

DEPARTMENT OF ECONOMICS

Econ602: Time Series Econometrics and Forecasting

COURSE AIMS & OBJECTIVES, KEY SKILLS AND LEARNING OUTCOMES

Course Aims & Objectives: The purpose of this core course is to provide students with an in-depth understanding of the fundamental concepts of time series econometrics and forecasting and with the practical skills to use econometric software to model and forecast economic time series and identify models with the best forecasting abilities. The module would build on the foundation of the econometrics core course and prepare students for MSc and PhD research.

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

- Understand how to model a univariate or multivariate time series process
- Understand the Maximum Likelihood estimation method
- Distinguish between stationary and nonstationary series and understand the implications of using nonstationary series.
- Understand how to forecast a univariate or a multivariate time series process
- Be able to conduct forecast evaluation with statistical and economic loss function.
- Build, estimate and forecast from univariate and multivariate time series models using econometric software.
- Understand and critically evaluate recent research in forecasting.

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

- Engage in abstract thinking by extracting the essential features of complex systems to facilitate problem solving and decision-making
- Communicate and present complex arguments in oral and written form with clarity and succinctness
- Present, interpret and analyse information in numerical form
- Utilise effectively statistical and other packages
- Apply econometrics techniques to aid understanding of the financial and macroeconomic environment
- Work effectively both individually and within a team environment.

COURSE STRUCTURE

Econ602 is a core 20 credit course and therefore students are expected to input approximately 200 hours of study into the course. The total number of contact hours on Econ602 is 25 hours. This leaves 175 hours for private study. Course Delivery comes in the form of Lectures (5 days of 4 hours lectures), and 5-hours of tutorial /labs. During your private study you should strike a balance between reading textbook and journal materials, thinking critically about how these fit into the body of knowledge on the subject and about how our level of knowledge can be improved, performing exercises and revising for examinations.

Lectures

COURSE CONVENOR

Prof Dr Christian Francq

LECTURER AND TUTOR CONTACT INFORMATION

Email: Christian.Francq@ensae.fr

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

ADMINISTRATIVE SUPPORT STAFF

Emma Fitchett email: e.fitchett@lancaster.ac.uk Tel: 01524 594228

The Administrative Staff are your primary point of contact for all administrative matters concerning Economics courses. Most matters can be resolved with a single face-to-face meeting. You may also contact the Economics Department Office via email.

Office Hours: Mon-Fri, 9:30-11:30 and 14:00-16:00, room MS B34

Please email the Administrative Support Staff if you are unable to attend during office hours to arrange an appointment.

Please note: The course website on MOODLE is the primary means of communication with students. Also any emails will be sent to your Lancaster email account which you should check regularly.

MOODLE INFORMATION

Course website via MOODLE: <https://mle.lancs.ac.uk/course>. Login using your regular Lancaster University access details. This opens a page headed MLE: My home.

ATTENDANCE AND LECTURE INFORMATION

Attendance is monitored by class register at all compulsory classes i.e. tutorials, lecture seminars, computer laboratory sessions and workshops. Absences are recorded electronically against an individual's record. It is the responsibility of each student to ensure that their attendances are correctly recorded both in class and

electronically. Students must report all absences (illness or otherwise) using the online self certification system <http://mylusi.lancs.ac.uk/StudentInfo/> then click on absence notification). In cases where illness is causing you to miss a coursework element or for an illness causing you to miss a continued number of classes, you are required to provide medical confirmation after consultation with a doctor/GP whilst ensuring that you still maintain your attendance record in the self certification system. Equally, we may feel it necessary to request that you provide additional documentation to support the reasons you have entered on the self certification system for your absence(s). Students who are absent without explanation will be recorded as an unauthorised absence and this will be reported to the appropriate Director of Studies, who decides whether disciplinary measures need to be taken. Persistent failure to attend without explanation will lead to referral to the Standing Academic Committee and the risk of permanent exclusion from the University. Please note that the University teaching day runs until 20:00 hours. If you have any event timetabled up to and including this you should not make any travel arrangements that involve you leaving Lancaster before this time, in particular on the last day of term.

TIMETABLE INFORMATION

ASSESSMENT

The CWA mark will be calculated as 100% coursework. The coursework will be assigned at the end of the course

The coursework will be delivered to students at the end of week 6 of each term and is due for submission at the end of week 10, allowing students 4 weeks for completion.

Coursework must be submitted electronically through the Moodle site for this course.

MARKING CRITERIA AND PENALTIES

Marking criteria can be found on pages 21-22 of the Economics Undergraduate Handbook. An electronic copy of this can be found on the Econ Part 1 and Econ Part 2 Moodle pages.

FINAL MARKING

The Final exam takes place three weeks after the end of the course and resits are offered 9 weeks after the release of the exam results

RESEARCH ETHICS

In the event that your coursework involves collecting information from or conducting interviews with individuals you should be aware of the following LUMS research ethics code of conduct. You will need to sign on the coursework submission form that you have followed these guidelines

CODE OF CONDUCT

These are the principles of the LUMS Code of Conduct:

1. Students will agree to conduct empirical research involving human participants in line with the University ethical research guidelines: <http://www.lancs.ac.uk/depts/research/lancaster/ethics.html>.
2. Students will normally ensure that participation in their research activities is based on informed consent.
3. Students will be honest in all their relationships with research participants.
4. Students will be transparent as to the context and purpose of data collection.
5. Students will respect the confidentiality of information collected in their research activities.
6. Students shall respect the rights and well-being of all individuals and organisations affected by their research.
7. Students will ensure that respondents are not harmed or adversely affected by their research activities.
8. Students will respect the needs of participating individuals and/or organisations and the requirements of the University in meeting their academic requirements.
9. Students will discuss the research, design, and its operationalisation with their supervisors/module tutors, prior to conducting the research, to ensure that the above principles are adequately considered.

