Linear Programming Optimization, Part 3

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The point that I'm trying to make here is that there is a lot you can do with a graph like this, in terms of exploring your solution space. You can do a sensitivity analysis, which depends and reassesses the conditions that people have imposed on solving the problem. And out of this, you could get into a situation where, for example, you might be able to renegotiate some of the political conditions. You would also get out of this that it is not necessary or useful to raise another 10,000 pickles. You would have too much money. You'd have more than you could use.

Okay. So we now have an algorithm. We have a graphical solution, and we can recognize when a problem is a linear programming problem.

I want to take this one step further. It's quite possible that not all your constraints are going to plot as straight lines. So what would happen if you had a non-linear constraint? That would mean that one of the constraints would be a curve of some sort instead of a straight line. Under those conditions, the theorem that says the solution has to be at the intersection of two constraints, disappears. But the theorem that says the answer has to be on the boundary still lives. And, again, there are algorithms that you can find for finding the guaranteed solution to the problem, under those conditions.

Your objective function might not be linear either. In that case, it would plot as a curve. And if you've got a non-linear objective function, then you're in a situation where all bets are off. The solution no longer has to be on the boundary. It could be on the boundary or it could be anywhere inside the area that isn't hatched out. And again, there are computer algorithms that have been developed for solving problems like this.

So in general, you are looking at a problem not of linear programming, but a problem of **'constrained optimization'**. And what characterizes the general problem of constrained optimization is, again, that you have variables, you have an objective function, and you have constraints. But you no longer have the condition that both the objective function and the constraints have to be linear. If they are, you can get to your solution more quickly and perhaps

understand it better using linear programming. If they're not, there are other algorithms that will get you to the answer.

Well at this stage, you know how to solve two-dimensional problems graphically, but what happens if you have problems with three or four or five variables? It turns out that you can solve those on a spreadsheet.

And we are going to break now and see how we can put this particular problem onto a spreadsheet, and then we will talk about how we can use the spreadsheet to explore the solution space and what kinds of answers the spreadsheet gives us.

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