INTERPRETING A DECISION TREE ANALYSIS OF A LAWSUIT

by

Marc B. Victor

More and more attorneys are evaluating lawsuits by performing decision tree analyses (also known as risk analyses). These analyses can be used in a variety of ways:

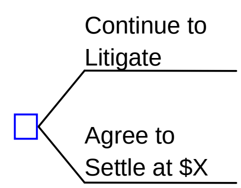
1. To give other counsel and the client a clearer understanding of the key issues, uncertainties and exposure presented by a case;
2. To gain settlement authority from the client;
3. To convince the other side to accept a given settlement;
4. To persuade a mediator or settlement conference judge of the rationale of your position;
5. To plan a cost-effective litigation strategy.

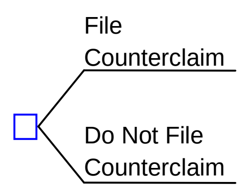
The increasing use of such analyses makes it important for you to understand how to *interpret* them, even if you are not personally familiar with how to *perform* them. Otherwise, your ability to participate in planning or critiquing litigation and settlement strategy will be hampered, as will your ability to negotiate favorable settlements for your clients.

<u>TERMINOLOGY</u>

One of the major products of a risk analysis is a DECISION TREE. Figure 1 on the next page is an example. The basic purpose of a decision tree is to show the most important and uncertain ULTIMATE ISSUES and INFLUENCING FACTORS if the case is litigated. Ultimate issues are those whose outcomes individually or in combination would be dispositive of the case with respect to liability (e.g., breach of duty), plus those comprising the major components of damages (e.g., compensatory damages, punitive damages). Influencing factors are those uncertainties that will influence how we do on the ultimate issues (e.g., admissibility of a document).

To read a decision tree, you first need to understand its parts. A DECISION NODE, represented by a square, identifies a strategy choice that is totally within your control (even though the consequences are not). Your possible strategic options would be written on the BRANCHES (horizontal lines) that follow the node. The following are examples of possible decision nodes and branches:





A CHANCE NODE, represented by a circle, identifies an uncertainty—something that is *not* totally within your control. The branches that follow a chance node show the possible ways in which the uncertainty might be resolved. The example decision tree in Figure 1 shows six different chance nodes (some of which are repeated more than once) and their possible outcomes.

Marc B. Victor, Esq., is the developer of Litigation Risk Analysis™ decision tree analysis.
For more information about consulting, training, or software, contact:
Litigation Risk Analysis, Inc. / P.O. Box 1085 / Kenwood, CA 95452 / 707-833-1093
or e-mail victor@litrisk.com or visit our website at www.LitigationRisk.com

