[SQUEAKING]

[RUSTLING]

[CLICKING]

RICHARD DE NEUFVILLE: Basically, something like 8, 10. 10 moves at the beginning with my pawns and my rooks, I would have 10 possible choices or 12 possible choices here. And then I could have what my opponent does, and a realistic problem can explode on you.

So one of the issues here, again back to my emphasis at the beginning or my remark at the beginning, is that decision analysis is good for simple problems. For complicated problems, it just gets too messy. So I'm going to illustrate this with a simple example.

So the situation is-- and I get this each Fall-- it's autumn at MIT. You can expect rain. You're about to leave your apartment and head to campus for class.

What's the probability of noticeable rain during the day? So again, this is part of decision analysis. It's fairly simple that what's a rainy day? Does it rain for a few seconds? Does it rain for 10 minutes? Is it a downpour-- good many states, but let's just say it's a yes/no answer-- that's either going to rain or it's not going to rain, or noticeable rain.

So you have four possible outcomes-- you take your coat and it rains, you take your coat and it's not raining, you didn't take your coat and it rains, you didn't take your coat and no rains. Now, I've given values to the outcome that a person might feel for this. I could I have a cover story for them as to why I invented the numbers.

But they're all fake anyway. It's more to show you a simple example of how you set it up and do the calculations. So bear with me that these numbers are OK for the purpose of a demonstration.

So first, I create the decision tree. So my first decision is, do I take the raincoat or not? Then whether it rains or doesn't rain, it so happens that nothing to do. Of course, nothing to do with my taking the raincoat affects the amount of rain, so these are the same here-- probability of rain is on one case, probably of no rain, and so forth.

Now, it may well be in general that the decision you make affects the competition, so their response depending on what you have. So the probability associated with one choice is not necessarily the probability associated with another choice. That is, if you be aggressive in the market, your competitors may respond by price cuts themselves, and the whole situation may be different.

If you're not aggressive there might be not the price cuts, and you have a different situation. But for the simple demonstration, I have, there's no dependence between your choices and the outcomes, which is contrary to the most general case. But again, I'm trying to make this very simple.

So first step, set up the tree. Secondly, now the process is to calculate the expected value of the outcomes. So given the data I have for the probability of rain and not rain, I can calculate the expected value of the raincoat.

So 2-- that is, 0.4 times 5-- minus 1.2-- that is, 0.6 times minus 2-- and it's 0.8. I can do the same thing for the other alternative. It is 0.4 times minus-- whoops, I didn't notice that. It's minus 10. Somehow when I transferred it from PowerPoint, that got moved there. Can I change it? Probably not right now. Well, I won't right now.

And that's a 4. And no rain, which is 0.6 times a value of 4. It is with a plus, so here I have the two values' outcome. This says, right, I've done the decision tree on it. With these values, my better choice, the expected value of the decision to take the raincoat is 0.8. It's better than -1.6. Decision marked is to take the raincoat.

Now, I can also do this, if you're interested in it, I can do it not as a tree but in an Excel layout. So here's an example of it. So I have the decisions, and you can imagine I leave the space here. I haven't had the grid behind it, remove that.

I can go through. I can automate I can set the equation so that probability times outcome, probability times this, is the sum of the probability times outcome here plus a sum of the probability times outcome here. I get 0.8, which I put in bold to indicate that it's the better solution. And I do the same thing here.

So it can be automated. And there are programs to do this. The classroom demonstration of the model might be where I'm tossing coins, or how many do I get in a row, or something, where everything is discrete.

The real world, however, is quite complicated, so that if you're thinking of using it to model a business expansion plan or some kind of activity, you'd have to have some kind of way to say, OK, if I did this and this-- if I took the raincoat or I did this action and this happened-- I have some way of calculating the result. And I didn't want to show something like that for this simple example, so I invented these numbers to fulfill it.