

SYLLABUS

958:565: Financial Time Series Analysis

960:565: Applied Time Series Analysis

Spring, 2012

Instructor: Professor Rong Chen
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 Office Hours: M 3:30-5:00 or by appointment

Grader: to be determined

Course Web Site: http://stat.rutgers.edu/~rongchen/TS_Course12.html

Prerequisite: First graduate level mathematical statistics course and graduate level applied regression course
 It should be emphasized that this course will cover a great deal of material at a rapid pace and will require some programming kills (**R**, or other software of your choice, such as SAS). Students who have had difficulty in previous mathematical statistics courses or have difficulty with computers may find that this course requires a considerable amount of time and effort, and should plan accordingly.

Text: *Analysis of Financial Time Series*, by Ruey S. Tsay. 2nd Edition, Wiley
 [Supplemental Text] *Time Series Analysis and Its Applications, With R Examples*, by Robert Shumway and David Stoffer, 2nd Edition, Springer

Note: Not all topics and chapters in the books will be covered. There will be supplemental materials outside the books. Lecture notes will be posted on the course web site.

Lectures: M 6:40-9:30, SEC 210 BUS

	960:565	958:565
Homework & Computing	30%	20%
Midterm Exam	35%	25%
Final Exam	35%	30%
Project		25%

Schedule: Midterm: Monday March 19 (in class)
 Final: Monday May 7 (6:40-9:30pm SEC 210)

Project (958:565) Proposal: Monday March 5
 Intermediate Report: Monday April 2
 Presentation: Monday, April 30
 Final Report: Wednesday, May 9

Homework:

- Homework will be assigned and collected regularly. **Late homework will not be accepted. DO NOT COPY from other sources**
- All homework assignment must be written on standard 8.5 by 11 paper and stapled together. Computer generated output without detailed explanations and remarks will not receive any credit. You may type out your answers, but make sure to use different fonts to distinguish your own words with computer output. Only hard copies are accepted, except under special circumstances. You should also submit the R source code with computing assignments.
- Homework solutions will be available on our course web site.

Computing: Data analysis is an integral part of the course. The main software package is **R**. Instructions for using the package will be given and briefly discussed, assuming you have taken the *applied regression* course with **R**. If you do not have previous exposure to **R** (or S+), please be aware that you may need to devote considerable time and effort to get started. **R** is a free software. Instructions for installing **R** on PC are available on the course web page. You may use any other software package of your choice, but no instructions or help will be given from TA or me.

Project (958:565): Project is to be carried out by a team of two investigators. Imagine that the upper management is contemplating to disband your team and this is your last chance to show how useful you are, in order to save your job. You can choose to do (but not limited to) one of the following things: (i) finding a strategy that will potentially generate positive returns, (ii) demonstrating your ability to help other team/line of business in generating useful information from data to help their business, (iii) demonstrate your ability to evaluate risk more accurately, including risk calculation and stress testing.

Your **project proposal** needs to include what you plan to do, why it is important to the business, what kind of data you are going to use and a list of possible methodologies you plan to use. Your **intermediate report** needs to include data description, preliminary analysis, the methodologies you are using, and the results you expect to get. The presentation is limited to 10 minutes to your upper management who will decide if you still have a job tomorrow. Your **final report** should contain a report of what you have done, with summaries for a very busy boss who missed your presentation, and with details for an expert consultant who will read all the details of your report and give an expert opinion to the upper management.

Course outline (tentative):

1. **Introduction and Review**
2. **Correlation and Serial Correlation**
3. **Trend and Seasonal Components. Transformations**
4. **Univariate ARIMA Models: Model building, Estimation and Prediction**
5. **Conditional Heteroscedastic Models, Stochastic Volatility Models and VaR**
6. **Extreme Value Theory and VaR**
7. **High-frequency Data and Realized Volatility**
8. **Regime Switching models, Hidden Markov Models and State Space Models**
9. **Nonparametric Time Series Models**
10. (if time permits) **Other Advanced Topics**