DECISION TREE SHOWS WAYS IN WHICH CASE COULD BE WON OR LOST

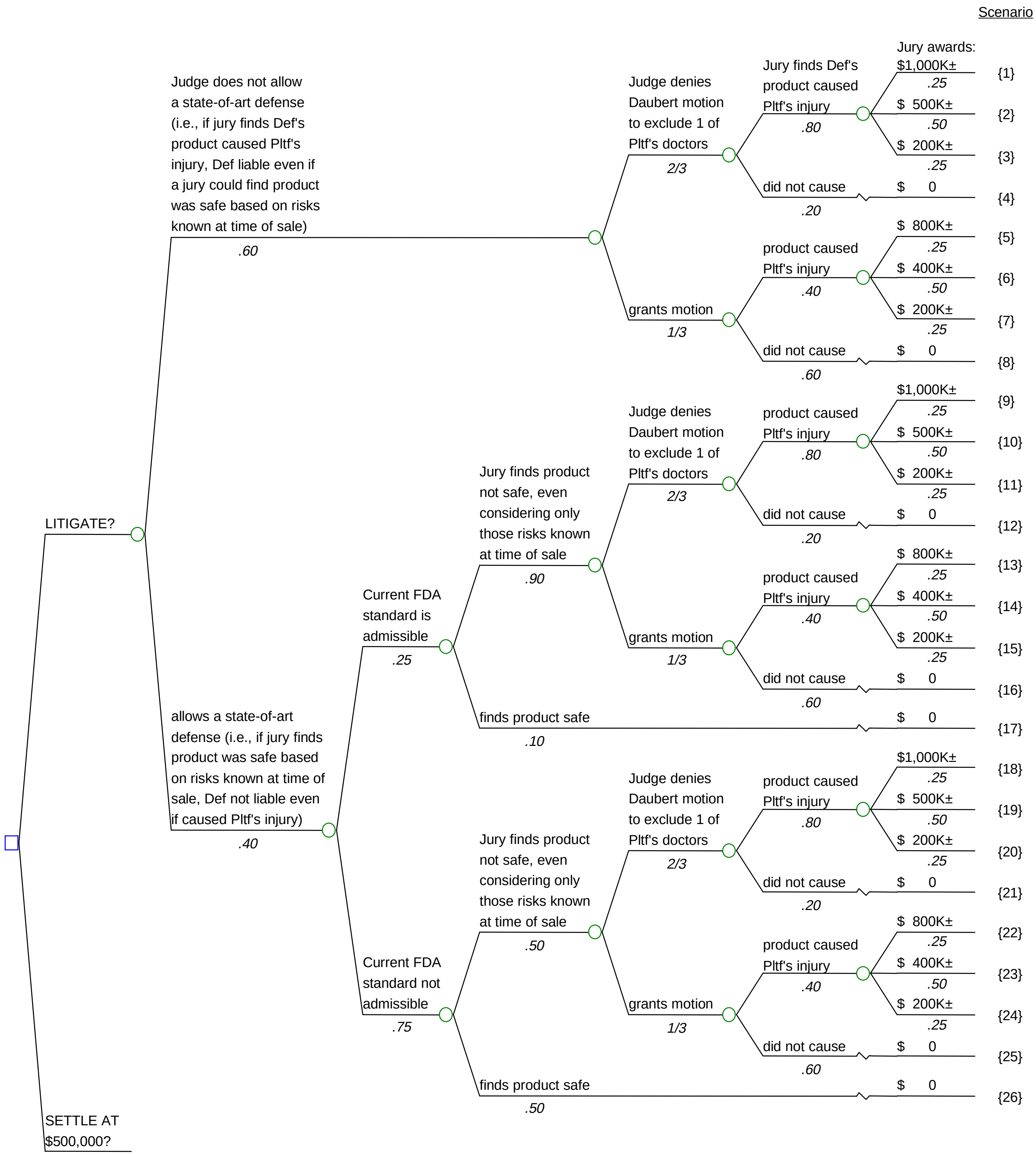
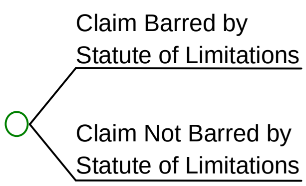
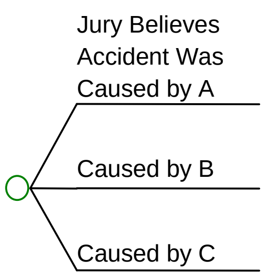


FIGURE 1

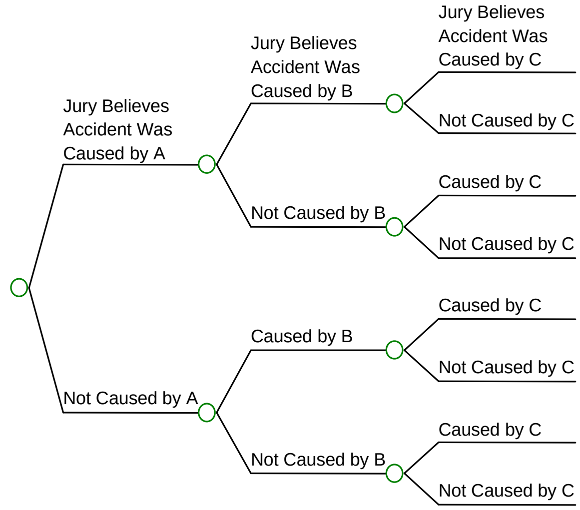
There can be any number of branches following a chance node, as long as they are "mutually exclusive" and "collectively exhaustive." That is, the uncertainty must be capable of being resolved in at least one of the ways shown on the branches, in no more than one of the ways shown, and in no additional ways beyond those already shown. *Outcomes that are direct opposites should meet these criteria, and represent the most frequent type of chance node*. For example:



