

SUPPLEMENT TO CHAPTER 16: USING TREEPLAN SOFTWARE FOR DECISION TREES

Since ASPE is not compatible with Mac versions of Excel, we will describe and illustrate how to use TreePlan, an Excel add-in developed by Professor Michael Middleton, for constructing and analyzing decision trees on a spreadsheet. This software is compatible with both Excel for Windows and Excel for Mac (2011). A free 30-day trial of this software is available from www.treeplan.com. If you want to continue to use the software longer than this period of time, you will need to register and pay. Like any Excel add-in, this add-in needs to be installed before it will show up in Excel. To install it, simply open the TreePlan Excel file.

To demonstrate how to use TreePlan, we will re-create the first Goferbroke Co. problem introduced in Sec. 16.1. The decision tree for this problem is shown below in Fig. 1. To begin creating such a decision tree using TreePlan, select Decision Tree from the Add-Ins tab (for Windows versions of Excel) or Tools menu (Excel 2011 for Mac) and click on New Tree. This creates the default decision tree shown in Fig. 2, which has a single (square) decision node with two branches. It so happens that this is exactly what is needed for the first node in the first Goferbroke problem (this node corresponds to node A in Fig. 1). However, even if something else were needed, it is easy to make changes to a node in TreePlan. Simply select the cell containing the node (B5 in Fig. 2) and choose Decision Tree from the Add-Ins tab or Tools menu. This brings up a dialog box that allows you to change the type of node (e.g., from a decision node to an event node) or add more branches.

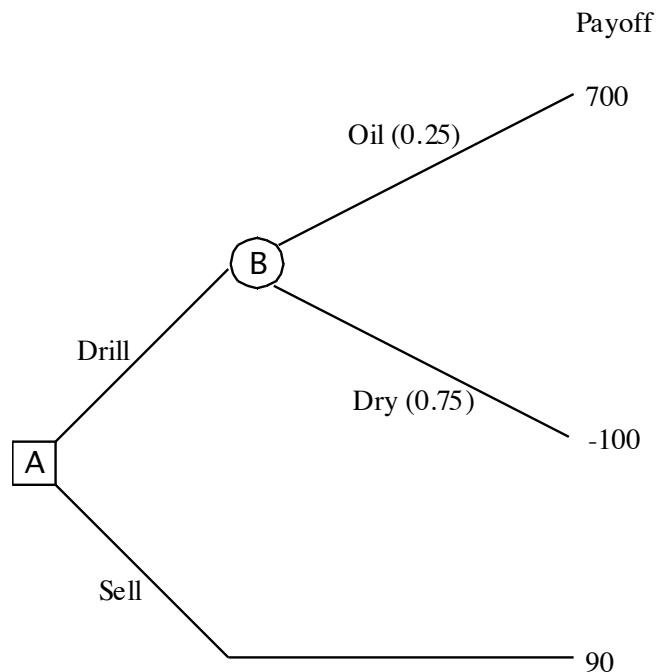


Figure 1 The decision tree for the first Goferbroke Co. problem.

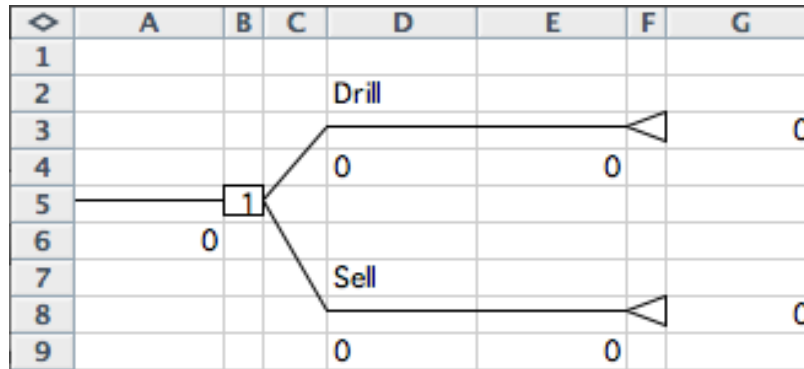


Figure 2 The default decision tree created by TreePlan by selecting Decision Tree from the Add-Ins tab (Windows versions of Excel) or Tools menu (Excel 2011 for Mac), clicking on New Tree, and then entering Drill and Sell labels for the two decision alternatives.

