CASS
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON
— EST 1894 —

Fees:

£180 City Students, Alumni, Staff

£210 External Students

£360 External rate

A 15% discount is available for groups of three or more participants

Monte Carlo tests in Matlab with applications in financial markets
Online course

Centre for Econometric Analysis
Delivered by: Professor Annamaria Bianchi

Course overview

This course introduces Monte Carlo test techniques, which provide a simple method for building provably exact tests, based on any statistic whose finite sample distribution may be intractable but can be simulated. In contrast to bootstrap techniques, the validity of the tests so obtained does not depend on the number of replications employed (which can be small). Further, Monte Carlo tests turn out to be very useful when combining multiple non-independent tests.

This course will provide participants with the essential theoretical and practical tools for performing Monte Carlo tests with Matlab. The fundamental issues that discourage participants using Monte Carlo test techniques in practice will be addressed. The course will show how any hypothesis test, for which the test statistic can be simulated under the null, can be improved (by achieving size control) by its corresponding MC test. The emphasis will be on concepts rather than technical details and the exposition will aim at being intuitive. The ideas will be illustrated using practical econometric and financial problems. Instructional examples with real and simulated data will be provided.

Benefits

- You will be introduced to the concepts of Monte Carlo simulation test techniques
- You will learn theoretical and practical tools for performing Monte Carlo simulation tests with programming language Matlab
- You will practise and work on practical econometric and financial problems
- You will implement Monte Carlo simulation tests on your own on real datasets.

Target audience

This course is particularly useful to both professionals working in the financial industry and researchers in the field of statistics, econometrics, and economics.

Course prerequisites

Participants should have a basic knowledge of probability, inferential statistics, and econometrics.

Professor Annamaria Bianchi (University of Bergamo)

Annamaria is Professor of Business Statistics at the University of Bergamo (Italy). She obtained her double PhD in Mathematical Statistics at University of Milan and Université Pierre et Marie Curie (Paris VI). She is a researcher associate to the Centre for Econometrics Analysis of Cass Business School in London, to the Department of Economics of Carleton University in Ottawa, and to Institute for Social and Economic Research (ISER) of the University of Essex. Her main research interests are Monte Carlo tests, GARCH models, and survey methodology related topics. She has published in the Journal of Econometrics, International Statistical Review, Survey Methodology, and other peer-reviewed journals. She has presented her works at several international conferences and workshops.

Contents

Day 1 : 4 hours online

Topic 1: An introduction to Monte Carlo tests and their implementation in Matlab

- Primer/intermediate on Matlab. This block reviews basic Matlab programming language, that will allow participants to understand and build their own codes
- Review of basic notions of hypothesis testing, with focus on important statistical issues motivating Monte Carlo (MC) tests
- MC test methods and their implementation in Matlab: MC tests based on pivotal statistics; MC tests in the presence of nuisance parameters; comparison with the bootstrap.

Day 2: 4 hours online

Topic 2: Monte Carlo Tests, Diagnostic Procedures and Tests Combination

- MC tests in econometrics and finance
- Multivariate diagnostic procedures in Multiple Linear Regression based financial studies, including tests for normality, tests for serial correlation, and tests for ARCH and GARCH effects. Empirical applications to stock return rates and other financial assets
- Problems related to combining non-independent tests and remedies proposed in the literature
- MC tests for combining non-independent tests. Combining tests for multiple structural breaks in the context of cointegrated regression. Empirical applications to 1) identify breaks in foreign exchange rates and 2) in money demand and comparison with the method proposed by Mogliani and Urga (2018) using a dataset of yearly observations for the US from 1900 and 2013.

Recommended reading

The following textbooks and journal articles are recommended for this course:

Bergamelli, M., Bianchi, A., Khalaf, L., Urga, G. (2019). Combining p-values to test for multiple structural breaks in cointegrated regressions, *Journal of Econometrics*, 211(2), 461-482. DOI: https://doi.org/10.1016/j.jeconom.2019.01.013

Dufour, J.M. (2006). Monte Carlo tests with nuisance parameters: A general approach to finite-sample inference and nonstandard asymptotics, *Journal of Econometrics*, 133, 443-477.

Dufour, J.M., Khalaf, L., Beaulieu, M.C. (2010). Multivariate residual-based finite-sample tests for serial dependence and ARCH effects with applications to asset pricing models, *Journal of Applied Econometrics*, 25, 263-285.

Dufour, J.M. and Khalaf, L. (2003). Monte Carlo test Methods in Econometrics. In: B.H. Baltagi (ed.), *A Companion to Theoretical Econometrics*. Blackwell Publishing Ltd.

Dufour, J.M., Khalaf, L., Voia, M. (2015). Finite-sample resampling-based combined hypothesis tests, with applications to serial correlation and predictability, *Communications in Statistics – Simulation and Computation*, 44 (9), 2329-2347.

Dufour, J.M., Khalaf, L., Bernard, J.T., Genest, I. (2004). Simulation-based finite-sample tests for heteroscedasticity and ARCH effects, *Journal of Econometrics*, 122, 317-347.

Dufour, J.M., Farhat, A., Gardiol, L., Khalaf, L. (1998). Simulation-based finite sample normality tests in linear regressions, *Econometrics Journal*, 1, C154-C173.

Hansen, P.R. (2003). Structural Changes in the Cointegrated Vector Autoregressive Model, *Journal of Econometric*s, 114, 261-295.

Mogliani, M. and Urga, G. (2018). On the Instability of Long-Run Money Demand and the Welfare Cost of Inflation in the United States, Journal of Money, Credit and Banking, 50(7), 1645-1660.

Registration, payment and cancellation policy

Payment of course fees is required prior to the course start date.

In case a course is cancelled, registered participants will receive the full refund.

Registration closes 7-calendar days prior to the start of the course.