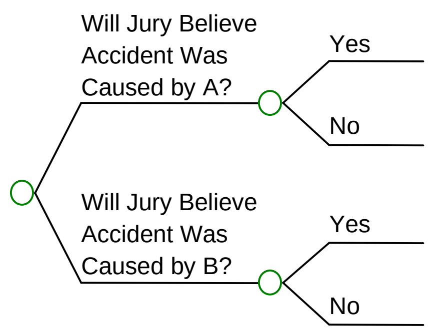
But three (or more) branches are also possible, a good example being:



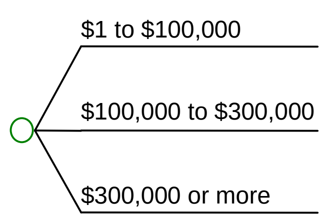
where the jury could find *one and only one* of the three to be the cause, because they conflict with each other (i.e., are "mutually exclusive"). Note that if the three causes did not conflict and the jury could conceivably believe *all* three, *some* of the three, or *even none* of the three, then three successive chance nodes would be necessary:



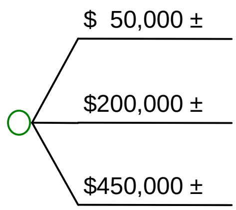
But make sure you understand why the following would *never* be correct:



In situations where an *infinite* number of outcomes are possible—such as the amount of damages to be awarded—mutually exclusive outcomes are created by identifying non-overlapping ranges. For example:



[Although the final decision tree will approximate each of the above ranges with a single "mid-range" value so that the risk analysis can be completed, you should remember that when you see a tree with a chance node such as:



it really represents a node like the one previously pictured, and thus meets the criteria of having mutually exclusive and collectively exhaustive branches.]

A SCENARIO is simply a combination of branches read from left to right. In Figure 1 we see 26 possible litigation scenarios.

PROBABILITIES represent counsel's quantitative "best guess" of the relative likelihood of the possible outcomes at each branch. They should be shown under their respective branches. Probabilities at a chance node must sum to 1.00 (100%). This is logical since the branches must be mutually exclusive and collectively exhaustive. There are no probabilities under the branches following a decision node, because there you select the strategy that is best.

READING THE TREE

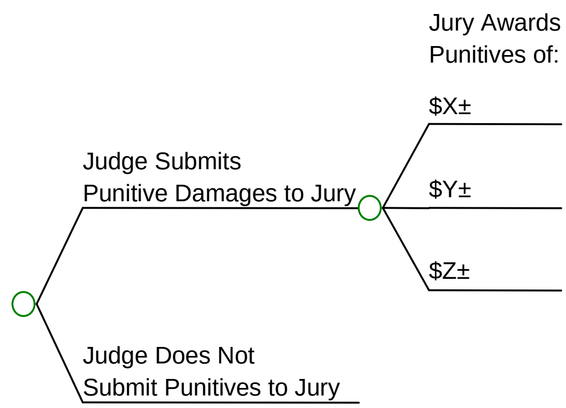
Now we can interpret the example tree in Figure 1. The decision node shows that Defendant is debating whether to litigate or pay a $500,000 settlement demand. If it rejects the demand and litigates, it faces possible consequences ranging from $0 (a defense verdict) to $1 million.

Reading from the left, we see that the ultimate liability issues are (1) will the judge permit a "state-of-the-art" defense (i.e., will Defendant be allowed to argue to the jury that it has no liability because its product was safe based on the known risks at the time it was sold); (2) if so, will the jury believe this defense; and (3) will the jury find that Defendant's product caused Plaintiff's injury? If Defendant succeeds on both issues (1) and (2), *or* on (3), it will be found not liable. If Plaintiff prevails on either (1) or (2), *plus* on (3), she will be able to recover some damages.

The two other liability issues shown are influencing factors: they cannot directly resolve the case, but instead influence the outcomes of some of the ultimate issues. For example, the probability of the jury finding Defendant's product was not safe based on the known risks at the time it was sold was assessed at 90% (.90) if evidence of the current stringent FDA standard is admissible, but only 50% (.50) if that evidence is not heard by the jury.

