UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Advanced Econometrics

2425-2-F5602M035

Learning objectives

The course aims to provide students with a general and comprehensive overview of the different econometric methodologies and approaches, focusing on what is relevant for doing and understanding empirical work in financial econometrics.

Contents

The course explores econometrics models and methods of financial econometrics. The course is split into two Parts.

PART I
The first part of the course focuses on financial time series models. It will cover the statistical and econometric techniques necessary for conducting quantitative research in estimating time series models, forecasting financial markets, and modeling asset price volatility. Emphasis will be placed on hands-on experience through computer-based applications in estimation and inference. Students must develop programming skills by working with econometric and statistical software packages.

PART II
The second part of the course aims to provide an overview of several techniques often used in financial research, including event studies, the Fama MacBeth approach, and program evaluation using panel data, among others. For each econometric methodology, an empirical application is proposed from the academic finance literature.

Detailed program

1. **PART I: Time Series Analysis**
   (a) Financial Time Series and their characteristics
   (b) Linear Time Series: AR, MA, and ARMA models
   (c) Unit-Root Nonstationarity
   (d) Conditional Heteroscedastic Models: ARCH and GARCH models
   (e) Value-at-Risk, Risk Metrics, and Expected Shortfall
   (f) Multivariate Time Series Analysis: Vector Autoregressive Models

2. **PART II: Applications in Financial Econometrics**
   (a) Event study analysis:
   We review the standard approach of the event study and how it can be adapted to deal with heteroskedasticity.
   i. Basic structure of the event study
   ii. Nonparametric and robust tests
   iii. Time Series Heteroskedasticity
   iv. Fiordalisi, F., and Ricci, O., 2016, "Whatever it takes: an empirical assessment of the value of policy actions in banking", Review of Finance
   (b) Program evaluation using panel data:
   We introduce program evaluation using panel data. Issues of measuring treatment effects are discussed, as are the pros and cons of panel data parametric, and nonparametric approach versus cross-sectional data.
   i. Cross-sectional data approach: Matching observables in terms of propensity score method; Regression discontinuity design; Difference-in-Difference approach.
   ii. Panel data approach: Regression method (PDA); Synthetic control method; Averging method.
   iii. Deiana C. and Mazzarella G., "Does the road to happiness depend on the retirement decisions? Evidence from Italy", book chapter in Crato N., and Paruolo P.
   iv. Pesaran, M.H. and Yang, C.F., 2022, " Matching theory and evidence on COVID-19 using a Stochastic Network SIR Model", Journal of Applied Econometrics.
   (c) Portfolio choice and testing the Capital Asset Pricing Model:
   We cover the implementation of mean-variance portfolio choice based on a panel dataset of stock returns.
   i. Portfolio choice
   ii. Testing the CAPM
   iii. Cross-sectional regression tests
   iv. Portfolio grouping
   v. Time-varying model
   vi. Empirical evidence on the CAPM
   (d) Multifactor Pricing Models:
   We consider multifactor models for returns, We discuss some of the key concepts in the arbitrage pricing theory, and we discuss the testing of this theory.
   i. Linear factor model
   ii. Diversification
   iii. Pervasive factors
   iv. Statistical factor models
   v. Fama E., and K.R. French, 2015, "A five-factor asset pricing model", Journal of Financial Economics.
   (e) Yield curve: We consider the measurement of interest rates and the time value of money.
   This plays an important role in many applications: portfolio allocation, predicting future interest rates, future inflation, and national income, among others.
   i. Discount function, yield curve, forward rates
   ii. Estimation of the yield curve from coupon bonds
   iii. Discrete time models of bond pricing
   iv. Arbitrage and pricing kernels
   v. Backus, D., Foresi, S., and Telmer C., 1998, "Discrete-time models of bond pricing", NBER Working Paper.

Prerequisites

Econometrics, Statistics.

Teaching methods

Frontal lessons.

Assessment methods

Oral exam covering the first and second parts of the course:

• PART I: Students will be required to complete a series of weekly exercises throughout the course.

• PART II: the students should discuss one of the techniques used in financial research, and proposed during the course.

Textbooks and Reading Materials

• Lecture notes/slides
• Tsay, R. S., 2010. “Analysis of financial time series”, John Wiley & sons.
• O. Linton, 2020, “Financial Econometrics”, Cambridge University Press.
• C. Hsiao, 2022, “Analysis of Panel Data”, Cambridge University Press.
• N. Crato and P. Paruolo, 2019, “Data-driven policy impact evaluation”, Springer.

Semester

II semester.

Teaching language

English.

Sustainable Development Goals

QUALITY EDUCATION