ECON 4304: Time Series Econometrics and Business Forecasting

2022-23 Spring

Department of Economics, HKUST

Instructor: C.Y. (Eric) Ng Email: ecyng@ust.hk Office: LSK 6016D Office hours: by appointment **TA:** Jeremy TO Email: ecjeremy@ust.hk Office LSK 6066 Office hours: by appointment	**Lecture:** Mon & Wed 10:30 - 11:50am Room: Rm 6591, Lift 31-32 **Tutorial:** Wed 5:00 - 5:50pm Room: Rm 1007, LSK Bldg **Course website:** https://canvas.ust.hk

Course Description

This course introduces econometric methods and their applications in economic time series analysis and forecasting. We begin by reviewing key concepts in multiple regression using time series data and introducing the test for structural change. We then go through both the theory and applications of ARMA models for forecasting, conditional heteroskedasticity through the perspectives of ARCH/GARCH models, estimation of dynamic causal effects using vector autoregression, unit root and cointegration. The applications focus on special features of economic time series data and the associated statistical tools.

Prerequisites

Econ 3334 or equivalent

Course Intended Learning Outcomes (CILOs)

Upon successful completion of the course, students will be able to:

1. Understand key concepts in time series econometrics and acquire basic analytical skills in time series analysis.
2. Construct an appropriate time series regression model to analyze a given economic data set, and then conduct statistical inference and interpret the results.
3. Use the statistical software R to conduct time series analysis and forecast.
4. Collect data set to conduct empirical analysis, and provide answers to economic questions.
5. Present your understanding of certain economic problems verbally and in writing, and use empirical results to justify your explanation.

Teaching Approach

Teaching & Learning Activities	Roles in the Course	Course Learning Outcomes Addressed
Lectures and Tutorials	Explain key concepts and models to students.	1, 2, 3
In-class Discussion	Develop critical thinking in addressing economic questions.	1, 5
Assignments	Apply econometric methods to conduct empirical analysis.	2 , 3, 4, 5

Assessment Scheme

- Homework (20%): Three or four assignments
- Midterm (35%): Mar 20
- Final Exam (45%): TBA

Course Outline

Topic 1. Introduction (Week 1, CB Ch.2)

Topic 2: Review of Linear Regression Using Time Series Data (Weeks 1-2, CB Ch.3-4)

Topic 3: Review of Regression Diagnostics: A Time Series Perspective (Weeks 2-3, CB Ch.5)

- Tests for Structural Break

Topic 4. Univariate Time Series Models (Weeks 3-6, CB Ch.6)

- Stationarity, Autocorrelation/Partial Autocorrelation, Forecast
- Autoregressive (AR), Moving Average (MA), ARMA Models
- Application to US Core Inflation

Topic 5. Volatility Models (Weeks 6-7, CB Ch.9)

- Autoregressive Conditional Heteroskedasticity (ARCH/GARCH) Models
- Applications of ARCH/GARCH Models

Topic 6. Multivariate Time Series Models: Vector Autoregression (VAR) (Weeks 8-9, CB Ch.7)

- Structural VAR (SVAR), Reduced-form VAR, Recursive VAR Models
- Applications of VAR Models

Topic 7: Non-stationary Time Series: Time Trend and Stochastic Trend (Week 10, CB Ch.8)

Topic 8. Multivariate Time Series: Modeling the Long-Run Relationship (Weeks 10-11, CB Ch.8)

- Cointegration and Error-Correction Models
- Applications of VECM Models

Note: This is a tentative course outline. The instructor may fine-tune the topics while ensuring the course objectives being achieved.

Learning Resources

There is no required textbook. We use lecture slides for teaching. All teaching materials (including lecture slides, code examples and data) are downloadable from CANVAS.

The following books (in Library Reserve) help enhance your learning of the content in the lecture slides.

- Chris Brooks (**CB**) (2019): "Introductory Econometrics for Finance." 4th Edition, Cambridge University Press.
- Stock, James and Mark Watson (2019) "Introduction to Econometrics." 4th Edition, Pearson.

Computer Software

Data analysis will be mainly demonstrated using the free software R. It is available at: https://www.r-project.org/. You may install R first. Then install Rstudio (https://rstudio.com/), which is an easy interface to use R.

Academic Policy

Dishonesty or plagiarism will not be tolerated. Any student violating HKUST Academic Integrity and Honor Code (https://registry.hkust.edu.hk/resource-library/regulations-student-conduct-and-academic-integrity) will be subjected to disciplinary procedure.