STUDENT FEEDBACK

At the end of the course students will be given the opportunity to provide feedback on the course. This is done through an online questionnaire using the Questionmark Perception software. Students will be notified via email during the course as to when the questionnaires will be available. This feedback is extremely valuable to the University as it enables us to identify areas of strength and weakness so that we can improve the course in the future. You are strongly advised to complete this questionnaire for every course that you take at Lancaster University.

COURSE TEXT AND RECOMMENDED READING

Main texts

The main recommended textbook is:

Course text:

- Brooks, C., (2019). *Introductory Econometrics for Finance*, Cambridge University Press.

Recommended readings:

- Hamilton, J.D., (1994). *Time Series Analysis*, Princeton University Press.
- Greene, W., (2003). *Econometric Analysis*, Prentice Hall.
- Brockwell & Davis, 2002, *Introduction to Time-Series and Forecasting*.
- J. Stock and M. Watson, *Introduction to Econometrics*.

- Marno Verbeek (2000). A Guide to Modern Econometrics.
- W E Griffiths, R C Hill and G C Lim, Using EViews for Principles of Econometrics, Wiley. 5th Edition. This supplementary book presents the EViews software commands required for the examples in Principles of Econometrics, 5th Edition in a clear and concise way. It contains many illustrations that are student friendly. It is useful not only for students and instructors who will be using this software as part of their econometrics course..

Students will also find the following texts useful as further reading.

- J.M. Wooldridge (2012) *Introductory Econometrics: A Modern Approach*, CENGAGE Learning Custom Publishing; 5th edition.
- C Dougherty (2011) *Introduction to Econometrics* Oxford University Press.
- Pindyck, R. S. and D. L. Rubinfeld, (1997), *Econometric Models and Economic Forecasts*, 4th edition. McGraw-Hill.
- W.H. Greene, (2011) *Econometric Analysis*, Pearson Education
- H. Maylor and K. Blackmon, *Researching Business and Management* (Palgrave Macmillan, 2005) – this may be helpful when planning your computer project
- Maddala, G (1983). *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge.
- Gujarati, D. (1995). *Basic Econometrics*, Mc Graw-Hill, New York.
- Kennedy, P (1993). *A guide to Econometrics*, Basil Blackwell, Oxford.
- Maddala, G. (1992). *Introduction to Econometrics*, Macmillan, Ontario.
- Stewart, M. and Wallis, K. (1990). *Introductory Econometrics*, Basil Blackwell, Oxford

Note Copies of the lecture slides will be made available on the course web pages. You **MUST** print off the notes for each lecture **prior to** attending. Solutions to exercises, and some additional material associated with these lectures and course announcements will also be placed on this website.

COURSE OUTLINE/LECTURE SCHEDULE

Day 1:

Lecture 1: Introduction and key concepts

- Definitions of time series
- Strictly and weakly stationary processes

Lecture 2: Moments, stochastic processes and lag operators

- Conditional moments
- Simple stochastic processes
- Lag operators and data transformations

Lecture 3: The autoregressive model of order 1

- Definition of AR(1)
- Stability and moments

Day 2

Lecture 4: ARMA models

- Overview of ARMA models
- Stability and moments

Lecture 5: ARMAX models

- Overview of ARMAX/ADL models
- Stability and moments
- Short-run and long-run multipliers

Lecture 6: Forecasting and impulse response functions

- Forecasting and IRFs for ARMA models
- Forecasting and IRFs for ARMAX plus ARMA models
- Examples

Day 3:

Lecture 7: ARMA model estimation

- The maximum likelihood estimator
- Estimator properties

Lecture 8: ARMA model specification

- General-to-specific estimation
- Residual testing

Lecture 9: Testing and validation

- Testing and diagnostic checking
- ARMA model validation and comparison

Day 4:

Lecture 10: Multivariate Time Series

- Concepts and properties
- VARs and seemingly unrelated regression

Lecture 11: Estimation and forecasting of VAR models

- Estimation by ML
- Forecasting vector models
- Impulse response functions

Day 5:

Lecture 12: Unit Roots and Stationarity Tests

- Introduction to the notion of stationarity and unit roots
- The Dickey-Fuller unit root test
- Other stationarity and unit root tests

Lecture 13: SARIMA Models

- The Box-Jenkins methodology
- Integrated ARMA models
- Seasonal ARIMA models

Day 6 :

Lecture 14: Multivariate forecasting I - Vector Error Correction Model:

- Cointegrated VARs: Johansen's test for cointegration
- The (Vector) Error Correction Model (VECM)
- Estimating and interpreting a VECM in **EViews**

Lecture 15: Multivariate forecasting II - Forecasting using the VECM :

- Creating and interpreting forecasts with non-stationary VARs
- Static and dynamic prediction
- Modelling and predicting UK inflation