Tips

Supertree

How Do I Make Tree Displays More Readable?

Problem: You have used numbers to specify outcomes for your spread-sheet. For instance, the value for Decision might be 1 for Build, 2 for Joint Venture, 3 for Do Not Build. Now you have evaluated the tree and realize that when you have Supertree draw the tree, it is pretty hard to explain what the branches labeled 1, 2, and 3 mean.

Solution: Go to Input or Change Node Data and change the outcomes from cryptic numbers to the actual words. When you draw the tree, Supertree will note that things have changed, but give you the opportunity to retain the old values—respond Yes. Warning: If you save the Supertree file in this form, you will not be able to use it to evaluate the tree again unless you restore the original form of the outcomes.

Another solution: Paste the drawing into a program like PowerPoint and double-click on the image to turn it into an editable object. Edit entries to replace cryptic indices with explanatory text.

How Do I Plot the Results From Different Trees on the Same Graph?

Problem: You have several decision trees in different files and you want to plot the cumulative (or histogram) probability distributions on the same graph. Or you wish to plot results obtained from the same tree with the nodes in different orders.

Solution: Use the Store Distribution option from the File menu to store the information for each distribution and the Recall Distribution option to reload the information and perform the plots. If the first node is a decision node and you want to store the distribution for each alternative, specify the node at which to obtain the information as the second node in the tree, and then you will be able to specify the branch of the first node for which you want to store information.

How Often do I Make a "Downstream" Decision?

Problem: Your decision tree has a decision ("Build a factory?") followed by several uncertainties ("How do cost, price, and volume turn out over the next three years?") followed by a "downstream" decision ("Expand the factory?") followed by some other uncertainties. Under what circumstances do you choose to expand the factory?

Tips

Solution: Display the tree up to and including the second decision node; the display will show the "policy"—the decisions you make in each situation. Suppose there are too many branches to make much sense out of this display. Create a cell in the spreadsheet with a formula like =IF(Decision_2=1,1,0) and have this be one of the result measures returned to Supertree. (You can return several result measures by listing them, separated by semicolons—see p. 6-17.) Roll back the tree, making decisions on the primary value measure, but displaying the result from the cell defined above; the result will be the probability that you choose the branch of Decision_2 labeled 1.

What if my big tree exceeds Excel's limits?

Problem: Supertree writes one line per endpoint in supermacro.txt (sometimes more if there are lots of nodes and the node names are long), so supermacro.txt can be many lines long. However, Excel 95 has a maximum of about 16,000 lines in a spreadsheet and Excel 97 a maximum of about 64,000 lines. Suppose you exceed this limit.

Solution: You could eliminate a variable and make the tree smaller, but there is a solution that enables you to have the full tree (assuming you have time for the evaluation). Assume that node 99 is the last decision/chance node in the tree and that it has three branches that lead to node 100, the Excel endpoint. Create a new endpoint, 101, that is identical to 100, and have one of the branches of 99 lead to 101. Supertree now thinks that 99 is asymmetric (not all successor nodes are identical), so it goes through the branches of 99 one at a time. The result: three calls to the Excel spreadsheet, each with 1/3 the number of evaluations, resulting in 1/3 the number of lines in supermacro.txt per call.

Is there a simple way to enter a new order of nodes?

Problem: For a complicated tree, you have entered the nodes in Supertree in the order that makes evaluation most efficient. However, for the analysis, you need the nodes in a different order. It is a bore to retype the list of nodes each time into the New Order of Nodes box, and there is the possibility of an error in retyping. You use the clipboard to copy and paste the graphics to PowerPoint, so you cannot just store the new order of nodes on the clipboard.

Tips

Solution: Open up Notepad (or some other application with text capabilities) and type the order of nodes that you want there. Then, after you have pasted the graphic, switch to Notepad, copy the nodes, switch to Supertree, paste into the New Order of Nodes box. You can even leave the list highlighted in Notepad so that all you have to do is press Ctrl-C to copy the list.

What if I need to stop an Excel run during an evaluation?

Problem: You select Evaluate Tree and Supertree puts out a call to Excel. You realize that there is an error in your information and you want to halt the Excel run before it is complete.

Solution: Use Control + Break to halt the run. A Macro Error dialog box will appear that gives you the following choices: Halt, Step, Continue, Goto. If you choose Halt, the evaluation will terminate.

How can I make my Sensitivity Displays More User Friendly?

Problem: In Sensitivity, you may want to multiply some quantity (say, Volume) by .90 and 1.15 for a sensitivity. It is usually easier to explain tornadoes by percent changes than by introducing the idea of a multiplier.

