Welcome to the Course

Help

This course is an introduction to data analysis and econometric modeling using applications in finance. Equivalently, this course is an introduction to computational finance and financial econometrics. As such, the course uses concepts from microeconomics, finance, mathematical optimization, data analysis, probability models, statistical analysis, and econometrics.

The course will be 10 weeks long . Each week consists of roughly two and a half hours of recorded video lecture, broken up into five- to 20-minute segments. Finance topics include asset return calculations, risk and performance measures, portfolio theory, index models, and if time permits, the capital asset pricing model. Mathematical topics include optimization methods involving equality and inequality constraints and basic matrix algebra. Statistical topics include probability and statistics (expectation, joint distributions, covariance, normal distribution, sampling distributions, estimation and hypothesis testing, and so on) with the use of calculus, descriptive statistics and data analysis, linear regression, basic time series methods, the simulation of random data, and resampling methods.

There will be weekly automatically graded homework assignments as well as ungraded programming assignments and discussion forum questions. In addition to the discussion forum questions, there will be weekly homework assignments. In addition, there will be a midterm and final exam. Both will consist primarily of multiple-choice questions and will be automatically graded.

Your Instructor

Dr. Eric Zivot

Eric Zivot is the Robert Richards Chaired Professor in the Economics Department, Adjunct Professor of Statistics, Adjunct Professor of Finance, and Adjunct Professor of Applied Mathematics. He is co-director of the Master of Science Program in Computational Finance and Risk Management in the Department of Applied Mathematics at UW. He is also a risk management consultant to BlackRock Alternative Advisors. He is co-author of Modeling Financial Time Series with S-PLUS and co-developer of S+FinMetrics, and has consulted on the use of S-PLUS and R in the finance industry. He regularly teaches courses on econometric theory, financial econometrics and time series econometrics, and is the recipient of the Henry T. Buechel Award for Outstanding Teaching. His current research focuses on the econometric analysis of high frequency financial data and the measurement of financial risk. He has published extensively in the leading econometrics and empirical finance journals. He holds the Ph.D. in Economics from Yale University, and the BS in Economics and Statistics from the University of California Berkeley.

Course Goals and Objectives

The course will emphasize the transition from an economic model of asset return behavior to an econometric model using real data. This transition involves (1) specification of an economic model; (2) estimation of an econometric model; (3) testing of the assumptions of the econometric model; (4) testing the implications of the economic model; (5) forecasting from the econometric model. The modeling process requires the use of economic theory, probability models, optimization techniques, and statistical analysis.

By the end of this course, you will be able to

- perform asset return calculations;
- measure risk; and
- construct optimized portfolios using the open source R programming language and Microsoft Excel.

You will learn how to

- build probability models for asset returns;
- apply statistical techniques to evaluate if asset returns are normally distributed;
- use Monte Carlo simulation and bootstrapping techniques to evaluate statistical models; and
- use optimization methods to construct efficient portfolios.

Course Prerequisites

The *ideal* prerequisites are a year of calculus (through partial differentiation and constrained optimization using Lagrange multipliers); some familiarity with matrix algebra; a course in probability and statistics using calculus; intermediate microeconomics; some exposure to a programming language (preferably object oriented); and an interest in financial economics

Technology Requirements

To complete this course successfully, you will need to have regular access to a computer with a high-speed internet connection capable of playing videos. In addition, the course will use R for data analysis and statistical modeling and Microsoft Excel for spreadsheet modeling.

R is a free, open-source statistical modeling and graphical analysis language built upon the S language developed at Bell Labs. We will be using several user-created packages (libraries or R functions) specifically designed for the analysis of financial time series data. R packages are maintained on the web and can be automatically downloaded from with R.

Since R has a rather steep learning curve, you will use the web-based platform DataCamp for all R assignments in this course. DataCamp is an online interactive learning platform that offers free R tutorials through learning-by-doing. It breaks the different programming assignments down into many short exercises, and provides you with hints and instant feedback on how to perform even better. This helps you to understand deeply what is going on, even if you are a novice to programming.

If you do not have Microsoft Excel or do not wish to purchase it, open-source spreadsheet software is

available from open openoffice.org. However, the course and assignments will assume students are using Excel.

Course Materials

Videos

The main resource for this class is the video lectures. Each week will have approximately two and a half hours of video lecture, broken up into five- to 20-minute segments. Some videos may contain short embedded quizzes. These quizzes will not be graded, and no one but you will see the results. They are designed to help test your knowledge of the material covered in the lecture. Note that you can switch between the video and slides in each lecture simply by clicking on the slides.

Video Downloads of Lectures

The University of Washington is committed to working with some of the world's leading instructors to provide high quality, free education, globally.

