CS 4

4.1   *A Case Study: The Super Grain Corp. Advertising-Mix Problem*   **109**

The Decisions

The problem has been defined as determining the most effective advertising mix among the three media selected by Giacomi & Jackowitz. Therefore, there are three decisions:

Decision 1:   TV = Number of commercials for separate spots on television.

Decision 2: M = Number of advertisements in magazines.

Decision 3:   SS = Number of advertisements in Sunday supplements.

The changing cells to hold these numbers have been placed in row 13 in the columns for these media:

$$\text{TV} \rightarrow \text{cell C13} \qquad M \rightarrow \text{cell D13} \qquad \text{SS} \rightarrow \text{cell E13}$$

These changing cells are collectively referred to by the range name NumberOfAds (C13:E13).

The Constraints

These changing cells need to be nonnegative. In addition, constraints are needed for the three resources. The first two resources are the ad budget and planning budget. The amounts available for these two budgets are shown in the range BudgetAvailable (H8:H9). As suggested by the ≤ signs entered into column G, the corresponding constraints are

Total spending on advertising ≤ 4,000   (Ad budget in $1,000s)

Total cost of planning ≤ 1,000   (Planning budget in $1,000s)

Using the data in columns C, D, and E for the resources, these totals are

Total spending on advertising = 300TV + 150M + 100SS

Total cost of planning   = 90TV + 30M + 40SS

These sums of products on the right-hand side are entered into the output cells BudgetSpent (F8:F9) by using the SUMPRODUCT functions shown in the lower right-hand side of Figure 4.1. Although the ≤ signs entered in column G are only cosmetic (trial solutions still can be entered in the changing cells that violate these inequalities), they will serve as a reminder later to use these same ≤ signs when entering the constraints in the Solver dialogue box.

The third resource is TV spots for different commercials. Five such spots are available for purchase. The number of spots used is one of the changing cells (C13). Since this cell will be used in a constraint, we assign the cell its own range name: TVSpots (C13). The maximum number of TV spots available is in the data cell MaxTVSpots (C15). Thus, the required constraint is TVSpots ≤ MaxTVSpots.

The Measure of Performance

Claire Syverson is using *expected number of exposures* as the overall measure of performance, so let

Exposure = Expected number of exposures (in thousands) from all the advertising

The data cells ExposuresPerAd (C4:E4) provide the expected number of exposures (in thousands) per advertisement in the respective media and the changing cells NumberOfAds (C13:E13) give the number of each type of advertisement. Therefore,

$$\text{Exposure} = 1{,}300\text{TV} + 600M + 500\text{SS}$$

$$= \text{SUMPRODUCT (ExposuresPerAd, NumberOfAds)}$$

is the formula that needs to be entered into the target cell, TotalExposures (H13).