Solution: Use the Value variation and enter 90% and 115% for the low and high values of the multiplier. Excel will interpret these numbers as .90 and 1.15, and Sensitivity will display 90% and 115% at the ends of the tornado bar. The same type of entry can be used for node values in Supertree.

How Do I Make Sensitivity Displays Even More Readable?

Problem: You have used index numbers to specify outcomes for your spreadsheet. For instance, the value for Price Modifier might be 1 for Low, 2 for Base, 3 for High—the spreadsheet figures out what to do when it gets a value of 1, 2, or 3. Now you have evaluated the sensitivity and realize that when you have Sensitivity display the tornado, it is pretty hard to explain what the variations labeled 1, 2, and 3 mean.

Tips

Solution: Paste the drawing into a program like PowerPoint and double-click on the image to turn it into an editable object. Edit the values shown at the ends of the bars, replacing the cryptic indices with explanatory text.

How Do I Make Sure Sensitivity is Running the Right Alternative?

Problem: You have a decision variable in your spreadsheet; if the cell named *decision* contains the value 1, the spreadsheet evaluates the Aggressive alternative, and for 2 it evaluates the Status Quo alternative. How do I make sure that the sensitivity runs for the Aggressive alternative.

Solution: The simplest solution is to make sure you saved the spreadsheet with the value 1 in the cell named *decision*. More fool-proof, however, is to include a variable in the sensitivity named *decision*, with a base value of 1 and low and high values of 1. This will make sure the correct decision is evaluated and, because there is no variation, the variable will be shown at the bottom of the "tornado" plot and can be eliminated from the plot.

The following sections list a series of practices that have proved valuable in performing decision analyses. It is assumed that Excel is the modeling language, but most of the practices can be implemented in Lotus 1-2-3 or Quattro Pro spreadsheet construction.

Parameterize, Parameterize, Parameterize!

When building a spreadsheet, parameterize your input data as much as possible. For instance, place the initial period's sales volume in a single cell and a growth rate in another cell. The numbers that appear in the row for sales volume are developed by using an equation involving the initial volume and the growth rate (see below) rather than by directly entering a number into each cell. The parametric approach to spreadsheet construction is crucial when performing sensitivity analysis and other forms of "what if" analysis.

Tips

Keep All Input Together, Use Range Names, and Separate Calculations from Input

Completely separate calculations from input. Experienced modelers know the pain (and occasional panic) of trying to find out why things are going wrong when input data is scattered through the spreadsheet. Besides, keeping input together is a good way to document the analysis.

Use range names for the cells containing input data. Calculations using these range names are much easier to understand and debug than formulas that use cell addresses like B245. In addition, Supertree and Sensitivity can refer to these cells unambiguously—neither Supertree or Sensitivity will know if you add a row and cell B245 becomes cell B246, but the range name will still refer to the correct cell.

Uncertainty is central to the application of Sensitivity and Supertree. It is good practice to document uncertainty ranges in the spreadsheet. One form is a table like the following:

	A	B	C	D	E	F	G
1	Description	Value in Use	Name	Low	Base	High	Units
2							
3	Price in 2000	$3.50	price_00	$2.50	$3.50	$3.75	$/unit
4	Price Growth Rate	.02	price_gr	.01	.02	.025	fraction/yr

The cells in the Value in Use column contain the data that is used in the calculations. The cells in the Name column contain the range names for the cells in the Value in Use column. The Low, Base, and High columns contain the uncertainty range on the variables.

One advantage of keeping input data in this form is that it can be imported into Sensitivity by the Import Variable Data command (see Page 3-14).

Tips

The calculations section would contain a line for Price as below:

	A	B	C	D	E	F	G
10	Year		2000	2001	2002	2003	2004
11							
12	Price		$3.50	$3.57	$3.64	$3.71	$3.79

The calculation is done by a formula like =price_00*(1+price_gr)^(C10-C10) entered into C12 and copied across.

Use Indices

Frequently modelers create an index that moves the data from the Low, Base and High columns into the Value in Use column depending on the value given to the index. For instance, in the table below, the formula in B3 might be =INDEX(F3:H3,D3). More sophisticated forms of indexing can use words instead of numbers—for instance, if the entry in D3 were "Base," the formula =INDEX(F3:H3,MATCH(D3,{"low","base","high"},0)) in B3 would return the base value.

