

12F005

6 ECTS

Financial Econometrics

Professor: Christian Brownlees

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Introduction

The course introduces students to the theory and practice of time series analysis for economic and financial time series.

Objectives

This course builds on and further extends the econometric and statistical content studied in the first quarter, with a special focus on techniques relevant to the specific field studied and their empirical applications.

This course provides an introduction to the quantitative techniques used for the analysis of economic and financial time series. We begin with a brief review of regression with time series data and linear time series models. The main topics that will then be covered in the course are nonlinear time series models. In particular, nonlinear model for the analysis of time varying volatility (GARCH, Stochastic Volatility) and correlations (DCC).

The course heavily relies on R for the implementation of the techniques illustrated in class. Computer lab sessions using R will be used to apply the techniques illustrated in class on real data sets. Students will replicate findings documented in the literature and engage in forecasting exercises.

Required Background Knowledge

Students are supposed to have a background in Statistics and Econometrics. No prior knowledge of R is required.

Learning Outcomes

The student should comfortably carry out time series analysis with the following classes of models: the ARMA family and GARCH. The student will be able to understand the underlying mathematical and statistical framework for their estimation (e.g. maximum likelihood), their properties in terms of prediction (step-ahead forecast distributions and moments thereof), and the appropriateness of the different models for different type of data.

Methodology

Theory classes will introduce the content of the course. Practice session will be used to introduce students to R and replicate the methodology and findings documented in class. Weekly problem sets will be assigned to review the content of the course.

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Evaluation

Exam (70%) and problem sets / assignments (30%).

Course contents

Indicative course plan.

Session	Topic Number and Lecture Title
1	1.1. Time Series in Economics and Finance
2	1.2. Time Series as Stochastic Processes
3	1.3. Time Series Properties
4	1.4. Time Series: Testing for stationarity
5	2.1. Regression with Time Series Data
6	2.2. Spurious Regression
7	3.1. Linear Time Series: Models
8	3.2. Linear Time Series: Prediction
9	3.3. Linear Time Series: Estimation
10	3.4. Linear Time Series: Practice
11	4.1. Volatility Modeling: ARCH and GARCH
12	4.2. Volatility Modeling: Asymmetric Effects
13	4.3. Volatility Modeling: Prediction and Evaluation
14	4.4. *Volatility Modeling: Stochastic Volatility
15	4.5. *Volatility Modeling: High Frequency Data Based Volatility Modelling
16	5.1. Conditional Distribution of Returns and Value-At-Risk
17	6.1. Multivariate Volatility Models
18	6.2. Multivariate Volatility Models: DCC
19	7. Recent Developments in Time Series Analysis I
20	7. Recent Developments in Time Series Analysis II

Topics marked with an asterisk are advanced.

Bibliography

- Campbell, J. Y., Lo, A. W. and MacKinlay, A. C. (1996), The Econometrics of Financial Markets
Christoffersen, P. (2003), Elements of Financial Risk Management
Engle, R. F. (2009), Anticipating Correlations: A New Paradigm for Risk Management
Hayashi, F. (2000), Econometrics
Tsay, R. S. (2010), Analysis of Financial Time Series

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Professor's Biography

Christian Brownlees is an Assistant Professor in the Department of Economics and Business at the Universitat Pompeu Fabra. He received the (B.S.) degree in Economics and Quantitative Methods in 2003 and Ph.D. degree in Statistics in 2007 from Università di Firenze. He a Post-Doc Research Fellow at NYU Stern until 2011. Over the years he studied, visited and researched at the University of Reading, Monash University, UCSD and EUI.