ECONOMETRICS III:  
TIME SERIES FOR FINANCE  
(Updated April 28, 2008)

The course will cover several topics on Time Series Econometrics, Financial Econometrics and Empirical Finance, although the focus is mostly on time series-based methods applied to finance.

I will structure the course, in principle, in 16 sessions, distributed usually on a 2-session basis per topic. I expect the course to be quite intensive in both reading and in carrying out some empirical analyses (in the form of problem sets). Since it is a specialized course, I would assume that all of you are explicitly interested and, hence, willing to do hard work. I warn you that most of the burden of the learning process falls on you. This means that the extent to which you learn will depend mainly on the amount of work that you do on your own. The sessions -i.e., my job- will consist of:
- A review of some of the material that you have read during the previous week
- An identification of the main issues that I believe are most relevant when carrying out the different empirical analyses or using the different techniques
- An illustration of the corresponding methodologies either by reviewing some important contribution of the literature or by carrying out some analysis in class. This means that I will also cover some tutorial of Eviews, a click-and-drag program that carries out most of the time series analyses we would need. I strongly recommend you to become familiar with it, or, better, with other software such as GAUSS or Matlab, that give enhanced flexibility. I might even use GAUSS myself in class.

The first meeting will be organizational, so we will need to arrange an extra class at the end of the term. Course grades will be based on class participation, a number of problem sets and a research proposal of a topic for an empirical paper.

On June 16-17 the Methods in International Finance Network will meet at IESE for its annual research workshop. I am in charge of organizing this meeting, where both Ph.D. students and professors from several European universities will present their research on empirical finance. I strongly encourage you to attend this meeting, as it is a perfect complement for the course. You may not fully understand everything that is being talked about, but it will give you a feeling for the type of work that is being done and that will be expected from you in your dissertations. It will also help you start getting to know people in the field.
SESSION TOPICS

1. Univariate Time Series Analysis
   1. ARMA Models
   2. Unit roots
   3. Seasonality
   4. Long memory

2. Multivariate Time Series Models
   1. Structural and reduced-form VAR models
   2. VARMA models
   3. Granger causality
   4. Cointegration
   5. Factor Models

   1. The behavior of financial time series
   2. Tests of the random walk hypothesis
   3. Are there cycles in the stock market?

4. The empirical analysis of the main Pricing Models
   1. Testing the CAPM
   2. Testing the APT and other factor-pricing models
   3. Risk or characteristics?
   4. Anomalies: calendar effects (January, weekend, holidays, turn-of-the-month, intraday), the accrual anomaly
   5. Event studies

5. Volatility and Financial Time Series (1)
   1. Stylized facts of financial time series volatility
   2. ARCH Models
   3. Volatility in levels

6. Volatility and Financial Time Series (2)
   1. Stochastic volatility
   2. Long memory in mean and volatility
   3. Quantile estimation, VAR and extreme values

7. Nonparametric Methods
   1. Estimation of density functions
   2. Estimation of conditional moments and derivatives
   3. Choosing the window width and the kernel
   4. Nonparametric regression for time series

8. Special Topics in Time Series Analysis (1)
   1. An introduction to nonlinearity
   2. Threshold models
3 Other nonlinear models
4 State-space models and the estimation of unobservables

9. Special Topics in Time Series Analysis (2)
   1 Estimation of endogenous breakpoints in mean
   2 Estimation of endogenous breakpoints in volatility
   3 Regime-Switching Models (mean and volatility)

10. Markov-Chain Monte Carlo Methods
    (if time allows)

       1 Outlier detection
       2 Stochastic Volatility
       3 Regime-Switching models

11. High-frequency analysis, market microstructure and duration models
    (if time allows)

READINGS FOR THE SESSIONS.

This is a list of the readings (book chapters and articles) that we will use for the different sessions. You
are responsible for reading them before class. We will then review some of the material in the very
limited- time that we meet. I include first a list of reference books, that contain the main readings for
the sessions. Then, for each session, I give you some lecture notes that I have developed, a few
chapters of the main reference books and some review articles that should be the main source of
reading for the session (excluding Hamilton: this book is very technical, and you may want to glance
lightly at the material covered and keep it in mind as a reference for the future, but do not go too deep
into it...or, if you do, do so at your own risk!). Then I include a list of additional related papers, both
“classics” and some new references, which you do not necessarily have to read, but at least you should
know that they exist! (of course, this list is non-exhaustive and continuously evolving).