	A	B	C	D	E	F	G	H	I
1	Description	Value in Use	Name	Index	Index Name	Low	Base	High	Units
2									
3	Price in 2000	$3.50	price_00		2	price_00_i	$2.50	$3.50	$3.75	$/unit
4	Price Growth Rate	.02	price_gr		2	price_gr_i	.01	.02	.025	fraction/yr

Supertree and Sensitivity can write directly into either the Value in Use cells or into the Index cells.

Parameterize the Alternatives

Input is more complicated when decisions are involved. Create a cell and associate an index with each alternative in the decision. Input can be entered as below, with different input lines for each alternative; in the calculation, price growth rate might be entered in calculations as CHOOSE (decision,price_gr_1,price_gr_2).

	A	B	C	D	E	F	G	H	I
1	Decision		1	decision	1=Aggressive, 2=Status Quo				
2									
3	Description	Value in Use	Name	Index	Index Name	Low	Base	High	Units
4									
5	Price in 2000	$3.50	price_00		2	price_00_i	$2.50	$3.50	$3.75	$/unit
6	Price Growth Rate,1	.025	price_gr_1		2	price_gr_2_i	.02	.025	.035	fraction/yr
7	Price Growth Rate,2	.02	price_gr_2		2	price_gr_2_i	.01	.02	.025	fraction/yr

Tips

The preceding form is very convenient for Sensitivity where each variable can be varied. However, it is less convenient for Supertree, because separate nodes would be needed for price_gr_1 and price_gr_2.

	A	B	C	D	E	F	G	H	I
1	Decision	1	decision	1=Aggressive, 2=Status Quo					
2									
3	Description	Value in Use	Name	Index	Index Name	Low	Base	High	Units
4									
5	Price in 2000	$3.50	price_00		2	price_00_i	$2.50	$3.50	$3.75	$/unit
6	Price Growth Rate	.025	price_gr		2	price_gr_i	.02	.025	.035	fraction/yr

A second common choice is to use a more elaborate form of indexing, as in the example below.

The entries in F6:H6 are formulas referring to data in cells K6:P6 shown below. For instance, the formula in F6 could be =INDEX(K6:P6,1+3*(decision-1)).

	J	K	L	M	N	O	P
1							
2							
3							
4		Alternative 1			Alternative 2		
5		Low	Base	High	Low	Base	High
6		.02	.025	.035	.01	.02	.025

This form is convenient for both Supertree and Sensitivity because only one variable name is used to describe price growth rate.

Troubleshooting

Sensitivity or Supertree Problems

Run the problem (or a simpler version) in Manual rather than Auto-matic mode. Stop the macro in the middle of the run (Control-Escape, Control-Break, Control-C, or Command-.), and see what is happening. Check the column you designated to hold the answers to see if the answers are reasonable. After the macro is run, open SUPERANS.txt (Windows) or SUPERANS (Macintosh) from Excel, Lotus 1-2-3, or Quattro Pro and see what values are in it. Complete the evaluation and see if nonzero answers have been picked up.

Supertree Problems

- Use Show Tree Structure or Show Schematic Tree in the Structure menu to check for any error messages below the node listing.

- Use Display Tree in the Analyze menu to examine the first few nodes in the tree; maybe you can spot the problem there.

- Use Trace Value in Tree in the Analyze menu to find nonzero values, and then problem solve from there.

- Do List Distribution Values, Plot Distribution in the Analyze menu, or Store Distribution in the File menu give answers that are wrong or give too few points?

  For big trees, Supertree collapses the distribution to an approximately equivalent smaller distribution when it reaches a certain size, so there may be fewer points. Further, in collapsing the distribution, Supertree creates some values in the list that are not actual endpoint calculations. To adjust the number at which this reduction occurs, use Set Options in the File menu.

Troubleshooting

Interface

- **Is Excel, Lotus 1-2-3, or Quattro Pro not called during automatic evaluation?** (Windows only). Click the Options button while in the Enter or Change Model option (Sensitivity) or the Input or Change Node Data option (Supertree). Make sure that Sensitivity or Supertree has the correct location of the file that runs the spreadsheet program:

  EXCEL.EXE for Excel
  123W.EXE for Lotus 1-2-3
  QPW.EXE for Quattro Pro.

- **If Supertree (or, more rarely, Sensitivity) gives WS FULL (workspace full) error messages,** it means that there is insufficient memory allocated to Supertree. Use the APL, Execute APL Expression option in the File menu, and enter *&WA*; the answer given is the workspace available in bytes and should be over 1 megabyte.

  If you need to allocate more memory, follow these steps:

  Windows

  1. Quit the application.

  2. Open the application Notepad from the Accessories folder.

  3. Open the file \super95\sup95.ini (\super95\sen95.ini for Sensitivity) and edit the line with "Wssize" in it. The number after Wssize= is the amount of memory (in Kilobytes) assigned to Supertree. The amount usually sufficient is 2500K for Supertree and 1024K for Sensitivity.

