MS4218 Mid-term examination

March 31, 2014

Answer all 3 questions.

15% of total marks.

Q 1

(i) Find the auto-correlation functions at lags 1 and 2 for an MA(1) process
given by

$$Y_t = e_t - \theta e_{t-1}.$$

(ii) What restrictions must apply to the values obtained at lag 1?

(iii) A particular MA(1) process is given by:
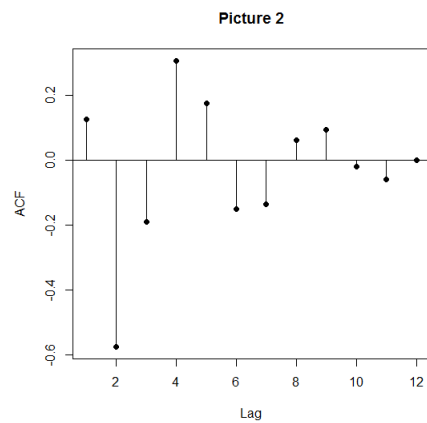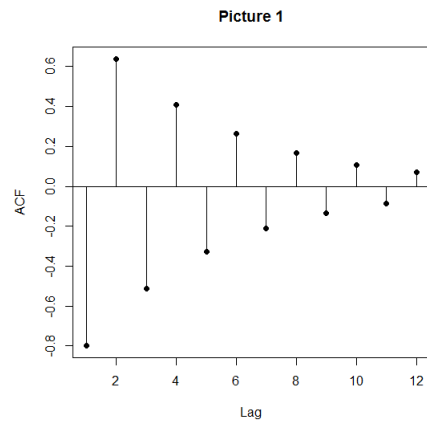
$$Y_t = e_t - 0.7e_{t-1}.$$

Define "invertibility". Show why this particular process is invertible.

5 marks.

Q 2

The diagrams below (Picture 1 and Picture 2) show the plot of the sample auto-correlation function (acf) for two different datasets.

(a) Describe the plots and the types of model suggested by the acf pictures.

Picture 1

Picture 2

(b) Suggest parameter values for each model and give reasons for your answers.

4 marks.

Q 3

Let $Y_1 = \theta_0 + e_1$.

For $t > 1$ define Y_t recursively by $Y_t = \theta_0 + Y_{t-1} + e_t$, where $\{e_t\}$ is white noise.

(a) Show that Y_t may be rewritten as $Y_t = t\theta_0 + e_t + e_{t-1} + \ldots + e_1$.

(b) Find the mean function for Y_t.

(c) Find the auto-covariance function for Y_t.

(d) Is this time series stationary? Give reasons for your answer.

(e) What effect does the presence of θ_0 have on the series?

6 marks.