

CSC425 – Time series analysis and forecasting

Homework 2

Due on February 1st, 2013 before midnight

Total points: 20

Reading assignment

- Chapter 2 sections 2.4 and 2.5 on AR models
- Review course documents posted under week 3.

For SAS users

- Review notes on SAS procedures posted under SAS resources in the Documents page on the course website.
- Useful resources are at <http://www.ats.ucla.edu/stat/sas/> and http://support.sas.com/documentation/cdl_main/

For R users

- Review notes on R posted under R resources in the Documents page on the course website.
- Useful resources are at <http://www.statmethods.net/> and <http://www.ats.ucla.edu/stat/R/>

PROBLEMS

Problem 1 [6 pts]

Consider the following AR(2) time series process: $r_t = 0.01 + 0.3r_{t-2} + a_t$, where $\{a_t\}$ is a Gaussian white noise series with mean zero and constant variance $\sigma^2=0.02$. (Hint: Read section 2.4.1 and 2.4.4 in your book on properties of AR models before you work on this problem)

- What is the mean of the time series r_t ?
- Determine if the AR(2) model is stationary. Explain.
- Compute the lag-1 and lag-2 autocorrelations of r_t (HINT: check week 3 slides)
- Assume that $r_{100} = -0.01$ and $r_{99} = 0.02$. Compute the 1-step and 2-step ahead forecasts of the AR(2) series at the forecast origin $t=100$.
- [Extracredit: 1 pts] What is the variance of the time series r_t ?

Problem 2 [12 points]

Consider the Unemployment Insurance Weekly Claims (claims) from January 1990 to January 2013 in the file `icsa.csv`, obtained from the Federal Reserve Bank at St Louis. Build an AR(p) time series model for the series as described below. Review week 3 examples before analyzing this dataset.

- Import the data either in R or SAS (Hint: be careful...the data are comma-delimited. In R you should create a time series object using the `zoo()` function.
- Compute the growth rate of claims (`ratechg`) variable as the percentage change : $(x_t - x_{t-1})/x_{t-1}$
- Create time plots for `claims` and for `ratechg`. Analyze the time trends displayed by the plots?

- d) Analyze the distribution of `ratechg`. Can you assume that `ratechg` is normally distributed?
- e) Is the time series of rate changes (`ratechg`) serially correlated? Use the Ljung Box test.
- f) Analyze the first 15 lags of ACF for `ratechg`. Draw conclusions.
- g) Is there evidence that the time series `ratechg` is non stationarity?
- h) Analyze the first 15 lags of PACF of `ratechg`. If you want to fit an AR(p) model, what order would you use based on the PACF? Why?
- i) Fit an AR(p) model for the data.
- j) Examine the significance of the model coefficients, and analyze the residuals to select a good model for the data. If the AR(p) model selected above is not appropriate, fit another AR(p) model of different order.
- k) Write down the expression of the selected Ar(p) model, and discuss the serial dependence represented by the model.

“Reflection” Problem [2 pts]

Post a message on the discussion board reflecting on the week 3 topics and hwork 2. Indicate the assignment in this module you found to be the easiest, the one you found to be the hardest, and why. I created a new Thread called “Hwork 2 Comments”.

Submission instructions

Submit the homework at the Course Web page <http://d2l.depaul.edu>.

1. Keep a copy of all your submissions!
2. If you have questions about the homework, email me BEFORE the deadline.
3. The assignment will lose 10% of the points per day, after the due date.
4. Assignments submitted five days after the deadline will not be accepted.