Financial Econometrics II

ECTS : 3

Description du contenu de l'enseignement :

The last ten years have seen an extraordinary growth in the use of quantitative methods in financial markets. Professionals now use sophisticated statistical techniques in portfolio management, proprietary trading, derivative pricing, risk management and securities regulation. This course has two main objectives. The first one is to offer an overview of mostly used econometrics tools, and some of their developements in the machine learning area: moment estimation, linear factor models, dynamic linear models, latent factor models, numerical simulations, model selection, clustering. The second one is to highlight the strong link between academic research and their practical implementation in various fields – portfolio construction, asset pricing, fund analysis, performance evaluation, quantitative investment strategies, factor investing, backtesting – through the analysis of research papers and applications into Python.

Course outline:
Lecture 1 - An Overview of Financial Data

- The statistical properties of financial asset's return
- Portfolio returns and aggregatio
- Distribution estimation
- Robust estimator
- Distributional test
- Time dependency

Python applications: distributional tests, modified-/conditional-/theoretical value-at-risk estimations.
Lecture 2 - Econometrics of the Efficient Frontier, part 1

- Theoretical Background of the efficient frontier and Sharpe ratio estimation
- The impact of estimation errors on efficient portfolios, and more generaly on portfolio optimizations

Python applications: simulation of estimation errors ; illustration of the impact of estimation errors on optimal porfolio weights.
Lecture 3 - Econometrics of the Efficient Frontier, part 2

- Portfolio optimization in practice
- Dealing with the presence of estimation errors in the estimation of the efficient frontier
- Bootstrap estimation of the efficient frontier
- Testing the efficiency of the efficient frontier and efficient portfolios

Python applications: Replication of the main results of 3 research papers (cf. references): simulation of statistically equivalent optimal portfolios, estimation of the resampled efficient frontier, bootstrap estimation of the efficient frontier.
Lecture 4 - Factor Pricing Models

- From the CAPM to multifactor model
- The main types of factor models
- Latent factor models
- Financial applications and paper study (cf. references)

Python applications: Identification of the cross-sectional return drivers of global macro hedge funds.
Lecture 5 - Dynamic factor Models

- Conditional factor models
- Dynamic factor models
- Dynamic latent factor models

Python applications: estimation of fund dynamic exposures, implementation of trend following strategies.
Lecture 6 - Model selection

- Stepwise selection methods
- Ridge and LASSO regressions
- Statistical inference and cross validation

Python application: Identification of the global macro factors driving equity returns.
Lecture 7 – Backtest validation

- Backtesting biases
- Assessing the impact of backtesting bias on return distributions

- Estimating backtest parameters
- Validating backtested strategies

Python applications: backtesting the momentum alternative risk premia strategy.

Compétence à acquérir :

Master econometrics (static) tools in empirical finance: factor models, risk premia, etc.

Mode de contrôle des connaissances :

Final Exam

Bibliographie, lectures recommandées :

- Greene W. H., 2017, “Econometric Analysis”, 8th edition, Pearson, 1176 pages.
- Hastie T., Tibshirani R., and J. Friedman, 2016, “The Elements of Statistical Learning”, Springer Series in Statistics, 2nd edition, 745 pages.
- Meucci A., 2009, “Risk and Asset Allocation”, Springer Finance, 3rd Edition, 532 pages.
- Tsay R., 2010, “Analysis of Financial Time Series”, Wiley-Blackwell, 3rd edition, 712 pages.

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Université Paris Dauphine - PSL - Place du Maréchal de Lattre de Tassigny - 75775 PARIS Cedex 16