

next 50 units. Bohring wants to submit a competitive bid, but at the same time, it wants to ensure that all the costs of manufacturing the radar unit are fully covered. As part of this process, Bohring is attempting to develop a standard for the number of labor hours required to manufacture each radar unit. Developing a labor standard has been a continuing problem in the past. The file [P10_70.xlsx](#) lists the number of labor hours required for each of the first 50 units of production. Bohring accountants want to see whether regression analysis, together with the concept of learning curves, can help solve the company's problem.

71. Sometimes it is instructive to generate random data that have a given relationship and then use regression on the generated data to see if the estimated regression

is basically the same as that used to generate the data in the first place.

- a. Let X be normally distributed with mean 100 and standard deviation 10, and let Y equal $100 + 5X$ plus a normally distributed random residual with mean 0 and standard deviation 40. Generate 50 observations.
- b. Copy the random data and paste as values in another range of the worksheet. Then run the regression on the copy (the frozen values).
- c. Repeat part b several times to see if you get basically the same regression results each time. That is, each run should be on a *different* set of frozen data.
- d. Write a short report of your method and your findings.

CASE

10.1 QUANTITY DISCOUNTS AT FIRM CHAIR COMPANY

Firm Chair Company manufactures customized wood furniture and sells the furniture in large quantities to major furniture retailers. Jim Bolling has recently been assigned to analyze the company's pricing policy. He has been told that quantity discounts were usually given. For example, for one type of chair, the pricing changed at quantities of 200 and 400—that is, these were the price breaks, where the marginal cost of the next chair changed.

For this type of chair, the file [C10_01.xlsx](#) contains the quantity and total price to the customer for 81 orders. Use regression to help Jim discover the pricing structure that Firm Chair evidently used. (Note: A linear regression of Total Price versus Quantity will give you a “decent” fit, but you can do much better by introducing appropriate variables into the regression.)

CASE

10.2 HOUSING PRICE STRUCTURE IN MID CITY

Sales of single-family houses have been brisk in Mid City this year. This has especially been true in older, more established neighborhoods, where housing is relatively inexpensive compared to the new homes being built in the newer neighborhoods. Nevertheless, there are also many families who are willing to pay a higher price for the prestige of living in one of the newer neighborhoods. The file [C10_02.xlsx](#) contains data on 128 recent

sales in Mid City. For each sale, the file shows the neighborhood (1, 2, or 3) in which the house is located, the number of offers made on the house, the square footage, whether the house is made primarily of brick, the number of bathrooms, the number of bedrooms, and the selling price. Neighborhoods 1 and 2 are more traditional neighborhoods, whereas neighborhood 3 is a newer, more prestigious neighborhood.

Use regression to estimate and interpret the pricing structure of houses in Mid City. Here are some considerations.

1. Do buyers pay a premium for a brick house, all else being equal?
2. Is there a premium for a house in neighborhood 3, all else being equal?
3. Is there an extra premium for a brick house in neighborhood 3, in addition to the usual premium for a brick house?
4. For purposes of estimation and prediction, can neighborhoods 1 and 2 be collapsed into a single “older” neighborhood?

CASE

10.3 DEMAND FOR FRENCH BREAD AT HOWIE'S BAKERY

Howie's Bakery is one of the most popular bakeries in town, and the favorite at Howie's is French bread. Each day of the week, Howie's bakes a number of loaves of French bread, more or less according to a daily schedule. To maintain its fine reputation, Howie's gives away to charity any loaves not sold on the day they are baked. Although this occurs frequently, it is also common for Howie's to run out of French bread on any given day—more demand than supply. In this case, no extra loaves are baked that day; the customers have to go elsewhere (or come back to Howie's the next day) for their French bread. Although French bread at Howie's is always popular, Howie's stimulates demand by running occasional 10% off sales.

Howie's has collected data for 20 consecutive weeks, 140 days in all. These data are listed in the

file **C10_03.xlsx**. The variables are Day (Monday Sunday), Supply (number of loaves baked that day), On Sale (whether French bread is on sale that day), and Demand (loaves actually sold that day). Howie would like you to see whether regression can be used successfully to estimate Demand from the other data in the file. Howie reasons that if these other variables can be used to predict Demand, then he might be able to determine his daily supply (number of loaves to bake) in a more cost-effective way.

How successful is regression with these data? Howie correct that regression can help him determine his daily supply? Is any information missing that would be useful? How would you obtain it? How would you use it? Is this extra information *really* necessary?

CASE

10.4 INVESTING FOR RETIREMENT

Financial advisors offer many types of advice to customers, but they generally agree that one of the best things people can do is invest as much as possible in tax-deferred retirement plans. Not only are the earnings from these investments exempt from income tax (until retirement), but the investment itself is tax-exempt. This means that if a person invests, say, \$10,000 of his \$100,000 income in a tax-deferred retirement plan, he pays income tax that year on only \$90,000 of his income. This is probably the best method available to most people for avoiding tax payments. However, which group takes advantage of this attractive investment

opportunity: everyone, people with low salaries, people with high salaries, or who?

The file **C10_04.xlsx** lets you investigate this question. It contains data on 194 (hypothetical) couples: number of dependent children, combined annual salary of husband and wife, current mortgage on home, average amount of other (nonmortgage) debt, and percentage of combined income invested in tax-deferred retirement plans (assumed to be limited to 15%, which is realistic). Using correlation scatterplots, and regression analysis, what can you conclude about the tendency of this group of people to invest in tax-deferred retirement plans?