Similarly, the *Daubert* motion to exclude one of Plaintiff's doctors from testifying is also an influencing factor: the probability of the jury finding Defendant's product caused Plaintiff's injury was assessed at 80% (.80) if the motion is denied and the doctor testifies, but only 40% (.40) if the motion is granted and the doctor's testimony is excluded.

The ultimate damage issue in this example is simply one of how much the jury will award in compensatory damages. In many cases there are additional ultimate damage issues, involving such things as punitive damages:



If at issue in the case, this set of chance nodes would have to be tacked on to the end of each of the 18 existing branches at which the jury had awarded compensatory damages!

A careful look at the damages chance nodes shows that the range of compensatories differs depending on whether or not Plaintiff's doctor is allowed to testify—compare scenarios 1–3 with 5–7. These different assessments mean that the admissibility of this testimony is an influencing factor in counsel's opinion on damages as well as on causation.

IS THE TREE SOUND?

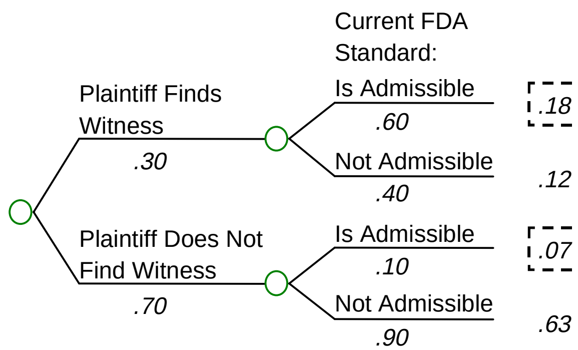
Before worrying about the quantitative conclusions to be drawn from a decision tree, it is critical to review its soundness. Do not be misled by the "scientific," "precise," or "objective" appearance of a decision tree. It merely reflects a lawyer's best *subjective opinions* of the major uncertainties in a case, their interrelationships and consequences, and their probabilities of occurring.

Therefore, begin by looking to see if the tree has incorrectly omitted any ultimate issues—either regarding liability or damages. For example, if Defendant is allowed to argue its product was "state-of-the-art" and the jury believes it was, is Defendant truly assured of a defense verdict (as currently shown by scenarios 17 and 26)? Or does Plaintiff have another theory that might result in a finding of liability? Similarly, even if the state-of-the-art defense fails (or is not allowed) and the jury believes Defendant's product caused Plaintiff's injury, is Plaintiff assured of receiving the damages shown? Or might Defendant be able to convince the jury that Plaintiff's own conduct should bar the claim, or at lease reduce the amount awarded?

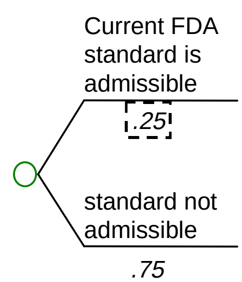
Next, ask whether there are any other influencing factors whose inclusion would aid considerably in assessing probabilities on an existing issue.

If an influencing factor affects only one issue in the tree and the tree is getting unwieldy, a SUBTREE is often created. To illustrate, assume that the admissibility of the current FDA standard depends on whether Plaintiff can find a particular witness. A subtree containing just these two uncertainties can be drawn and solved for the probability that would be used in the main tree (as explained in the next section):

SUBTREE



Result for MAIN TREE:



Only when you are comfortable with the tree should you carefully review the probabilities. And even if the percentages and verdict ranges look about right, *go behind the numbers:* what supports counsel's judgment—on *both* sides of the issue? What evidence (unfavorable as well as favorable)? What witnesses (harmful as well as helpful)? What precedent (bad as well as good)? What general factors may come into play, such as a jury bias against big companies, or a conservative judge eager to reduce his or her trial calendar? *The importance of such an examination cannot be overstated!* You may think you agree (or disagree) with someone's quantitative assessments until you realize you or they have overlooked some important considerations.

Finally, be sure counsel has been "realistic" with his or her assessments, not "academic": First, juries, and even many trial judges, frequently don't look at issues the way an attorney does. Second, the trier's view of a later issue in the tree is often affected by the branch it has chosen on an earlier issue (even though the two issues may be *legally* unrelated).

UNDERSTANDING THE RESULTS

Once you are satisfied that (i) the decision tree is a reasonable representation of the ways in which your case might be won or lost and the major components of damages, and (ii) the probabilities and verdict ranges best reflect all of the evidence, witnesses, and arguments and your own subjective judgment of how the judge and jury will react to them, then it is time to calculate and interpret the results.

