**Time Series Econometrics (ECON 6121D, 2 credits, Spring 2026)**

**Department of Economics, HKUST**

**Instructor:** WANG, Peng        Email: pwang@ust.hk        Phone: 2358-7630

Office: Rm 6077, LSK Bldg        Office Hours: by appointment.

**Lecture schedule and location:** Wednesday 09:00 - 10:50. (Rm 1027, LSK Bldg)

**Course Description:**

This doctoral-level course provides a rigorous foundation in modern time series analysis. We begin with a review of core time series concepts, including stationary ARMA processes, unit root testing, cointegration, and GARCH. We then delve into Vector Autoregressions (VARs), Vector Error Correction Models (VECM), Markov Regime-Switching Models, and High-Dimensional Factor Models. Students will practice estimation, inference, and forecasting using both R and MATLAB.

**Prerequisites:**

Introductory econometrics, linear algebra, calculus, probability and statistics, or consent of instructor.

**Course Web Site:** http://canvas.ust.hk

The course content is based on my lecture notes. All teaching materials and problem sets will be posted on Canvas. You should check the course website at least **twice a week** for important announcements such as homework information.

**Computer Software**

This course requires computer-based calculation. Students are required to write codes to conduct statistical inference using real data and to conduct Monte Carlo simulations. The teaching will be based on Matlab/R.

**Grading Rubics:**

**Homework (40%):**     The course is topic-based. Homework will be assigned for every topic. Students are encouraged to form small study groups. However, each student must submit his/her own solution in their **own writing**. Do not copy other people's work, even if they come from your study group. Students must submit their solutions through **Canvas** before the due dates. Late submission including uploading failure will not be accepted without justification. If the submission occurs after the answer is posted, it will receive zero points.

**Class discussion (10%):** We will ask students to conduct short presentations. The content can be homework solutions, a journal article, a research idea, etc. The timing of the presentations will be coordinated during the semester.

**Final exam (50%):** Time and location to be assigned.

**Attendance**:

We will not take record of attendance, but you are strongly encouraged to attend every lecture.

**Exam Policy:**

The exam is closed-book. However, you may prepare **three pages** of double-sided cheat sheets and use them during the exam. There is zero tolerance of cheating. The case of cheating will be reported to the school. We will check your **school ID cards** during exams.

**Re-grading Policy:**

Contact your TA regarding any grading issue within <u>one week</u> from the time the grade is released.

**Academic Integrity and Honesty**:

Students are required to comply with the university policy on academic integrity as detailed at

https://registry.hkust.edu.hk/resource-library/academic-honor-code-and-academic-integrity

The case of **plagiarism** and **copying** will be reported to the school.

**Program Intended Learning Goals (PILG): PG, MPhil, PhD**

1. Students will have up-to-date and in-depth knowledge in Economics, leading to independent substantive scholarly research.

    1. Demonstrate a sound grasp of literature in Economics.

    2. Apply their knowledge in Economics to solve related business problems in an innovative fashion.

2. Students will have an in-depth understanding of contemporary business and organizational issues, within the field of Economics.

    1. Demonstrate a broad-based knowledge of core business functions.

    2. Integrate functional knowledge to solve business problems within the field of Economics.

3. Students will be equipped to perform all aspects of the role of faculty in academia, including pedagogical skills.

1. Teach independent courses or lead lab/tutorial sessions effectively.

2. Present their discipline knowledge clearly to layman.

**Course Intended Learning Outcomes:**   Upon completion of the course, you will be able to:

1. Weigh the significance of key assumptions used in different econometric models and explain the relationship between those assumptions and properties of estimators. (PILO 1)

2. Design an identification strategy. (PILO 1, 2)

3. Derive statistical properties of an estimator. (PILO 1)

4. Use Matlab to conduct Monte Carlo simulations to analyze properties of estimators. (PILO 1)

5. Construct an appropriate econometric model and use Matlab/Stata/R to analyze a given economic dataset and then conduct statistical inference and interpret the results. (PILO 1,2,3)

**Reference Textbooks:**

Hayashi, Fumio (2000): "Econometrics." Princeton University Press

Hamilton, J. D. (1994): "Time Series Analysis." Princeton University Press.

Hansen, Bruce. (2022): "Econometrics." Princeton University Press.

**Course Outline: (Weekly topics)**

- Introduction to time series
- Special features of time series
- Lag operator and ARMA models
- Autocorrelation
- Stationarity and Wold representation
- Prediction using ARMA and VAR models
- State space models and Kalman filter
- Unit root and cointegration
- GARCH
- Markov regime switching models
- Vector autoregression
- Cointegration and VECM
- High-dimensional factor analysis