Chapter 6, Problem 25

Simulate AR(1) time series of length $n = 36$ with $\phi = 0.7$.

(a) Calculate and plot the theoretical autocorrelation function for this model. Plot sufficient lags until the correlations are negligible.

(b) Calculate and plot the sample ACF for your simulated series. How well do the values and patterns match the theoretical ACF from part (a)?

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

(d) Calculate and plot the sample ACF for your simulated series. How well do the values and patterns match the theoretical ACF from part (a)? Use the large-sample standard errors reported in Exhibit 6.1 on page 111 to quantify your answer.

(e) Calculate and plot the sample PACF for your simulated series. How well do the values and patterns match the theoretical PACF from part (c)? Use the large-sample standard errors reported on page 115 to quantify your answer.

Chapter 6, Problem 27

Simulate an AR(2) time series of length $n = 72$ with $\phi_1 = 0.7$ and $\phi_2 = -0.4$.

(a) Calculate and plot the theoretical autocorrelation function for this model. Plot sufficient lags until the correlations are negligible.

(b) Calculate and plot the sample ACF for your simulated series. How well do the values and patterns match the theoretical ACF from part (a)?

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

(d) Calculate and plot the sample ACF for your simulated series. How well do the values and patterns match the theoretical ACF from part (a)?

(e) Calculate and plot the sample PACF for your simulated series. How well do the values and patterns match the theoretical PACF from part (c)?

Chapter 6, Problem 36

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) 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) Calculate and plot the sample ACF and PACF for these data. Based on this additional information, do these data appear to come from a stationary or nonstationary process?

(c) Calculate and interpret the sample EACF.

(d) Use the best subsets ARMA approach to specify a model for these data. Compare these results with what you discovered in parts (a), (b), and (c).

Chapter 6, Problem 38

Calculate and interpret the sample EACF for the color property time series. The data are in the COLOR file. Does the sample EACF suggest the same model that was specified by looking at the sample PACF?

Chapter 10, Problem 2

An AR model has AR characteristic polynomial

$$(1 - 1.6x + 0.7x^2)(1 - 0.8x^{12})$$

(a) Is the model stationary?

(b) Identify the model as a certain seasonal ARIMA model.

Chapter 10, Problem 5

Identify the following as certain multiplicative seasonal ARIMA models:

(a) $Y_t = 0.5Y_{t-1} + Y_{t-4} - 0.5Y_{t-5} + e_t - 0.3e_{t-1}$.

(b) $Y_t = Y_{t-1} + Y_{t-12} - Y_{t-13} + e_t - 0.5e_{t-1} - 0.5e_{t-12} + 0.25e_{t-13}$.