There are two principal ways of evaluating a tree. The first is to determine the COMPOUND PROBABILITY of each scenario and then to plot the various damage awards and their respective probabilities in a graph. To determine the compound probability of a scenario we multiply together the probabilities that lie under the branches comprising that scenario. For example, the probability of scenario 1 of our large tree is $.60 \times 2/3 \times .80 \times .25 = .08$ (8%). (This is also the arithmetic that was done to solve the subtree on the prior page.) This multiplication for all of the litigation scenarios in Figure 1 produces the following table:

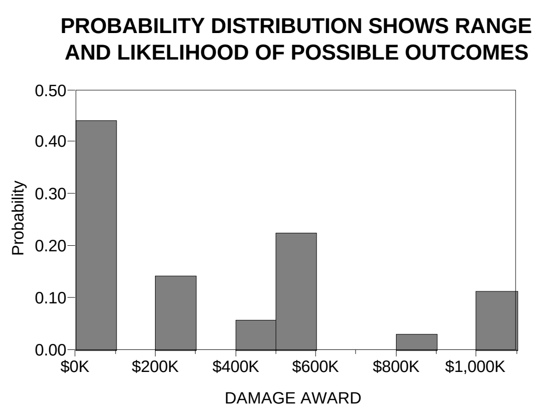
Tree Scenario	Compound Probability	Damage Award
1	8.0%	$1,000,000
2	16.0	500,000
3	8.0	200,000
4	8.0	0
5	2.0	800,000
6	4.0	400,000
7	2.0	200,000
8	12.0	0
9	1.2	1,000,000
10	2.4	500,000
11	1.2	200,000
12	1.2	0
13	0.3	800,000
14	0.6	400,000
15	0.3	200,000
16	1.8	0
17	1.0	0
18	2.0	1,000,000
19	4.0	500,000
20	2.0	200,000
21	2.0	0
22	0.5	800,000
23	1.0	400,000
24	0.5	200,000
25	3.0	0
26	15.0	0
	100.0%	

The logic behind multiplying probabilities together is that this ensures—*and is the only way of ensuring*—that each issue is given just the right amount of weight and that the final conclusion is the one that best fits counsel's carefully arrived at opinions on each of the many underlying issues. For example, notice that the sum of the probabilities of the first 8 scenarios is 60% $(8+16+8+8+2+4+2+12)$, and that .60 is exactly the probability under the branch that defines those first 8 scenarios ("Judge does not allow a state-of-art defense"). Or notice that the probability of scenarios 1–4 (40%) is exactly twice that of scenarios 5–8 (20%), because the probability of the judge denying the *Daubert* motion (2/3) is exactly twice that of the judge granting the motion (1/3).

The above table can then be summarized:

Scenarios	Probability	Award
1, 9, 18	11.2%	$1,000,000
5, 13, 22	2.8	800,000
2, 10, 19	22.4	500,000
6, 14, 23	5.6	400,000
3, 7, 11, 15, 20, 24	14.0	200,000
4, 8, 12, 16, 17, 21, 25, 26	44.0	0
	100.0%	

and graphed as follows:



This graph, known as a PROBABILITY DISTRIBUTION or BAR CHART, gives a visual sense of the risks faced if the case is litigated. To interpret it correctly, you should recognize that while any one of the bars corresponding to an actual damage award may look small—especially when compared with the 44% bar at $0—the sum of those bars (i.e., the probability of liability being found and *some* award being given) is 56%. The graph can be used by a party both to think about its own settlement position and to impress upon its adversary the wide range of possible results if a reasonable compromise cannot be reached.

