

PROBABILITY ASSESSMENT WITH CONDITIONS

Warren R Hughes of *hugheseconomics.com* – March 2024

Probability assessment with minimal calculations using pairwise comparisons of “more likely” values for events adjacent in the likelihood ranking, has been documented on this website (downloadable). When the decision-maker (DM) has other pertinent information on the probabilities, this can be incorporated in the methodology as demonstrated in this note (also downloadable). The example uses a 3-event problem but is easily extended to more events, as necessary.

TABLE 1: 3-EVENT PROBLEM APPROACH

		Pairwise Values	
Events	Pairwise Ratios	Low	High
A	Base = 1	1	1
B	B/A	x	2x
C	C/B	2	3

Table 1 shows the DM ranking the events from least to most likely as in A,B and C. It is assumed that he/she has good ideas about the C/B pairwise value but less idea about the B/A value. The x - 2x values allow for one unknown to be determined by one condition using other DM information. Here this condition is that the most likely outcome C has probability of 60% or more. Accordingly, the combined probabilities for events A and B must total 40% or less with x to be determined by this condition. In principle, each unknown in the analysis will require a condition on the probabilities in addition to the original pairwise values. Using a range as in x - 2x means there is just one unknown and simplifies the algebra. In practice, the speed and ease of spreadsheet re-calculation substitutes for precise algebraic analysis, which is not reproduced here, but would use the information in Table 1.

TABLE 2: SENSITIVITY OF PROBABILITIES TO THE P(C) ≥ 60% CONDITION

Events	Pairwise Ranges	Percentage Probabilities			Other B/A Ranges		More Likely Values Depending on B/A Range				
		x = 1.2	x = 1.5	x = 2	2 - 3	3 - 4	x = 1.2	x = 1.5	x = 2	2 - 3	3 - 4
A	Base = 1 – 1	16	13	10	11	8	Base	Base	Base	Base	Base
B	x - 2x	24	25	26	26	27	1.50	1.92	2.60	2.36	3.38
C	2 - 3	60	62	64	63	65	2.50	2.48	2.46	2.42	2.41
		100	100	100	100	100					

In practice, once an appropriate value for the unknown is determined, the DM may alter this to reflect his/her additional judgments, possibly triggered by the analysis completed so far. And of course, the final distribution settled on will be up to the DM’s discretion.

(Word count 416, 10.3.24)