By default, the labels for the decisions (cells D2 and D7 in Fig. 2) are “Decision 1,” “Decision 2,” etc. These labels are changed by clicking on them and typing a new label. In Fig. 2, these labels have already been changed to “Drill” and “Sell.” If the decision is to drill, the next event is to learn whether or not the land contains oil. To create an event node, click on the cell containing the triangle terminal node at the end of the drill branch (cell F3 in Fig. 2), and choose Decision Tree from the Add-Ins tab or Tools menu. This brings up the TreePlan Terminal dialogue box shown in Fig. 3. Choose the “Change to event node” option on the left and select the two branches option on the right, and then click OK. This results in the decision tree with the nodes and branches shown in Fig. 4 (after replacing the default labels “Event 1” and “Event 2” by “Oil” and “Dry,” respectively).

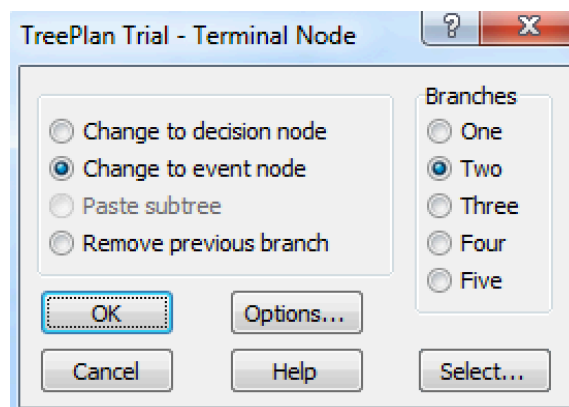


Figure 3 Selecting the cell that contains a terminal node and choosing Decision Tree from the Add-Ins tab or Tools menu brings up the TreePlan Terminal Node dialog box shown here. This dialog box allows you to change a terminal node to a different type of node. It is used here to change the terminal node in cell F3 of Fig. 2 to an event node.

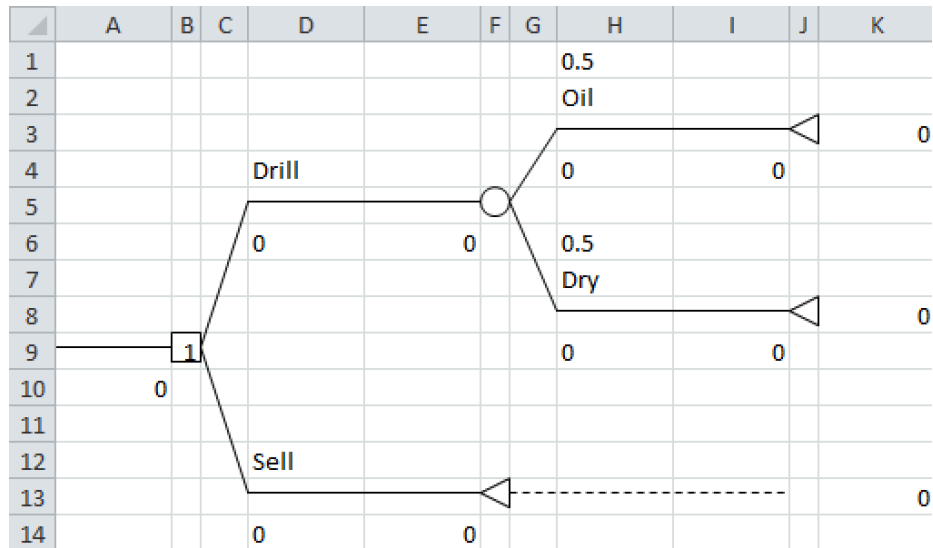


Figure 4 The decision tree created by TreePlan after changing the terminal node in cell F3 of Fig. 2 into an event node and then relabeling the two branches as Oil and Dry.