The second principal way of evaluating a tree is to calculate its EXPECTED VALUE. This is a probability-weighted average value (or mean value). It is arrived at by weighting each of the possible outcomes by its probability of occurring:

Probability		Award		Product
11.2%	×	$1,000,000	=	$112,000
2.8%	×	800,000	=	22,400
22.4%	×	500,000	=	112,000
5.6%	×	400,000	=	22,400
14.0%	×	200,000	=	28,000
44.0%	×	0	=	0
		Expected Value	=	$296,800

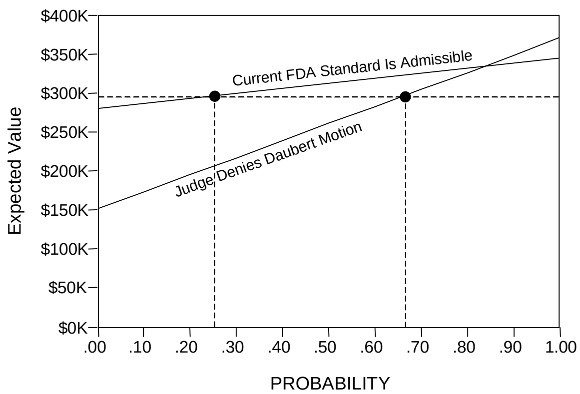
Even though the case is unique, the expected value can be thought of as the average result of litigating one hundred identical cases: In 44 you would anticipate a defense verdict; in 14 you would anticipate an award of $200,000; in 5 or 6 you would anticipate $400,000; and so on, up to 11 where you would anticipate $1,000,000. If you added up all 100 awards and divided by 100, the average award would be just under $300,000.

If a party can afford to "play the averages," the expected value is a fair settlement. Thus in our example tree, the $500,000 currently demanded by Plaintiff would be rejected by Defendant. A settlement below approximately $300,000 would be okay, though a party usually tries to negotiate a deal that is even better than the expected value. However, if a party is unable to bear the risk posed by litigating—usually when its net worth is small in relation to the magnitude of the possible gains or losses—it will need to go beyond the expected value and see the full bar chart in order to decided on its litigate-versus-settle strategy. For example, how much of a premium above the expected value might some defendant pay in order to avoid a 36% chance of a loss in the range of $500,000 to $1,000,000 as exists in our problem?

USING SENSITIVITY ANALYSIS GRAPHS

The final concept with which counsel needs to be familiar is that of a SENSITIVITY ANALYSIS. Such an analysis reveals how the expected value of the case changes as the probability on any issue changes. The graph below shows two examples.

SENSITIVITY ANALYSIS GRAPHS SHOW IMPORTANCE OF DIFFERENT ISSUES



The top diagonal line indicates that as the probability of the judge ruling that the current FDA standard is admissible increases from 0% (.00) to 100% (1.00), the expected value of litigating increases from around $280,000 to around $340,000. (Note that at the original probability of .25, the expected value is slightly less than $300,000—just as we determined earlier.) This kind of graph can be used to plan more cost-effective pretrial strategies: not much should be spent by Defendant to try to reduce the chance of this evidence being admissible, since even reducing the probability from counsel's current assessment of 25% all the way to 0% only reduces the expected value by about $20,000 (i.e., $300,000 – $280,000).

The bottom diagonal line indicates that as the probability of the judge granting Defendant's *Daubert* motion to exclude one of Plaintiff's doctors increases from 0% to 100%, the expected value of litigating increases from around $150,000 to around $370,000. The greater slope of this line indicates that improving your odds of success on this issue would be worth a greater expenditure.

Sensitivity analysis graphs are also important for planning your settlement strategy because they show those issues where differences of opinion have a big dollar impact and are therefore likely to make reaching a settlement more difficult.

PROTECTING THE CLIENT'S INTEREST

Let me conclude by relating an incident that demonstrates why it is important to be familiar with the basics of decision tree analysis. Company A and Company B were involved in a contract dispute that each party preferred to settle. Prior to any negotiations, counsel for A performed a risk analysis, including sensitivity analyses on all issues. Then, at the first meeting with Company B's counsel he unfolded his decision tree—but a version without any probabilities. Counsel for B was not familiar with decision trees, but after an explanation he agreed that A's counsel had fairly captured the important issues. Furthermore, he agreed that if the two of them could concur on all of the probabilities it would be reasonable to settle at the expected value—which they proceeded to do. However, the fact that counsel for A had privately performed sensitivity analyses prior to the meeting put him at a great advantage: he knew those issues on which he could appear "generous" in accepting his opponent's probabilities in exchange for B's counsel bending A's way on the more dollar-sensitive ones!

A better understanding of decision trees, expected values, probability distributions and sensitivity analyses might have helped Company B secure a more favorable settlement.