SI for M. Granger Morgan "The Use (and Abuse) of Expert Elicitation in Support of Decision Making for Public Policy"

A Simple Illustration of the Process of Eliciting a Subjective Probability Distribution

As the main text explains, a well-developed protocol for expert elicitation may entail a variety of activities, only some of which involve asking an expert to assess the likely value of an uncertain coefficient as a subjective probability distribution.

An example of the protocol used in Zickfeld et al. (16) can be found at:
http://www.pnas.org/content/suppl/2010/06/28/0908906107.DCSupplemental/Appendix.pdf

The protocol used in Abdulla et al. (24) can be found in Appendix S2 at:
http://www.pnas.org/content/suppl/2013/05/22/1300195110.DCSupplemental/sapp.pdf

This box provides a very simple illustration of how that actual process of eliciting a probability distribution might proceed.

Suppose that I have a colleague who has driven to the airport midday from our offices, many times. It is midday now and the colleague is sitting next to me in my office. I want to elicit a probability distribution that provides his judgment of how long he believes it will take him to drive to the airport if he leaves for the parking lot to get his car right now.

First, we should probably break the question up into at least three parts:

1. Time to get to his car
2. Time to drive to the airport
3. Time to get from his car to the gate

For simplicity in this illustration I'll focus on just part 2.

Before I ask my colleagues any questions we need to agree on some general assumptions. I am interested in his judgment assuming normal traffic at this hour, no major accidents, no Presidential motorcades, no ice storms, no terrorist attacks, etc. We also assume that his car starts, has adequate gas, and has no mechanical problems.

Having agreed on these general assumptions, the interview dialogue might run something like this:

Me: Once you are in your car what is the maximum amount of time you could expect it to take to drive to the airport right now?
Colleague: 50 minutes.
Me: Has it ever taken you any longer than that?
Colleague: Yea, once it took 60 minutes and I missed my flight.
Me: With normal traffic could it take longer than that?
Colleague: I suppose maybe 65 minutes.
Me: Do you want to up your maximum time from 45 to 65?
Colleague: Yea, I guess I should.

Me: OK, now what's the minimum time for the drive to the airport?

Colleague: So, now I know that you're going to push me on this, so let's see, it is 30 miles and the speed limit is 55, but everyone drives 60. So 30 miles at 60 mph, that's 30 minutes. Sometimes I push it a bit more so I'll say between 25 and 30 minutes.

This dialogue results in my marking the range illustrated in Fig. B1. The objective in these initial exchanges is to get all the evidence brought to mind for my colleague as to minimize the impact of the heuristic of "availability" (see main text). In doing this, it is common to use strategies such as counter examples, so as to establish as wide a range as possible and minimize overconfidence. In more technical examples, a common strategy is to say something like "you said the minimum [maximum] value is X. Suppose that when the actual value becomes known it turns out to be 0.95[1.05] X. Can you think of any way in which that might occur?" If the expert can offer an explanation, then he or she might decide to increase the bounds.

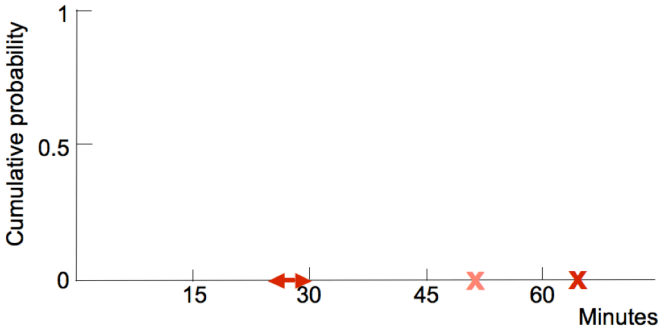

Fig. B1. Establishing the upper and lower bounds on the time it will take my colleagues to drive to the airport.

Continuing with the airport drive-time example, having established the range, I would then start to ask questions such as:

Me: What's the probability that your drive to the airport will take less than 60 minutes?

Colleague: 0.98.

Me: What's the probability that the drive will take more than 40 minutes?

Colleague: 0.65.

Me: What's the probability…etc.

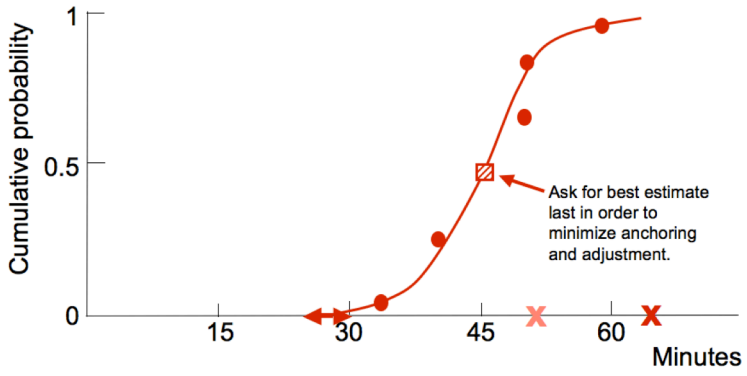

Fig. B2. Elicited distribution of the time it will take for my colleagues to drive to the airport.

Through a series of such questions we would build up a distribution of the sort shown in Fig. B2. If my colleague's estimates appear to be scattered, I might also phrase questions in the form "Give me a time such that you think there is at least a 30% chance you can drive to the airport in less time than that."

Finally, while I will ask my colleague for a best or median estimate, I will not pose that question until I have completed all my other questions so as to minimize the influence of the heuristic of "anchoring and adjustment" (see main text).

In virtually all the elicitations I have run, the experts have been very numerate and have chosen to answer questions directly in terms of probabilities. When respondents are not very numerate, folks in the decision analysis community sometimes ask the expert to respond by adjusting the colored section of a probability wheel of the sort shown in Fig. B3.

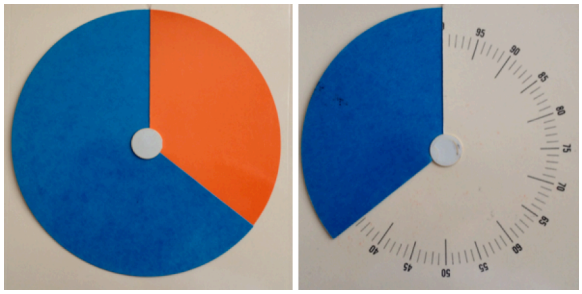

Fig. B3. Example of the sort of probability wheel that is sometimes used by the decision analysis community when eliciting experts who are not particularly numerate. Respondents are asked to adjust the size of the orange pie section (left) to match their probability. The value can then be read off the scale on the back (right). The specific wheel shown was made by Decision Focus, Inc.