MAIN REFERENCE BOOKS

  Univ. Press.
This book is a must for anyone pretending to do research with financial data. It has become the
reference book for any course similar to the first part of ours.

  An easy introductory book to the analysis of time series. Highly recommended for beginners.

  The “must have” book on time series analysis. A little too technical, though.

A collection of review articles on most of the applications of statistical models to finance. Some of the articles are excellent. The book is extremely expensive, though, but it should be available in the library.

  Not very expensive and comprehensive enough. Some chapters are better written than others, but in general it is accessible and easy to read.

  Great manual on nonparametric and semiparametric methods in Econometrics.

  A book by one of the authors who have contributed the most to nonlinear time series. Quite expensive, but nicely written and very easy to read.

**SESSION SCHEDULE**

**Session 1**

- Enders, Chapters 1, 2, 4.
- Mills, Chapters 2, 3, 6.1, 6.3
- Tsay, Chapter 2
- Hamilton, Chapters 1-5, 8, 15-17

**Session 2**

- Enders, Chapters 5, 6.
- Mills, Chapters 6.5-6.8, 7, 8.
- Tsay, Chapters 8, 9
- Hamilton, Chapters 9-11, 18-20
Session 3


- Thaler, R. Series on anomalies in the *Journal of Economic Perspectives*. (1, 2, 7, 12, 13, 17)
  http://faculty.chicagogsb.edu/richard.thaler/research/Anomalies.htm
- Hamilton, Chapter 6 (for spectral analysis)


Session 4

- Campbell, Lo and MacKinlay, Chapters 4, 5, 6
- Thaler, R. Series on anomalies in the *Journal of Economic Perspectives*. (1, 2, 13, 17) http://faculty.chicagogsb.edu/richard.thaler/research/Anomalies.htm

- Fama, E.F. and K. French, (1996b): "The CAPM is wanted, dead or alive," *Journal of Finance*

**Session 5**

- Lecture notes (Volatility and Financial Time Series)
- Campbell, Lo and MacKinlay, Chapter 12.2
- Enders, Chapter 3.
- Mills, Chapters 4.4, 6.2
- Tsay, Chapters 3.1-3.11, 10

**Hamilton, Chapter 21**


**Session 6**

- Lecture notes (Volatility and Financial Time Series)
  - Mills, Chapters 4.3, 5
  - Tsay, Chapters 3.12-3.15, 7


**Session 7**

- Lecture notes (Nonparametric Methods + Resampling Methods)
  - Campbell, Lo and MacKinlay, Chapter 12.3
  - Pagan and Ullah, Chapters 1, 2.1, 2.2, 2.7, 2.8, 3.1, 3.2, 3.6, 4.1, 4.2, 4.3


Session 8 -9

- Lecture notes (Special Topics in Time Series Analysis + MLE and the Kalman Filter)
- Campbell, Lo and MacKinlay, Chapter 12.1
- Mills, Chapters 4.5, 4.6
- Tsay, Chapters 4, 11
- Hamilton, Chapter 22


**Session 10**

- Tsay, Chapter 12

**Session 11**

- Campbell, Lo and MacKinlay, Chapter 3
- Tsay, Chapter 5


**OTHER BOOKS**

  An easy, introductory book, that also contains directions on carrying out analysis with Eviews and RATS.

  Revised edition of a clear and very well written manual on both theory and empirical asset pricing. Its use of GMM is especially intense and enlightening.

  http://faculty.chicagogsb.edu/john.cochrane/research/Papers/time_series_book.pdf

  Gourieroux tends to be a little too technical, but his knowledge of econometrics is so broad that anything he writes is worth at least taking a look at.

  A collection of articles by Lo and Mackinlay on the efficiency of financial markets and the random walk hypothesis.