| Example 2 | Interpreting R^2 |

In Example 1, we obtained the value of $R^2 = 0.9992$ for the quadratic model. Interpret that value as it relates to the predictor variable of year and the response variable of population size.

Solution

In the context of the year/population data from Table 10-7, the value of $R^2 = 0.9992$ can be interpreted as follows: 99.92% of the variation in the population size can be explained by the quadratic regression equation (given in Example 1) that relates year and population size.

In "Modeling the U.S. Population" (*AMATYC Review*, Vol. 20, No. 2), Sheldon Gordon makes this important point that applies to all uses of statistical methods:

> **"The best choice (of a model) depends on the set of data being analyzed and requires an exercise in judgment, not just computation."**

using TECHNOLOGY

Any system capable of handling multiple regression can be used to generate some of the models described in this section. For example, STATDISK is not designed to work directly with the quadratic model, but its multiple regression feature can be used with the data in Table 10-7 to generate the quadratic model as follows: First enter the population values in column 1 of the STATDISK Data Window. Enter 1, 2, 3, . . . , 11 in column 2 and enter their squares of 1, 4, 9, . . . , 121 in column 3. Click on **Analysis,** then select **Multiple Regression.** Use columns 1, 2, 3 with column 1 as the dependent variable. After clicking on **Evaluate,** STATDISK generates the equation $y = 10.012 - 6.0028x + 2.7669x^2$ along with $R^2 = 0.99917$, which are the same results obtained from the TI-83/84 Plus calculator.

MINITAB   First enter the matched data in columns C1 and C2, then select **Stat, Regression,** and **Fitted Line Plot.** You can choose a linear model, quadratic model, or cubic model. Displayed

results include the equation, the value of R^2, and the sum of squares of the residuals.

TI-83/84 PLUS   First turn on the diagnostics feature as follows: Press **2ND** **0** to get to the **CATALOG** menu, then scroll down to **DiagnosticON** and press the **ENTER** key twice. Now enter the matched data in lists L1 and L2. Press **STAT**, select **CALC,** and then select the desired model from the available options. Press **ENTER**, then enter L1, L2 (including the comma), and press **ENTER** again. The display includes the format of the equation along with the coefficients used in the equation; also the value of R^2 is included for many of the models.

STATCRUNCH   You can find a model for a polynomial of any order from 1 through 6. Click on **Open StatCrunch.** Enter the columns of data or open a data set. Click on **Stat,** then select **Regression,** then select **Polynomial.** Select the desired order and enter the columns to be used, then click on **Calculate.**

10-6 Basic Skills and Concepts

Statistical Literacy and Critical Thinking

1. Identifying a Model and R^2 A data set is obtained as follows: Squares of different sizes are used, and x represents the length (cm) of a side and y represents the corresponding area (cm²) of the square. What formula best describes the relationship between x and y? Which of the five models describes this relationship? What should be the value of R^2?

2. Super Bowl and R^2 Let x represent years coded as 1, 2, 3, . . . for years starting in 1980, and let y represent the numbers of points scored in each Super Bowl from 1980. Using the data from 1980 to the last Super Bowl at the time of this writing, we obtain the following values of R^2 for the different models: linear: 0.0185; quadratic: 0.103; logarithmic: 0.000557; exponential: 0.0253; power: 0.00264. Based on these results, which model is best? Is the best