Stat 481/581:

Assignment 2: Due Sep 23 Thursday

1.- a) For the EEG series of 400 observations plot lowess estimates of the trend over the time series data for different values of the smoothing parameter; ($f = 0.1, 0.25, 0.5, 0.8, 1.0$). Do you think the smoothing parameter has any impact on the estimated trends. b) Now fit a simple linear regression to the data using time as the only regressor. Plot the least squares line over the data. Do you think this line adequately represents any potential trends?

2.- a) For the first 400 observations of the sea level pressures at Darwin, find a moving average estimator that represents the trend and a moving average estimator that represents the seasonality. Explicitly declare the weights and the value of q (or k) used to build the smoothers. Make plots of these estimators in top of the data. b) Make plots of the autocorrelation function (lag 50) of the data and the moving average for seasonality and trend. Comment on your results. c) Fit a regression to the data with mean function $Asin(wt) + Bcos(wt)$ and for values of the frequency w equal to .25,.5,1. Which of the 3 fitted mean functions better represents the seasonality? Why? d) Take a first and second difference of the sea level pressures and plot the resulting differences. Comment on your results

3.- A stationary autoregressive process of order 1 is defined by the equation $X_t = aX_{t-1} + W_t$ where W_t are i.i.d with normal distribution of mean zero and known variance; the parameter a is between -1 and 1. Find an expression for the theoretical autocorrelation function of the process. What is the shape of the is function if a is negative? What happens if a is strictly positive?

4.- From Shumway and Stoffer's text, exercise 2.2

5.- From Shumway and Stoffer's text, exercise 2,3.

6.- From Shumway and Stoffer's text, exercise 2.6.

7.- From Shumway and Stoffer's text exercise 2.10.

8.- From Shumway and Stoffer's text exercise 2.12.