ECON 4304: Time Series Econometrics and Business Forecasting

HKUST Department of Economics

2023/24 Spring

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
	Lecture: Mon 03:00PM - 04:20PM
	     Fri 10:30AM - 11:50AM
	     Rm 1005, LSK Bldg
	 Tutorial: Thu 03:00PM - 03:50PM
	     Rm 1033, LSK Bldg
	 Course website: https://canvas.ust.hk

Course Description

This course introduces econometric methods and their applications in time series analysis and forecasting. Topics include multiple regression using time series data, tests for structural break, theories and applications of ARMA models for forecasting, modeling time-varying volatility using ARCH/GARCH models, unit root testing for non-stationary time series data, estimation of dynamic causal effects using vector autoregression and cointegration, and forecasting with mixed frequencies using MIDAS.

Prerequisites

Econ 3334 or equivalent

School Intended Learning Outcomes (SILOs)

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

Assessment Scheme

- **Homework (25%):** Three problem sets: HW1 (Feb 21), HW2 (Mar 8), HW3 (Apr 10)
- **Tests* (75%):** Three in-class tests (25% each): Test 1 (Mar 15), Test 2 (Apr 19), Test 3 (May 10)
  *You need to bring your laptop (with R and Rstudio installed) to the classroom and log in the CANVAS website to take the tests. An absence from a test without a valid reason (including sickness or unexpected family emergencies) and a documentary proof will result in zero mark for the test. Note that time conflict with job fair, seminar, part-time job, or social event is not a valid reason for your absence from a test.

Course Outline

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

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

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

- Tests for Structural Break

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

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

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

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

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

7: Non-stationary Time Series: Time Trend and Stochastic Trend (Weeks 9-10, CB Ch.8)

- Unit root tests

8. Multivariate Time Series: Modeling the Long-Run Relationship (Weeks 10-12, CB Ch.8)

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

9. Forecasting with Mixed Frequencies (Weeks 12-13)

- The MIDAS Approach

Learning Resources

There is no required textbook. We use lecture slides and code examples for teaching. All teaching files are downloadable from the course CANVAS website (https://canvas.ust.hk).

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.

Software

Data analysis will be 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.