Deterministic Wrap Up

Tony Starfield

recorded: 2005

I'm going to ask the following question: Suppose you were writing an executive summary for the caliph. You've built your model. You've done your sensitivity analyses. You've calculated all kinds of results and got some recommendations to make to him. But in this summary you are allowed one diagram to encapsulate what you have discovered with your model. What would you put in that diagram?

The tendency in a diagram like this is to say, gee, we're looking at a how a population changes over time, so maybe we need a graph of rocs versus time, and maybe we'll show two or three different trajectories under different conditions. But very often there is a better way to produce a diagram that shows a lot of information in one simple diagram, and that is,to put the parameters on the axes rather than to plot population versus time.

If you look at this diagram, we have here bullets along one axis and clutch size along the other axis. And implicit in what I'm going to do, we're going to assume that we start with a population of 700. So, for example, if I were to choose a clutch size of one and no silver bullets, what would happen to the population? Well, it wouldn't change. It would stay at 700. So I'm going to have that as a point on my diagram.

I'm now going to say, what happens at a clutch size of 1.02? At what silver bullet position would the population remain constant? Well, that's easy to find. Let's look at our spreadsheet. In the spreadsheet, if I change the clutch size to 1.02, then as you can see in this particular example, with 10 silver bullets, the final population is 823. Well, let's increase the number of silver bullets. Let's make it 20. At 20 we have a population that's less than 700. Change it to 15. The population is almost at 700. Make it 14. That's about as close to 700 as one can get it. In other words, a clutch size of 1.02 with 14 silver bullets produces a virtually steady population.

So let's go back to our graph. I can now go and plot a point at 1.02 and 14. I could then change clutch size on my spreadsheet to 1.04. I won't do it, but I would probably get an

answer something like that, and at 1.06 an answer something like that, and at all of these points the population is not changing. Suppose I join them? I get a graph, and that is a threshold graph, because if I take any combination of clutch size and bullets above the graph, that tells me that the population will decline. Any combination of clutch size and silver bullets below the graph tells me that the population will increase.

So for an initial population of 700, that graph is a very nice summary for the caliph of the conditions under which the population would grow or decline, and that after all is what he's concerned about. I could repeat the exercise with an initial population of 800. And maybe again with an initial population of 600. And if you look at that one graph, that contains one heck of a lot of information of use to the management. It gets to the nub of his problem, which is: Is the population going to grow or is the population going to decline with time?

So, to make my point again, if you're allowed one graph, very often look at the parameter space rather than how the population changes with time and look for thresholds.

<p style="text-align:center">< 00:04:47 End ></p>