introduction to the mathematical, statistical and financial foundations of investment science. Learning of the theoretical concepts will be re-enforced through use of computational exercises. The material is similar in scope to an MBA level investments course, but at a significantly higher quantitative level.

Tentative course outline:

1. Introductory Probability Theory
 - Random variables
 - Distribution and density functions
 - Expectation and variance
 - Law of large numbers and central limit theorem
 - Random number generation
2. Assets and Returns
 - Price process and underlying assumptions
 - Asset returns - arithmetic and logarithmic
 - Multiperiod returns
3. Utility Theory
 - Risk aversion
 - Utility functions
 - Examples and general properties
 - Certainty equivalent
 - Expected utility maximization
4. Mean-Variance Investing
 - Background material: multivariate distributions, covariance and correlation, linear-quadratic optimization, constrained optimization
 - Global minimum variance portfolio
 - Frontier boundary
 - Indifference curves
 - Tangency portfolio
5. Capital Asset Pricing Model
 - The market portfolio
 - The security market line
 - CAPM as a pricing tool
 - Single factor models
6. Multi-Factor Models

- Arbitrage and pricing
- Estimation by regression
- Estimation by principal component analysis

7. Term Structure of Interest Rates

- Bonds and the yield curve
- Forward rates
- Estimating the yield curve

Some additional topics will be covered based on available time.

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (<https://registrar.washington.edu/students/religious-accommodations-request/>).