

The Islamic University of Gaza
Faculty of Commerce
Department of Economics and Applied Statistics



Time Series Analysis and Forecasting

STAT 4321 - Spring 2012

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Time and location: 12:30-2:00 K108

Office hours: 12-3 Saturday & Monday - 9:30-12:30 Sunday & Tuesday

Description

This course is designed to introduce time series methodology. It covers probability models for time series, stationary processes, the autocorrelation function; pure random process, MA and AR processes; mixed models, integrated models; the general linear process, continuous processes. Model identification and estimation, estimating the autocovariance and autocorrelation functions; fitting AR and MA processes; estimating the parameters of mixed and integrated models; the Box-Jenkins seasonal model; residual analysis. Forecasting with ARIMA models.

The course intends to meet two goals. It provides tools for empirical work with time series data and is an introduction into the theoretical foundation of time series models.

Course Objectives:

- To understand time series analysis and forecasting.
- To gain some knowledge and skills on how to build ARIMA models.
- To highlight the impact of using R-software for data analysis.
- Determining how well the models fit the data.
- Develop the theory and methods of minimum mean square error forecasting for ARIMA models.

Course Outcomes:

Students will improve their knowledge and awareness on the following:

- Understand the basic concepts of Time Series.
- Model-building strategy for ARIMA modeling.
- Students will be able to mix application and theory throughout this course
- Use time series for applications from the real life.
- Ethics and social responsibilities.

Textbook:

Jonathan D. Cryer and Kung-Sik Chan (2008). *Time Series Analysis With Applications in R*, Second Edition, Springer.

References:

1. Box, G.E.P., Jenkins, G.M. and Reinsel, G.C. (1994). *Time Series Analysis: Forecasting and Control*, 3rd Edition, Prentice Hall, New Jersey.
2. Brockwell, P.J. and Davis, R.A. (1996), *Introduction to Time Series and Forecasting*. Springer-Verlag, New York.
3. Brockwell P. J., and Davis R. A. *Time Series: Theory and Methods*. Second edition. New York: Springer-Verlag, 1991.
4. Chatfield, C. (2003). *The Analysis of Time Series: An Introduction*, 6th edition, Chapman and Hall, New York.
5. Hamilton J. D. (1994). *Time Series Analysis*. Princeton University Press, Princeton.
6. Pole, A., West, M. and Harrison, P. J. (1994); *Applied Bayesian Forecasting and Time*
7. *Series Analysis*. Chapman and Hall.

Advice:

I will expect students to attend and participate in all lectures and recitations and to read and understand the book and work text problems. I cannot overemphasize the importance of both reading and practicing over the course of the entire semester! Start reading and working problems from day 1. The book is written well enough so that you can read it on your own. You will be expected to know the material even if we don't cover it in class.

Note:

Some people suffer from "Statistics Anxiety." A common symptom of this is paralysis when faced with a Statistics problem, and a reluctance to put anything down on paper lest it be wrong. The solution to this is practice, and resolution in making mistakes. Write down all the solutions you can think of, and then examine them to find the errors. Waste lots of paper!

Some people find themselves studying for a long time without making progress. This can be counterproductive. If this sounds like you then either set a time limit for yourself or study until you feel that additional time will not be productive. Then stop. I repeat: just stop. Don't feel bad about it. I have the same experience. I can only work at a problem for so long before I have to stop.

Come back to the problem later. If you still can't make progress, come see me. Perhaps we can say the right thing to get you going again.

Practice Problems:

Practice problems are assigned each lecture. All class periods will have readings and problems assigned in advance. It is your responsibility to ask questions about the readings and problems you do not understand. The purpose of practice problems in this course is to develop skills in understanding and communicating ideas in time series analysis and forecasting. These problems carry out analysis of data sets using computers. Conclusion and interpretation of results are more important than good printouts.

Exams:

Exams are announced in advance. There will be two midterm exams, final project and a final exam. These exams are closed book, closed note exams.

Final Grades:

Final grades will be based on a weighted class average determined as follows:

Mid-term Exam	30%
Computer Project	20%
Final Exam	50%

Topic Schedule:

To some extent all topics in this syllabus are approximate and depend on day class progress. The following is an approximate reading schedule for the semester.

CHAPTER 1: INTRODUCTION

CHAPTER 2: FUNDAMENTAL CONCEPTS

CHAPTER 3: TRENDS

CHAPTER 4: MODELS FOR STATIONARY TIME SERIES

CHAPTER 5: MODELS FOR NONSTATIONARY TIME SERIES

CHAPTER 6: MODEL SPECIFICATION

CHAPTER 7: PARAMETER ESTIMATION

CHAPTER 8: MODEL DIAGNOSTICS

CHAPTER 9: FORECASTING

CHAPTER 10: SEASONAL MODELS