At any time, you also can click on any existing decision node (a square) or event node (a circle) and choose Decision Tree from the Add-Ins tab or Tools menu to make changes to that node. Initially, each branch shows a default value of 0 for the net cash flow being generated there (the numbers appear below the branch labels: D6, D14, H4, and H9 in Fig. 4). Also, each of the two branches leading from the event node displays the default values of 0.5 for their prior probabilities (the probabilities are just above the corresponding labels: H1 and H6 in Fig. 4). Therefore, you next should click on these default values and replace them with the correct numbers, namely,

- D6 = -100 (the cost of drilling is \$100,000)
- D14 = 90 (the profit from selling is \$90,000)
- H1 = 0.25 (the prior probability of oil is 0.25)
- H4 = 800 (the net revenue after finding oil is \$800,000)
- H6 = 0.75 (the prior probability of dry is 0.75)
- H9 = 0 (the net revenue after finding dry is 0).

This leads to the final decision tree shown in Fig. 5.

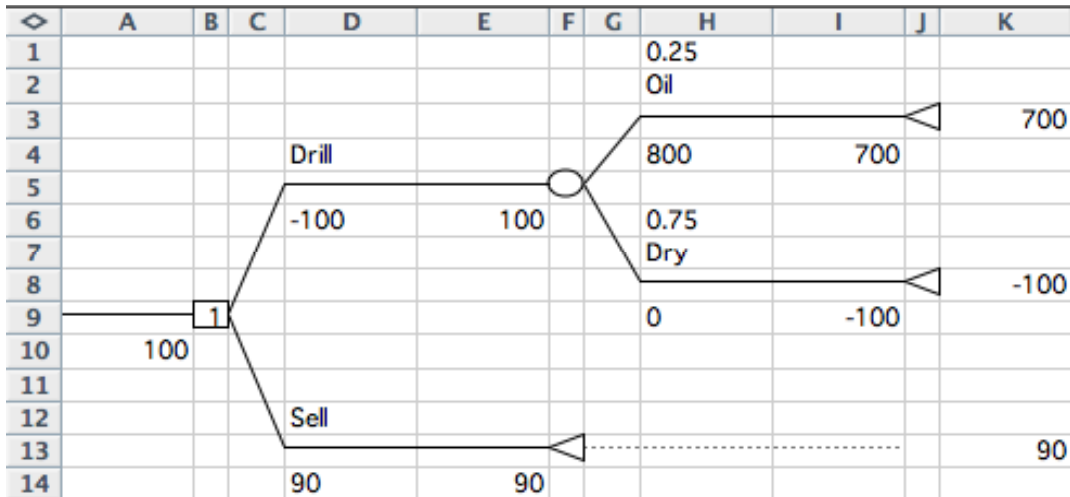


Figure 5 The final decision tree constructed and solved by TreePlan for the first Goferbroke Co. problem shown in Fig. 1. The 1 in cell B9 indicates that the top branch (the Drill alternative) should be chosen. The 100 in cell A10 specifies that the expected payoff of this venture is \$100 thousand.

At each stage in constructing a decision tree, TreePlan automatically solves for the optimal policy with the current tree when using Bayes' decision rule. The number inside each decision node indicates which branch should be chosen (assuming the branches emanating from that node are numbered consecutively from top to bottom). Thus, for the final decision tree in Fig. 5, the number 1 in cell B9 specifies that the first branch (the Drill alternative) should be chosen. The number on both sides of each terminal node is the payoff if that node is reached. The number 100 in cells A10 and E6 is the expected payoff (the measure of performance for Bayes' decision rule) at those stages in the process.

This description of TreePlan may seem somewhat complicated. However, we think that you will find the procedure quite intuitive when you execute it on a computer. If you spend considerable time with TreePlan, you also will find that it has many helpful features that haven't been described in this brief introduction.