  4. Experiment with the correct settings. Setting these numbers too low leads to WS FULL errors. Setting these numbers too high leads to slower computer performance.

Troubleshooting

Macintosh

1. Quit the application.

2. Switch to the Finder.

3. Select Sensitivity or Supertree.

4. Choose Get Information from the File menu, and increase the memory figure at the bottom of the information screen.

- **Does SUPERMACRO halt at one of the early cells (A2 through A6)?** This almost always means that one of the range names (including the result name in the Sensitivity model or Supertree endpoint) you have defined in Sensitivity or Supertree is not defined in the spreadsheet. Check spelling, particularly the possibility of confusing the letter "l" with the number one or the letter "O" with zero. Error messages with the following forms will be seen:

  IN EXCEL, "MACRO ERROR AT CELL: SUPERMAC.TXT!A2."

  IN LOTUS 1-2-3, "INVALID VALUE {LET}."

  IN QUATTRO PRO:

  - "INVALID CELL OR BLOCK ADDRESS {LET} [SUPERMAC.TXT]A:A2)," FOR AN INVALID VARIABLE NAME (IN SENSITIVITY) OR NODE NAME (IN SUPERTREE).
  - "NON-NUMERIC RESULTS WERE REPORTED FROM THE PROGRAM RUN. (THE FIRST DISALLOWED RESULT IS RESULT NUMBER 1: [ ] RANGENAME," FOR AN INVALID MODEL NAME (IN SENSITIVITY) OR ENDPOINT (IN SUPERTREE).

If you are using a multisheet spreadsheet in Excel, make sure that you save the spreadsheet with the sheet that has the input calls as the active sheet.

Troubleshooting

- **If you are running an asymmetric tree (all successor nodes are not identical) and Lotus 1-2-3 (version 4 or 5 only) crashes**, check the file \windows\123R5.INI. Find the [DDE] section in the file and add the line *TermTimeout=0.*

- **Are you getting strange, wrong answers back?** Check for the following problems:

  – You might have defined ranges with names like CF93 for cash flow in 1993. This sounds good, but Excel, Lotus 1-2-3, and Quattro Pro interpret this as row 93 in column CF. (In Excel, if you define a range name CF93, Excel will change this to CF93_ and never tell you!) Avoid range names composed of letter-number or letter-letter-number.

  – Make sure the column(s) defined to store the results is (are) empty.

  – Does Sensitivity or Supertree say it found a nonnumeric answer? Sensitivity or Supertree reports the first nonnumeric result sent to it. A frequent cause of nonnumeric answers is "division by zero" for one of the cases.

  – Did you name the endpoint with a range name c or r? Excel will not allow c or r as a range name. If you use Formula Create Names, Excel will create names c_ and r_ and never tell you! If you then use c or r as endpoint value names, strange things happen. SUPERMACRO would crash if c or r were used anywhere other than in endpoint/model values. In endpoint/model values, Excel refuses to accept the command but continues without notifying you.

Troubleshooting

    – Are the results being written to the wrong sheet and writing over some code? For Lotus 1-2-3 and Quattro Pro, the first sheet (sheet A) is selected for the sheet to write the answers to. For Excel, the results are written to the active sheet when the workbook is opened; this is the same as the active sheet when the workbook was last saved.

• **Are you getting zeros when analyzing an evaluated sensitivity or tree?** Here are some questions to ask: (These questions may also be useful when other puzzling answers come back.)

    – Did you evaluate? If in manual mode, did you follow the instructions for retrieving the answers after the Excel, Lotus 1-2-3, or Quattro Pro run?

    – Is the value to be returned actually the cell with the answer in it? Sometimes the wrong cell gets referenced, and it is empty or zero.

    – For Supertree only: Is there a NO GO alternative with value zero in the decision tree? Sometimes the NO GO alternative is the preferred alternative, so the value of the decision tree is zero!

    – Is the answer larger or smaller than one? Sometimes the values are like 0.02. Check Set Options in the File menu (Macintosh only) to make sure that enough decimals are shown (0.02 would show up as zero if the field width was 8 0, which means 8 characters wide, 0 decimals).

A problem sometimes occurs when using GRMACROS.XLS to graph Sensitivity results. If you use double quotes in the variable description (e.g., the "critical" variable), Excel doesn't like it! Solution: Edit out the double quotes before running GRMACROS.XLS.