



## **Statistics 435/711**

Fall 2019

### **Instructor**

Paul Shaman, 425 JMHH, shaman@wharton.upenn.edu, 215-898-8749

### **Class Hours and Location**

TuTh 12–1:20, JMHH

### **Office Hours**

MTuTh 4:30–6, and by appointment

### **Course Materials**

Class notes. These are the main source materials for the course. The notes will be posted throughout the semester on Canvas.

Tsay, R. S., *Analysis of Financial Time Series*, 3rd ed. Wiley, New York, 2010. Some supplementary reading will be assigned in Tsay's book, and the book will also provide some data sets for discussion and for homework.

### **Software**

The course will use R. As we proceed, I will discuss and illustrate the use of R in the notes and lectures.

The R package is free and open software and is available at [www.r-project.org](http://www.r-project.org). Several items of R documentation have been posted on Canvas.

### **Course website**

Statistics 435/711 is using Canvas. You can gain access by going to <https://canvas.upenn.edu/>. All notes, homework assignments and data sets for the course will be distributed and managed via the website.

## Course Description

The aims of this course are to introduce basic time series and forecasting techniques. The emphasis will be upon the use of statistical methodology, and the written communication of statistical results. Considerable time will be devoted to understanding statistical problems in the contexts in which they arise, and to proper selection of statistical techniques and interpretation of the statistical output.

As noted above, the primary class materials will be instructor's notes; the text will be supplementary. Use of R will be incorporated into the class notes.

There will be five homework assignments. Each will involve the analysis of data sets and interpretation of the findings, and the presentation of a clearly organized and presented written report. The homework is designed to teach and to give experience in the use of time series methodology. You are encouraged to consult with each other in doing the homework, and also to contact me for help. ***File sharing is not permitted, and you must submit your own writeup, with your own calculations. Penalties will be imposed if file sharing is detected.*** Homework must be submitted by the due date specified for the assignment. ***Unless otherwise instructed, please submit hard copy for the assignments.***

There are no examinations.

## **Calendar**

There are 28 classes (Tuesday–Thursday schedule).

The first class is Tuesday, 27 August.

The course selection period ends Monday, 16 September.

There is no class Thursday, 10 October (Fall break).

The drop period ends Monday, 7 October.

The withdrawal deadline is Friday, 8 November.

There is no class Thursday, 28 November (Thanksgiving break).

The last class is Thursday, 5 December.

## **Topics**

The primary goal is to present time series techniques. Basic multiple regression will be reviewed at the beginning, and additional regression topics will be presented as they are needed. For the most part, because of time limitations, attention will be focused on univariate series. Data sets studied will be primarily, but not exclusively, business and economic time series, including financial market data.

Multiple regression methods

Trends and seasonality

Distributed lag models

ARIMA models

Spectral methods

Exponential smoothing

Combination of forecasts

ARCH and GARCH models