We have removed the ability to download course video from Coursera for a number of reasons:

1. Our video contains functionality which only works within the Coursera environment. Downloading it to another platform, such as YouTube, prevents this from working as designed.
2. Our ability to bring you a free course means that we must protect its content so that it is viewed as intended, as a component of an instructionally coherent educational program in Coursera.

We apologize if this is an inconvenience for some students who would prefer more flexibility for viewing this free content.

We hope that you understand our need to maintain a quality standard and continue to enjoy the course

Additional Resources

In addition to the videos, some instructional notes or links will be posted to the course page. These are meant to supplement the videos. Several R scripts and Excel files will also be posted to the course page and will be used in conjunction with some of the assignments. You will also be asked to download financial data from public sources such as Yahoo!

Recommended Texts

Highly recommended:

- *Introduction to Computational Finance and Financial Econometrics*, Eric Zivot and R. Douglas Martin. Manuscript under preparation
- *Statistics and Data Analysis for Financial Engineering* by David Ruppert, Springer-Verlag.
- *Beginner's Guide to R* by Alain Zuur, Elena Ieno and Erik Meesters, Springer-Verlag.
- *R Cookbook* by Paul Teetor, O'Reilly.

Other books for further reference:

- *Introductory Statistics with R*, Second Edition (Statistics and Computing, Paperback), by Peter Dalgaard, Springer-Verlag, New York.
- *Modern Portfolio Theory and Investment Analysis*, by E.J. Elton et al., Wiley, New York. *Financial Modeling*, by Simon Benninga. MIT Press.
- *Statistical Analysis of Financial data in S-PLUS*, by Rene Carmona, Springer-Verlag, 2004.

Discussion Forums

Discussion forums in Coursera are a great resource. They allow you to discuss the course with other students. Here, you may ask questions regarding the material or assignments, or respond to other students in need of help. You may also report technical issues, such as broken links, in the Technical Feedback Forum.

These open-ended questions are designed to stimulate discussion and a variety of responses from many different perspectives. You are encouraged to actively participate in these discussions and to read and respond to other postings. Please be courteous when posting. The University of Washington's Department of Professional and Continuing Education has created a set of guidelines for courteous and effective online posting, available at http://www.pce.uw.edu/resources/online/netiquette.html. You'll find other guidelines, with examples, at the top of the "Discussion Forums" page in this course.

Unfortunately, due to the large number of students enrolled in the class professor Eric Zivot will not be able to respond directly to questions.

Assignments

In addition to the discussion forum questions, there will be weekly homework assignments. Since all grading must be done automatically using computer technology, questions will be limited to True/False, multiple choice, or short answer. **For short-answer questions, please follow the instructions given with the question on how to properly format your answer!** Failure to follow these instructions may result in your answer being marked incorrect. You will receive four attempts per assignment, which must be completed before the deadline in order for the assignment to be scored.

This course will also make heavy use of computer programming using R. Every lecture is complemented with weekly programming assignments that will help you to better understand the covered material. These programming assignments are to be completed on the web-based platform DataCamp, and every week a link to the new assignment will be posted in the "R programming assignments" page. You can attempt these assignments as many times as you like.

Exams

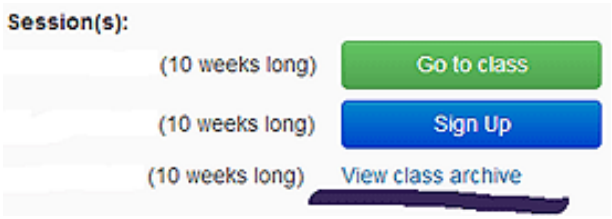
There will be a midterm and final exam. The midterm exam will be given during week 6 and will include material through week 5. The final exam will emphasize material after the midterm but is also comprehensive and will be given during week 10. The midterm and final exam will be similar to the graded homework assignments and consist of True/False, multiple choice and short answer questions.

Grading

Performance will be evaluated using a pass/fail grade. The grade will be based on your cumulative assignment score (40%), midterm score (25%) and final score (35%). In order to receive a passing grade, you must receive a total score of at least 70%.

Can I access the course and contents after it ends?

All quizzes and homework assignments need to be completed by the listed due dates. After this date, currently enrolled students can continue to access **this course session** via a "**View class archive**" button on the Coursera landing page for the course. As this course may be run in the future, students may choose to enroll in and attend a new session of the course if they wish. You can choose to **Sign Up** for future sessions on the Coursera home page https://www.coursera.org/uw .



We look forward to providing you with additional courses from the University of Washington in the future.

Thanks you for your participation in this course.
- The University of Washington

Is there a statement of completion or certificate issued for this course?

> No there is not a credential awarded for this course.

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