

NATIONAL TAIWAN UNIVERSITY
Department of Finance
FIN 7049 Applied Time Series Analysis

Prof. Kuan
Room 716, Bldg. 2

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ckuan@ntu.edu.tw

This course provides an introduction to time series analysis for Master and Ph.D. students. Many economic and financial data are available in time series. Such data, unlike cross-section data, are typically correlated over time and exhibit some special patterns in their conditional moments (e.g. mean and variance). Researchers thus propose various models to characterize these time series properties. In this course, we will discuss how to distinguish between stationary and non-stationary time series and present univariate and multivariate models for these data. Some nonlinear time series models (e.g., threshold models, Markov switching model) and factor models based on the principal component analysis will also be discussed. We may cover additional topics, depending on the time available.

The prerequisite of this course is at least one semester of graduate econometrics course (such as Fin 7047); some knowledge in matrix algebra and probability theory, in particular stochastic convergence concepts, would be very useful. I will follow my own lecture slides ([M1] below); more details can be found in other textbooks ([M2] & [M3]). A supplement reading about vector models with R codes is also a useful reference.

Throughout this course, homework problems, including simulation exercises, will be assigned for exercise. I assume that students already know how to do coding in R (or other languages). Your grade will be determined by the term paper of an empirical study and oral presentation of the paper; a detailed guideline will be provided later.

Readings

- [M1] Kuan, C.-M., Lecture Slides, <https://cool.ntu.edu.tw>; please constantly check the site for new versions.
- [M2] Hamilton, J. D., *Time Series Analysis*, Princeton University Press, 1994.
- [M3] Tsay, R. S., *Analysis of Financial Time Series*, 3rd edition, Wiley, 2010.
- [S1] Huang, Y.-L. and C.-M. Kuan, *Vector Autoregressive Models: Econometrics Methods with R* (in Chinese), Taipei, Yeh Yeh, 2014.

Course Outline

Lecture 1 Economic and Financial Time Series Data

Lecture 2 Weakly Stationary Time Series: Univariate Case (M2, Chap. 1-4; M3, Chap. 2)

Lecture 3 The Box-Jenkins Approach (M2, Chap. 5)

Lecture 4 Weakly Stationary Time Series: Multivariate Case (M2, Chap. 10 & 11; M3, Chap. 8)

Lecture 5 Non-Stationary (Integrated) Time Series (M2, Chap. 18; M3, Chap. 2)

Lecture 6 Models with Integrated Time Series (M2, Chap. 19 & 20; M3, Chap. 2)

Lecture 7 Volatility Models (M3, Chap. 3 & 10)

Lecture 8 Topic I: Nonlinear Time Series Models (M3, Chap. 4)

Lecture 9 Topic 2: Principal Component Analysis and Factor Models (M3, Chap. 9)

Lecture 10 Additional Topics

Office Hours: Monday 15:00–17:00 at Room 716, Management School Bldg. 2

Grading: Term paper (85%) and presentation(15%).