a. Create a scattergram of the closing stock price over time. What kind of pattern is evident in the plot?
b. Estimate a linear model to predict the closing stock price based on time. Does this model seem to fit the data well?
c. Now estimate a squared model by using both time and time-squared. Is this a better fit than in part (*b*)?
d. Now attempt to fit a cubic or third-degree polynomial to the data as follows:

$$Y_i = B_0 + B_1X_i + B_2X_i^2 + B_3X_i^3 + u_i$$

where $Y =$ stock price and $X =$ time. Which model seems to be the best estimator for the stock prices?

5.26. Table 5-17 on the textbook's Web site contains data about several magazines. The variables are: magazine name, cost of a full-page ad, circulation (projected, in thousands), percent male among the predicted readership, and median household income of readership. The goal is to predict the advertisement cost.

a. Create scattergrams of the cost variable versus each of the three other variables. What types of relationships do you see?
b. Estimate a linear regression equation with all the variables and create a residuals versus fitted values plot. Does the plot exhibit constant variance from left to right?
c. Now estimate the following mixed model:

$$\ln Y_i = B_0 + B_1 \ln Circ + B_2\, PercMale + B_3\, MedIncome + u_i$$

and create another residual plot. Does this model fit better than the one in part (*b*)?

5.27. Refer to Example 4.5 (Table 4-6) about education, GDP, and population for 38 countries.

a. Estimate a linear (LIV) model for the data. What are the resulting equation and relevant output values (i.e., *F* statistic, *t* values, and R^2)?
b. Now attempt to estimate a log-linear model (where both of the independent variables are also in the natural log format).
c. With the log-linear model, what does the coefficient of the GDP variable indicate about education? What about the population variable?
d. Which model is more appropriate?

5.28. Table 5-18 on the textbook's Web site contains data on average life expectancy for 40 countries. It comes from the *World Almanac and Book of Facts, 1993*, by Pharos Books. The independent variables are the ratio of the number of people per television set and the ratio of number of people per physician.

a. Try fitting a linear (LIV) model to the data. Does this model seem to fit well?
b. Create two scattergrams, one of the natural log of life expectancy versus the natural log of people per television, and one of the natural log of life expectancy versus the natural log of people per physician. Do the graphs appear linear?
c. Estimate the equation for a log-linear model. Does this model fit well?

d. What do the coefficients of the log-linear model indicate about the relationships of the variables to life expectancy? Does this seem reasonable?

5.29 Refer to Example 5.6 in the chapter. It was shown that the percentage change in the index of hourly earnings and the unemployment rate from 1958–1969 followed the traditional Phillips curve model. An updated version of the data, from 1965–2007, can be found in Table 5-19 on the textbook's Web site.

a. Create a scattergram using the percentage change in hourly earnings as the Y variable and the unemployment rate as the X variable. Does the graph appear linear?

b. Now create a scattergram as above, but use $1/X$ as the independent variable. Does this seem better than the graph in part (*a*)?

c. Fit Eq. (5.29) to the new data. Does this model seem to fit well? Also create a regular linear (LIV) model as in Eq. (5.30). Which model is better? Why?