University of Colorado- Department of Economics - Fall 2010
ECON 4858 Financial Econometrics (3 credits)
Professor Carlos Martins-Filho

**Office.** Economics Building 105

**Meetings.** Tuesdays and Thursdays 12:30 PM - 1:45 PM at Muenzinger E417.

**Office hours.** Thursdays 2:00 PM - 3:30 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 7 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 two midterms. Each accounts for 20 percent of your course grade.
- There will be a final examination which accounts for 25 percent of your course grade.

Dates for the examinations:

| Examination | Date and time |
|---|---|
| Midterm 1 | 09.28 from 12:30 PM - 1:45 PM |
| Midterm 2 | 11.02 from 12:30 PM - 1:45 PM |
| Final Examination | 12.11 from 7:30 PM - 10:00 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 reading.**

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. 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.

3. 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. Probability and Statistical Models (9 hours)
   - 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 (3 hours)
   - The random walk model
   - The efficient market hypothesis
3. Time Series Models (5 hours)
   - 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 (2 hours)
   - Trading off expected return and risk
5. Regression (8 hours)
   - Least squares estimation
   - Regression and best linear prediction
   - Non-normality and data transformations

6. The capital asset pricing model (4 hours)
   - Capital market line, security market line
   - Security characteristic line
   - Using CAPM in portfolio analysis
   - Factor models
7. Options pricing (6 hours)
   - 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
8. Fixed income securities (4 hours)
   - Zero-coupon bonds, coupon bonds
   - Yield to maturity
   - Term structure
   - Continuous compounding
   - Continuous forward rates
   - Sensitivity of price to yield
9. GARCH Models (4 hours)

**Important information.**

- If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and `www.colorado.edu/disabilityservices`.
- 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 two midterm, final or homework due dates prevent/inhibit you from exercising your rights to religious observance, please inform me by August 28, 2009 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. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty has the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which they and their students express opinions. Professional

courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender variance, and nationalities. 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/`.

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