

## BROAD OR NARROW PAIRWISE JUDGMENTS ON LIKELIHOOD – DOES IT MATTER ?

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### LIKELIHOOD PAIRWISE RANGE GAINS MAY BE BROAD OR NARROW

The decision-maker (DM) can make broad likelihood gains between adjacent events in the ordering as in 1 – 2 times “more likely” or more precise judgments as in 1.4 – 1.6 times “more likely”. Both judgments could be described as the “more likely” event being moderately more likely than the “less likely” event. A 2 value could be described as “significantly” more likely.

#### PROBABILITIES FOR THE INITIAL “BALLPARK” ASSESSMENT

Events	Likelihood Ratios	Pairwise Range		Compound Likelihood		PROBABILITIES				More Likely #	
		Low	High	Low	High	P(Low)	P(High)	Average	%	Average	%
A	Base ⇒ 1	1.00	1.00	1.00	1.00	0.333	0.143	0.238	24	Base	Base
B	B/A	1.00	2.00	1.00	2.00	0.333	0.286	0.310	31	1.30	1.29
C	C/B	1.00	2.00	1.00	4.00	0.333	0.571	0.452	45	1.46	1.45
				<b>3.00</b>	<b>7.00</b>	<b>0.999</b>	<b>1.000</b>	<b>1.000</b>	<b>100</b>		

Note that the B/A “more likely” range here is 1 – 2 which is quite likely to encompass the “correct” value, although broad. Similarly for the C/B range. Calculations for more precise 1.4 – 1.6 ranges are shown below.

#### PROBABILITIES AFTER MORE PRECISE RANGE ASSESSMENTS

Events	Likelihood Ratios	Pairwise Range		Compound Likelihood		PROBABILITIES				More Likely #	
		Low	High	Low	High	P(Low)	P(High)	Average	%	Average	%
A	Base ⇒ 1	1.00	1.00	1.00	1.00	0.229	0.194	0.212	21	Base	Base
B	B/A	1.40	1.60	1.40	1.60	0.321	0.310	0.315	32	1.49	1.52
C	C/B	1.40	1.60	1.96	2.56	0.450	0.496	0.473	47	1.50	1.47
				<b>4.36</b>	<b>5.16</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>100</b>		

Slight differences in the “ballpark” probabilities result from the more precise assessments with the lowest and highest probabilities changing the most.

### CONCLUSIONS

Of course, the 1 - 2 ranges being broad are almost certain to encompass the “correct” probabilities even though these can never be known. Note too that with the broad assessments, the resulting probability ranges for all events are quite large. Using benchmarks could reduce ranges. In particular is one event definitely “more likely” than its alternative in which case the lower bound should be greater than 1.0. Similarly, if the “more likely” event is definitely less than twice as likely as its predecessor event then the upper bound should be less than 2.

Another interpretation would be to assume that the more precise ranges do in fact reflect the “correct” probabilities. If so, then the averaged broad judgments (which are easier to make) are within 1% to 3% of the correct values and can be considered good estimates. Unit gains in likelihood could also be 1.5 – 2.5, 2.5 – 3.5 etc. to reflect DM assessments as in “around twice as likely” and similar.