

Course Outline for *Advanced Time Series and Financial Econometrics*
(01:220:400:01)

Department of Economics
Rutgers University
Fall Semester, 2017

Course Information

Title: Advanced Time Series and Financial Econometrics
Code: 01:220:400:01
Lecture Times: MTh 9:50am–11:10am
Location: AB1150 - College Avenue Campus
Course site: <http://sakai.rutgers.edu>
Final Exam: There is no final exam for this class.

Contact Information

Instructor: Prof John Landon-Lane
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Course Objective and Learning Goals

This is an advanced econometrics course. In this class you will be introduced to the models and econometric issues that occur when dealing with time series data. Applications of time series methods to economics and finance will be stressed. Students completing this class will be able to decompose time series into its constituent parts, be able to understand and deal with non-stationarity of time series data and be able to estimate and interpret univariate and multivariate time series econometric models. Students will also be able to use estimated time series models for policy analysis and forecasting.

Prerequisites

This is an UPPER LEVEL elective. Students must have obtained a grade of C or higher in 01:220:320, 01:220:321, and 01:220:322. A grade of C or higher is the minimal requirement for taking this class. A grade of B+ or higher in Econometrics (01:220:322) is recommended for taking this course. The material covered in Econ 322 is assumed and so it is strongly suggested that students revise their notes before starting this class.

Text and Software

The text for this course is:

Walter Enders, *Time Series Analysis: Univariate and Multivariate Methods (4th Ed.)*, Wiley. Print ISBN 9781118808566, eText ISBN 9781118918623.

The eText can be found at the following address:

<https://www.vitalsource.com/referral?term=9781118918623>.

The software that will be used in this course is EVIEWS. The software is available in all university computer labs. Students can also purchase a full student version of this software from the following website:

<http://www.ihsmarketplace.com/collections/student-version>

There is also a free student “lite” version available at the website as well.

Lecture Outline

The following is a list of lecture topics. I have indicated the relevant Chapters of the text for each topic. This should be used as a rough guide for your reading. The lecture material will be greatly enhanced for you if you are up to date with your readings.

1. Introduction (Chapter 1)

- What is a time series?
- Solving Linear Difference Equations
- Stationarity and Ergodicity.
- Measuring dependence in a time series: The autocovariance and autocorrelation functions
- The partial autocorrelation function.
- Estimation of ACF and PACF.

2. Univariate Time Series Models for Stationary Data (Chapter 1 and 2)

- The autoregressive AR(p) model.
- The moving average MA(q) model.
- The autoregressive and moving average ARMA(p,q) model.
- Identification.
- Seasonal Models

3. Parameter estimation and model identification

- the Box-Jenkins approach
- maximum likelihood methods
- model diagnostics
- information criteria

4. Regression Models with Stationary Time Series (Own Notes)

- Dynamic nature of regression relationships
- Distributed lag models
- Serially correlated errors in a regression model
- Estimating regression models with serially correlated errors
- Autoregressive distributed lag models

- Measuring dynamic impacts.
5. Time Varying Volatility in Time Series (Chapter 3)
 - Conditional heteroscedasticity in financial time series.
 - ARCH and GARCH.
 - Stochastic volatility.
 - Financial applications of time varying volatility.
 6. Trends and Nonstationarity (Chapter 4)
 - deterministic trends
 - stochastic trends
 - data transformations needed to make data stationary
 7. Testing for Unit Roots (Chapter 4)
 - The augmented Dickey-Fuller test.
 - other unit root tests.
 - spurious regression.
 - seasonal unit roots.
 8. Outliers and Structural Breaks (Chapter 4)
 - Testing for structural breaks.
 - Unit root tests when there are structural breaks and/or outliers.
 9. Decomposition of Time Series (Chapter 4)
 - Cycles in time series.
 - Spectral decomposition of time series.
 - some common filters used to decompose time series
 - The Hodrick-Prescott filter.
 - The Baxter-King Filter.
 10. Vector Time Series Methods (Chapter 5 and 6)
 - Vector autoregression models VARs
 - impulse response functions and their interpretation
 - policy evaluation using VARs
 - structural VARs
 - forecast error variance decompositions

- cointegration and vector error correction models

11. State Space Models (Own Notes)

- linear Gaussian state space models
- The Kalman Filter
- time varying parameter models
- real time forecasts

NOTE: I reserve the right to add or subtract topics as the course develops. Not all topics will be covered in the same detail. Time constraints may cause some topics to be omitted. Unless otherwise notified, students are responsible for all the topics noted in the lecture outline.

Course Assessment

Course assessment will take many forms. There will be graded assignments, empirical projects, and exams.

Final grades will be based on your performance in all forms of assessment according to the following distribution:

Assessment	Weight
Assignments and Empirical Projects	20%
Final Empirical Project	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%

Computer assignments sets will consist of applied econometric work using a computer program. I encourage students to work together on the empirical assignments. However, all students must write up their answers independently of each other. Students caught submitting identical, or nearly identical, assignments will receive a zero grade for that assignment. Late assignments will receive a score of zero. There will be plenty of time allocated for the assignments so that there is no excuse for a late assignment.

All exams are cumulative. If you do not attend an exam, you will receive a zero grade for that exam. Students who cannot attend an exam can, under certain circumstances, make alternative arrangements if they provide me with documentary evidence regarding the reason they missed the exam. I do not give extra-credit assignments.

Finally, I regard academic dishonesty as a very serious offence. Any student caught cheating will receive an F for this course and will be reported to the appropriate university authority. There will be no warnings. The following are some of the actions which I regard as academic misconduct:

1. Taking unauthorized materials into an examination.
2. Submitting work for assessment knowing it to be the work of another person.
3. Improperly obtaining prior knowledge of an examination paper and using that knowledge in the examination.
4. Failing to acknowledge the source of material in an assignment.

Grading Policy

The following table indicates what scores are necessary for each particular grade:

Grade	Range of Scores
A	> 85
B+	75 – 85
B	68 – 75
C+	60 – 67
C	55 – 60
D	50 – 55
F	< 50

Important Dates

Date	Event
Thursday, October 5, 2017	Exam 1 (regular class time)
Thursday, November 2, 2017	Exam 2 (regular class time)
Thursday, November 27, 2017	Exam 3 (regular class time)
Tuesday, December 19, 2017	Final Project Due 3pm.
Tuesday, September 12, 2017	Last day to drop class without receiving a W.
Monday, October 30, 2017	Last day to drop class with a W grade.
Tuesday, November 23, 2017	Change in designation of days. Thursday classes meet today.

Final Comments

1. It is expected that all students will attend lectures, be up to date with their readings and be prepared to participate fully in class. Please ask questions in class or in office hours if you have any problems or misunderstandings. Do not wait until just before an exam to ask questions.
2. Students are expected to attend all classes. If you expect to miss one or two classes because of illness or a family emergency, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.
3. The best way to learn is by doing. I recommend attempting as many exercises at the end of each chapter of the text as you can.
4. No electronic devices (e.g. laptops, iPads, or cell phones) are allowed to be used in class. Please be respectful of your fellow classmates and instructor and turn all devices off during class.