Time Series Analysis **Fall 2009**

Instructor information

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Course URL = http://www.ams.jhu.edu/~torcaso/495.html

About the course

This course will give an introductory treatment to the statistics of time series primarily in the time domain. The course will assume familiarity of basic statistical techniques (eg., hypothesis testing, test statistics, and basic distribution theory), and some linear algebra. This is a mathematics course: a maturity is assumed. Whenever appropriate practical applications and demonstrations will be provided to illustrate the methods. Since many (but not all) calculations are computationally intensive the use of a software is needed. A rough outline of the course is as follows:

1. Introduction, definitions, descriptive methods, linear filters
2. Basic models for time series, notions of stationarity
3. Linear time series, Autoregressive Moving Average (ARMA) processes
4. Yule-Walker estimation, Durbin-Levinson recursions, maximum likelihood estimates
5. Forecasting methods for stationary processes, and Ad-hoc methods
6. Nonstationarity, random walk, ARIMA, Seasonal ARIMA processes
7. Box-Jenkins estimation and forecasting
8. State Space models and representations, multivariate time series
9. Optimal prediction and the Kalman recursions
10. Other topics as time allows; frequency domain, spectral density estimation, ARCH processes

Textbook

Typed course notes will be distributed to each registered student during class. Although these notes are fairly self-contained, they were meant to follow Brockwell & Davis' *Introduction to Time Series and Forecasting* textbook which is not required for this course.

References

Brockwell & Davis, *Intro. to Time Series and Forecasting*, Springer-Verlag (2002)
Shumway & Stoffer, *Time Series Analysis and its appl.*, Springer-Verlag (2000)
Chatfield, *Time Series Forecasting*, Chapman and Hall/CRC Press (2000)
Harvey, *Time Series models, 2nd ed.*, MIT Press (1993)
Brockwell & Davis, *Time Series: Theory and Methods, 2nd ed.*, Springer-Verlag (1991)
Box & Jenkins, *Time Series Analysis: Forecasting and Control, revised ed.*, Holden-Day (1976)

Course structure

Homeworks (40%); One midterm examination (30%); Final Exam (30%)
Late is defined to mean *not handed in at the beginning of the class on the due date.* You are allowed **one** late homework in this course - the late assignment must be handed in directly to me at the beginning of the *next* regularly-scheduled class meeting. All other late homework will only receive half credit. Homeworks handed in after the lateness window will not be graded.