**Office.** Economics Building 105.

**Meetings.** Tuesdays and Theursdays 9:30 AM - 10:45 AM in GUGG 205.

**Office hours.** Tuesdays 3:30 PM - 5:30 PM and by appointment. For appointment send an email to carlos.martins@colorado.edu.

**Prerequisites.** Successful completion of ECON 3818 or equivalent is a required pre-requisite. ECON 4818 is desirable but by no means necessary.

**Objectives.** Introduce statistical models, estimation and testing procedures used in analyzing financial data.

**Class URL.** http://spot.colorado.edu/~martinsc/ECON_4858.html.

**Grades.** Grades (A-F) will be based on the following:

- There will be five sets of homework questions whose answers will be graded. Each set accounts for 8 percent of your course grade. Some of these questions will involve the use of MATLAB, a software that is freely available on campus.

- There will be one midterm examination. It accounts for 30 percent of your course grade.

- There will be a final examination. It accounts for 30 percent of your course grade.

Dates for the examinations:

| Examination | Date and Time |
|---|---|
| Midterm | October 17, in class |
| Final Examination | December 16, 1:30 PM - 4:00 PM |

Homework sets will be available on the class web site with their respective due dates.

**Textbook.**

1. Ruppert, D., 2004, Statistics and Finance: An Introduction. Springer, New York.

**Additional.**

1. Bernstein, P., 2005, Capital Ideas: The Improbable Origins of Modern Wall Street. John Wiley and Sons, New York.

   This book gives an informal and historical account of the development of many of the models we treat in class. Great reading for all students in this course.

2. Lai, T. L., and Peng, H., 2008, Statistical Models and Methods fo Financial Markets. Springer, New York.

3. Ruppert, D., 2011, Statistics and Data Analysis for Financial Engineering. Springer, New York.

   These books contain much of the material in our textbook. In many instances, however, the treatment is more advanced.

4. Campbell, J., Lo, A., and MacKinlay, A. C., 1997, The Econometrics of Financial Markets. Princeton University Press, Princeton, New Jersey.

   This is an advanced textbook, normally used in graduate courses. Its study is recommended for those that have taken more advanced courses in probability, statistics and econometrics and are looking for a deeper understanding of what we discuss in class.

5. Hanselman, D. and Littlefield, B., 2005, Mastering MATLAB 7. Pearson, Upper Saddle River, New Jersey.

   This is one of many step-by-step manuals/guide to MATLAB that are commercially available. It is very easy to read and provides speedy access to the many resources this software offers.

**Topics.**

All readings are from the textbook and class notes.

1. Introduction and Basic Concepts for Probability and Statistical Models

   Random variables

   Distribution functions, Cumulative distribution functions

   Quantiles Moments Order statistics

   Skewness, kurtosis and heavy tail distributions

   Multivariate distributions, marginals and conditional distributions

   Prediction Estimation - maximum likelihood, least squares

   Hypothesis testing and confidence intervals

2. Returns

   The random walk model

   The efficient market hypothesis

3. Time Series Models

   Stationarity

   Autoregressive AR(p) models and estimation

   Moving average models MA(q) and estimation ARMA/ARIMA models

   Model selection: Akaike's information criterion (AIC) and Bayesian information criterion (BIC)

   Forecasting

4. Portfolio theory

   Trading off expected return and risk

5. Regression

   Least squares estimation

   Regression and best linear prediction

   Non-normality and data transformations

6. The capital asset pricing model

> Capital market line, security market line
>
> Security characteristic line
>
> Using CAPM in portfolio analysis
>
> Factor models

7. Fixed income securities

> Zero-coupon bonds, coupon bonds
>
> Yield to maturity
>
> Term structure
>
> Continuous compounding
>
> Continuous forward rates
>
> Sensitivity of price to yield

8. GARCH Models

9. Value-at-Risk

> One asset
>
> Portfolio

10. Options pricing

> Call options
>
> The law of one price
>
> Pricing calls
>
> Martingales
>
> The Black-Scholes model, formula and its use
>
> Puts
>
> Evolution of option prices
>
> Leverage of options and hedging

**Important information.**

- If you qualify for accommodations because of a disability, please submit a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail dsinfo@colorado.edu.

  If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with me.

- Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, if the midterm, final or homework due dates prevent/inhibit you from exercising your rights to religious observance, please inform me by August 28, 2012 so that reasonable accommodations can be made. See full details at

  www.colorado.edu/policies/fac_relig.html.

- Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See polices at www.colorado.edu/policies/classbehavior.html. and at www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code.

- All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at www.colorado.edu/policies/honor.html and at www.colorado.edu/academics/honorcode/.

- The University of Colorado Policy on Sexual Harassment applies to all students, staff and faculty. Sexual harassment is unwelcome sexual attention. It can involve intimidation, threats, coercion, or promises or create an environment that is hostile or offensive. Harassment may occur between members of the same or opposite gender and between any combinations of members in the campus community: students, faculty, staff, and administrators. Harassment can occur anywhere on campus, including the classroom, the workplace, or a residence hall. Any student, staff or faculty member who believes s/he has been sexually harassed should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH and the campus resources available to assist individuals who believe they have been sexually harassed can be obtained at www.colorado.edu/odh/.