Educational Aim

The course kicks-off with a description of some stylised facts and offers a short introduction to the main characteristics of high-frequency data. An extended presentation of the econometric techniques developed to model financial time series, such Maximum Likelihood, GIVE and GMM estimators, follows. Linear and non-linear models provide a unified framework to study specific returns distributions, treatment of seasonality, and intraday and intraweek volatility. Univariate and multivariate (G)ARCH are introduced to model time varying variances and covariances. Fractional properties of financial time series are evaluated via the modelling of credit spreads. We introduce methods to forecast risk and returns, and dynamic markets correlation analysis, essential tools to understand interactions between financial markets, i.e. term structure and the bond markets, the foreign exchange market and the stock price volatility. We conclude with the presentation of realized volatility, a recently proposed non-parametric estimate of the return variation.
Education Objectives

- Provide a detailed knowledge of the tools of financial econometrics.
- Illustrate the techniques with actual examples of applied works using high frequency data

The course will provide the participants with:

- Knowledge of how econometrics can be applied to get useful insights about financial-world behaviour.
- Familiarise with the techniques by studying empirical papers, and undertaking practical works which may be asked to most applied financial economists to model the main characteristics of financial time series.

Prerequisites

A good mathematical and statistical background, and the attendance of Foundations of Econometrics in Term 1. Some reading and a crash review will be provided at the beginning of the course.

Course Requirements

Students are expected to attend a 3-hour weekly lecture, which also contains practical implementations of the theoretical material covered during the lectures, using the econometric packages PcGive-13 and G@RCH-6.

Assessment

There will be one assessed (individual) coursework and a final test (individual) in April/May 2010 that will count as 25% and 75% respectively. The coursework’s length must not exceed four A4 sheets (double sided), it must be word-processed and a hard copy to be submitted to the course office (and electronically via Moodle) by 4pm of Friday, 23rd of March 2012.

*Note:* 1. If two or more courseworks are identical will be graded zero.
2. Extensions are given *only for exceptional circumstances* and by the course director.

Lectures

The lectures will embody activities such as formal lectures and participative discussions on research papers of relevance to the course. The list of the topics to be covered during the lectures is provided below. A more detailed outline of the issues covered is provided at the beginning of each lecture.
Course Outline

Week 1 (25/01/12). Preliminaries: high frequency finance and data types
- Some notes on financial econometrics;
- High frequency data and methodology of high frequency research;
- Markets and data types (spot, futures and option markets);
- Markets: foreign exchange, over-the-counter interest rate, interest rate futures, bond futures, commodity futures and equity markets;
- Introduction to PcGive and G@RCH.


Week 2 (1/02/12). Linear time series models and forecasting
- AR, MA and ARMA models;
- Specification strategies, forecasting returns with linear models;
- Decomposing time series, measures of persistence and trends.
- Non stationarity, cointegration and spurious regression.

Further Readings: Diebold (2004); Hendry (2004); Mills-Markellos (2008, Chapter 2); Tsay (2005: Chapters 2); Decorogna et al. (2001: Chapters 3).

Week 3 (8/02/12). GMM and maximum likelihood estimation methods in finance.

- Time-series Econometrics: Cointegration and Autoregressive Conditional Heteroskedasticity.
- Empirical Macroeconomics

Week 5 (22/02/12): Modelling volatility: univariate (G)ARCH models.
Seasonality.
- Volatility patterns and markets volatility;
- Univariate (G)ARCH models;
- Seasonal components;
- Intraday and intraweek seasonalities.

Readings: Laurent (2009); Teräsvirta (2009)*.
Further Readings: Bollerslev (2009); Andersen et al. (1999); Bera and Higgings (1993); Mills-Markellos (2008, Chapter 5); Decorogna et al. (2001: Chapters 6 and 7); Zivot (2009).

Week 6 (29/02/12). Modelling volatility: MGARCH models.
- Intraday volatility and multivariate (G)ARCH models;
- Modelling heterogeneity volatility and forecasting short-term volatility;
- Practical applications using G@RCH.

Readings: Laurent (2009); Silvennoinen and Terasvirta (2009)*.

Week 7 (07/03/12). Dynamic conditional correlations (DCC) models, multivariate risk and contagion.
- Estimating the dependence of financial time series;
- Correlation behaviour of high data frequencies;
- Stability of return correlation;
- Estimating and testing cross-markets correlations with normal and asymmetric multivariate Laplace distributions for the innovations.
- Risk management analysis and measuring contagion.

Readings: Engle (2002)*.

Week 8 (14/03/12). Realized volatility. Forecasting risk and returns.
- Forecasting volatility and volatility for Value-at-Risk;
- Forecasting returns over multiple time horizons;
- Measuring forecast quality/accuracy;
- Practical implementations using G@RCH.

Reading: Laurent (2009); Andersen and Benzoni (2008a)*.
Further Readings: Andersen et al. (2003, 2004); Clements (2005); Decorogna et al. (2001).

Week 9 (21/03/12). The impact of macro-announcements on the term structure, foreign exchange rates and asset prices.
Readings: Flannery, M. J. and A.A. Protopapadakis (2002)*.

Week 10 (28/03/12). Fractional integration and long memory processes in finance: a short introduction. Revision class

* Papers in the lecture notes package.

The list of topics given above though provisional is intended to be a fairly accurate guide to the sorts of topics that we shall aim to cover in the course, even though I may add some topics to the list and drop some others.

Reading List
The material covered during the lectures will be drawn from textbooks and papers listed below. Relevant reading (compulsory) material and lecture notes prepared by the lecturer will be distributed at the beginning of the course.
Textbooks


Laurent, S. (2009), ESTIMATION AND FORECASTING ARCH MODELS USING GARCH 6, Timberlake Consultants Ltd.


Papers


Advanced Information Nobel Prize (2011), Thomas J. Sargent and Christopher A. Sims


Andersen, T. G., Bollerslev, T., Diebold, F. X. and P. Labys (1999), “(Understanding, optimizing, using and forecasting) realized volatility and correlation”, Manuscript, Northwestern University, Duke University and Pennsylvania University. Published in revised form as “Great realizations” in Risk, March 2000, 105-108.


**Further Readings:**

**Papers**


**Textbooks:**


**Tuesday, 10 January 2012**