Chapter 7, Problem 17

Simulate an ARMA(1,1) series with $\phi = 0.7$, $\theta = 0.4$, and $n = 72$.

(a) Find the method-of-moments estimates of ϕ and θ

(b) Find the conditional least squares estimates of ϕ and θ and compare them with part (a).

(c) Find the maximum likelihood estimates of ϕ and θ and compare them with parts (a) and (b).

(d) Repeat parts (a), (b), and (c) with a new simulated series using the same parameters and same sample size. Compare your new results with your results from the first simulation.

Chapter 7, Problem 29

The data file named ROBOT contains a time series obtained from an industrial robot. The robot was put through a sequence of maneuvers, and the distance from a desired ending point was recorded in inches. This was repeated 324 times to form the time series.

(a) Estimate the parameters of an AR(1) model for these data.

(b) Estimate the parameters of an IMA(1,1) model for these data.

(c) What are the theoretical partial autocorrelations for this model?

(d) Compare the results from parts (a) and (b) in terms of AIC.

Chapter 7, Problem 30

The data file named DAYS contains accounting data from the Winegard Co. of Burlington, Iowa. The data are the number of days until Winegard receives payment for 130 consecutive orders from a particular distributor of Winegard products. (The name of the distributor must remain anonymous for confidentiality reasons.)

(a) Display the time series plot of the data. Based on this information, do these data appear to come from a stationary or nonstationary process?

(b) Replace each of the unusual values with a value of 35 days, a much more typical value, and then estimate the parameters of an MA(2) model.

(c) Now assume an MA(5) model and estimate the parameters. Compare these results with those obtained in part(a).

Chapter 8, Problem 7

Fit an AR(3) model by maximum likelihood to the square root of the hare abundance series (filename HARE).

(a) Plot the sample ACF of the residuals. Comment on the size of the correleations.

(b) Calculate the Ljang-Box statistic summing to $K = 9$. Does this statistic support the AR(3) specification?

(c) Perform a runs test on the residuals and comment on the results.

(d) Display the quantile-quantile normal plot of the residuals. Comment on the plot.

(e) Perform the Shapiro-Wilk test of normality on the residuals.

Chapter 8, Problem 9

The data file named ROBOT contains a time series obtained from an industrial robot. The robot was put through a series of maneuvers, and the distance from a desired ending points was recorded in inches. This was repeated 324 times to form the time series. Compare the fits of an AR(1) model and an IMA(1,1) model for these data in terms of the diagnostic tests discussed in this chapter.

Chapter 8, Problem 10

The data file names DEERE3 contains 57 consecutive values from a complex machine tool at Deere & Co. The values given are deviations from a target value in units of ten millionths of an inch. The process employs a control mechanism that resets some of the parameters of hte machine tool depending on the magnitude of deviation from target of the last item produced. Diagnose the fit of an AR(1) model for these data in terms of the tests discussed in this chapter.
