Homework 6

1. Generate two time series data sets, each of length $n = 1000$, including (i) an AR(1) with $\phi = -0.6$, (ii) an MA(1) with $\theta = 0.8$. For each time series data set, plot the sample ACF, the sample PACF, and generate the extended auto-correlation function (EACF) table. Use set.seed(5) to generate each time series data set. Are the results based on ACF, PACF and EACF consistent with the true model for the time series? Explain your reasons.

2. For the following data set gasprices: average price (US dollars per gallon) for regular gasoline in the United States; there are $n = 145$ weekly observations collected from 1/5/2009 to 10/10/2011 (Source: Rajon Coles, Fall 2011).

(a) Plot the time series and the sample ACF. Does the time series look like stationary? Use the ADF test to test whether the time series is stationary or not.

(b) Take the first difference of the time series. Plot the difference series and its sample ACF. Does the difference series look like stationary? Use the ADF test to test whether the difference series is stationary or not.

(c) For the first differences of gasprice data, plot the sample PACF and generate the extended auto-correlation function (EACF) table. Based on the results in (b) and (c), identify a candidate ARMA model or a set of ARMA models for the difference of gasprice data.