Name _____

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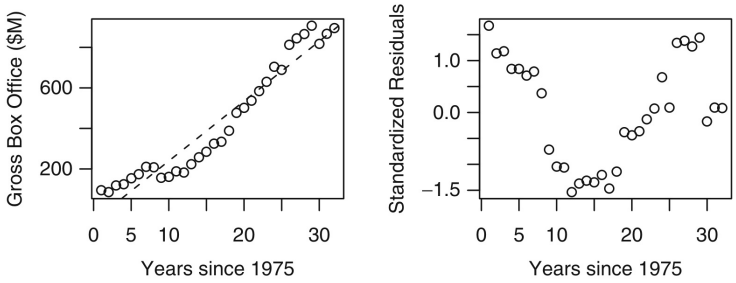
Reading Quiz for Sheather Chapter 9

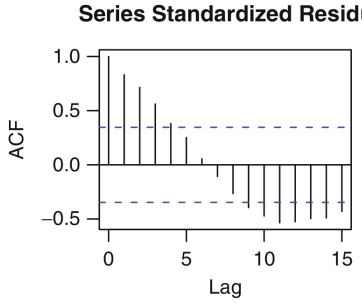
[Based on Sheather, Ch 9, #1]
Senior management at the Australian Film Commission (AFC) has sought your help with the task of developing a model to predict yearly gross box office receipts from movies screened in Australia. Such data are publicly available for the period from 1976 to 2007 from the AFC's web site (www.afc.gov.au). Interest centers on predicting gross box office results for 1 year beyond the latest observation, that is, predicting the 2008 result. In addition, there is interest in estimating the extent of any trend and autocorrelation in the data. A preliminary analysis of the data has been undertaken by a staffer at the AFC and these results appear below. In this analysis the variable Year was replaced by the number of years since 1975, which we shall denote as YearsS1975 (i.e., `YearsS1975 = Year - 1975`).

1. The first model fit to the data by the staffer was

$$\text{GrossBoxOffice} = \beta_0 + \beta_1 \text{yearsS1975} + \epsilon \tag{1}$$

Here are some of the diagnostic plots produced by the staffer after fitting the model as an ordinary linear regression model





(a) Explain what the spikes above and below zero are in the ACF plot.

(b) Offer a criticism of the model.

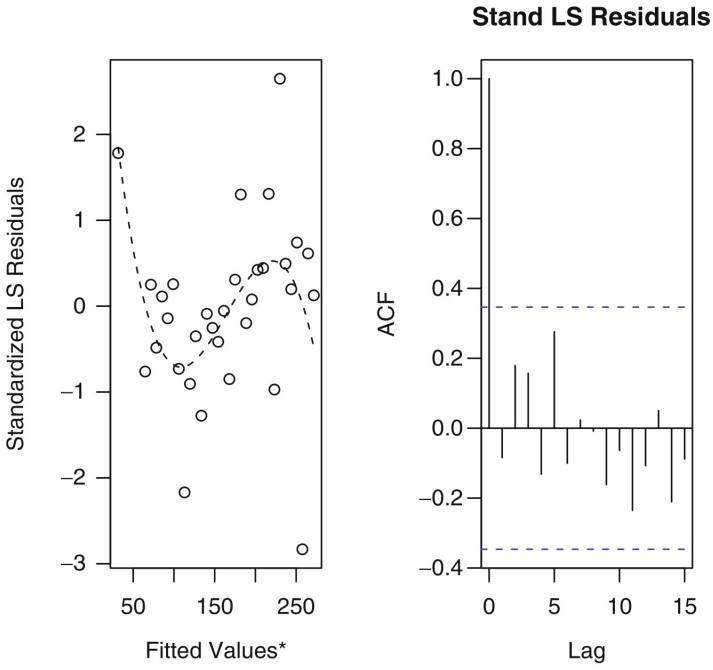
2. Next, the staffer transforms the data by estimating the variance-covariance matrix $\hat{\Sigma}$ for the residuals after fitting equation (1), and then premultiplying equation (1) by S^{-1}, where $\hat{\Sigma} = SS^T$, that is, the new problem is

$$y^* = \beta_0 + \beta_1 X^* + \epsilon^*$$

where

$$\begin{aligned} y^* &= S^{-1}\text{GrossBoxOffice} \quad \text{, and} \\ X^* &= S^{-1}\text{yearsS1975} \end{aligned}$$

After fitting an ordinary regression model to the new problem, the staffer obtained the following diagnostic plots:



(a) What does the new ACF plot tell you about the residuals for the new model?

(b) Offer a new criticism of the model.