Lancaster University Management School

timberlake
statistics | econometrics | forecasting

Econ 605 Advanced Time Series Econometrics 2022-2023

COURSE AIMS & OBJECTIVES, KEY SKILLS AND LEARNING OUTCOMES

Course Aims & Objectives: This course will show how time series can be modelled and analysed. The aim is to provide understanding and insight into the methods used, as well as explaining the technical details. Statistical time series modelling will be demonstrated using the STAMP computer package and participants will be given the opportunity to use STAMP in class. The Time Series Lab (TSL) program enables the score-driven approach to nonlinear time series to be implemented. There will be a wide range of applications, ranging from assessing the impact of the UK seat belt law, modelling volatility in financial time series and predicting the spread of coronavirus.

Key Skills: By the end of this course, students should have some knowledge and understanding of

- State space models and the Kalman filter
- The modelling of univariate and multivariate time series
- Practical time series modelling using the STAMP package
- Nonlinear time series models, including volatility modelling and the score-driven approach
- Practical time series modelling using the TSL package

Desired Outcomes: By the end of this course, students should be able to:

- Understand the nature of time series models and the way they are applied in practice.
- Present, interpret and analyse information and results from STAMP and TSL

COURSE STRUCTURE

Econ 605 is a 10 credits course and therefore students are expected to input approximately 100 hours of study into the course. The total number of contact hours on Econ 605 is 15 hours. This leaves 85 hours for private study. Course Delivery comes in the form of Lectures with 15 hours delivered over the first 3 weeks of the term (10 hours of lectures and 5 hours of tutorials). There will be optional clinics on the last day of the course.

During your private study you should strike a balance between reading the course material (which is the primary source of information) and the recommended textbooks,

thinking critically about how these fit in to the body of knowledge on the subject and about how our level of knowledge can be improved, performing exercises, completing coursework and revising for examinations. You can expect to perform well on this course only if you work consistently through the year.

COURSE CONVENOR

Professor Siem Jan Koopman

Professor Andrew Harvey

Tutor : Rutger Lit

LECTURERS CONTACT INFORMATION (Including Office Hours)

Email: s.j.koopman@vu.nl

Email: rlit@nlitn.nl

Available by appointment (please email to arrange a convenient time)

COURSEWORK ASSESSMENT

The final mark for the course will depend on a written exam. Timetable for details of time and venues will be communicated via Moodle and by Timberlake well in advance.

The CWA mark will be calculated as 100% coursework. The coursework will be assigned at the beginning of the module.

Coursework must be submitted electronically through the Moodle site for this course: https://mle.lancs.ac.uk/course. Login using your regular Lancaster University access details. This opens a page headed MLE: My home.

The format of the submission is as follows.

- The submitted file must be in pdf format with the following name

  stud#_studname_cw_**cw#.pdf**

  where: **stud#** is your student number, **studname** is your name in the format *surname_name*, **cw#** is either 1 or 2 according to the piece of coursework submitted. Eg a student with student number 111 would submit a file named *111_surname_firstname_cw_1.pdf*.

- Maximum file size is 2MB: figures resolution must be adjusted accordingly.

Note that your work will be screened using software designed to detect plagiarism.

Do not rely upon someone else to submit your coursework.
*Word counts are inclusive of all material submitted apart from the Bibliography.

FEEDBACK ON COURSEWORK:

The coursework will be marked and returned to students within 4 weeks of the submission deadline. Feedback will consist of marker's notes appended to the pdf of your coursework.

MARKING CRITERIA AND PENALTIES

Marking criteria can be found in the Economics Undergraduate Handbook and the general course information paper. An electronic copy of this can be found via the Current Student page of the university website then follow the Academic Regulations link
https://gap.lancs.ac.uk/ASQ/QAE/MARP/Documents/UG-Assess-Regs.pdf

FINAL MARK INFORMATION

This course is assessed 100% by means of coursework. The final mark is the average of the marks obtained in the two pieces of coursework.

COURSE TEXT AND RECOMMENDED READING

TEXT AND RECOMMENDED READING

The course will be based on extracts from three different books: (1) A new edition of Andrew Harvey's Time Series Models is being written by all three course teachers and handouts based on the book will be available for participants. (2) The introductory book by Commandeur and Koopman (2007, OUP) gives an introduction to modelling with STAMP. (3) The text "Dynamic models for volatility and heavy tails" by Harvey (2013) is primarily concerned with the theory and application of the recently developed score-driven methods.

Recommended Readings

- Commandeur, J.J.F. and S.J. Koopman. An introduction to state space time series analysis. OUP, 2007.
- Durbin, J. and S.J. Koopman, Time Series Analysis by State Space Methods, 2nd ed. Oxford University Press, Oxford, 2012.
- Harvey, A. C. Dynamic Models for Volatility and Heavy Tails. Cambridge University Press, 2013.
- Harvey, A. C., Time Series Models (TSM), 2nd Edition, Harvester Wheatsheaf, 1993. [Currently out of print]
- Harvey, A. C. (2020) Score-driven time series models.
- Martin, V., Hurn, S. and D. Harris, (2013) Econometric Modelling with Time Series: Specification, Estimation and Testing.
- Taylor, S. Modelling Financial Time Series, 2nd edition. World Scientific, 2008.

COURSE OUTLINE/LECTURE SCHEDULE

Day 1: Stationary time series.

- Review of the basic concepts of stationary time series.

· Unobserved components and signal extraction.

· State space models and the Kalman filter.

Day 2: Trends, seasonals and cycles.

· ARIMA models.

· Structural time series models.

· Explanatory variables and intervention analysis.

· STAMP package

Day 3: Multivariate time series models

· Common trends and co-integration

· Intervention analysis and control groups

Day 4: Nonlinear models

· Dynamic conditional score models.

· The TSL program.

Day 5:Modelling volatility

· Conditional heteroscedasticity

· Time-varying correlation and association