ASSESSING PROBABILITIES WITH MINIMAL CALCULATIONS
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Thinking probabilistically in an uncertain world is a valued skill that makes for better decision making. In particular, whatever does happen should not surprise the decision maker (DM) as he/she has prepared ahead of time , even if a low probability event does manifest itself.

The difficult task is to easily assess the relative likelihoods of the possible eventualities. This note outlines how tentative ideas on relative likelihoods can be transformed into probabilities initially designated as the "ballpark" probability distribution. Ballpark here means a first pass at calculations that can be amended with new information or revised judgments as the DM sees fit. That is, the daunting task of transforming tentative qualitative ideas into a quantitative probability distribution can be easily and routinely accomplished, although not necessarily producing the final distribution.

The methodology is best illustrated by example. We take the current war in Ukraine as the situation to be analyzed. Recent analysis by *The Economist* postulated three possible outcomes:

- CRT : Ceasefire with terms favourable to Russia
- CUT : Ceasefire with terms favourable to Ukraine
- STM : Stalemate on the battlefield along current lines

No probabilities were given in the article except to state that STM was "far more likely" than the other two outcomes. We take "far more likely" here to mean STM is 4 – 5 times more likely than either of the other two possibilities. This pairwise range can be easily altered as shown below. CRT and CUT we take to be equally likely using a pairwise range of 1 – 1 to express this fact. The pairwise ranges for the three events in the above order are then 1 – 1 (base), 1 – 1 (equally likely) and 4 – 5 (far more likely). Either CRT or CUT can be taken as the least likely event and STM is the most likely event, and the ordering above is then from least to most likely. Two distributions can now be calculated. Using the low end of the ranges we get 1 (base), 1 x 1 or 1 for CUT and 1 x 1 x 4 or 4 for STM. Total weights are the sum or 6 with corresponding probabilities 1/6, 1/6 and 4/6. That is, STM is 4 times more likely than CRT (or in this case CUT as well). Using the high end of the ranges, the weights become 1, 1 and 5 with sum 7 and respective probabilities 1/7, 1/7 and 5/7. Average probabilities from the two distributions are then 0.155, 0.155 and 0.69 or in percentage terms 15%, 15% and 70% or possibly 16%, 16% and 68%. Either distribution can be considered the "ballpark" distribution with further amendments by the DM into a final distribution, as necessary. For example, the DM on reflection may feel that the current situation in Ukraine gives that country a slight edge over Russia in any negotiations with a final distribution of 14% (CRT), 16% (CUT) and 70% (STM). Of course, the difference between 14% and 16% is minimal, but does reflect the "slight edge" judgment.

Suppose the "slight edge" judgment above uses a pairwise range of 1.1 – 1.2 or CUT is judged to be 10% to 20% more likely than CRT. The pairwise ranges now become respectively 1 – 1, 1.1 – 1.2 and 4 – 5. Using the above methodology, the resulting probability distribution in percentage terms is 14%, 16% and 70% with more likely values 1.14 (CUT over CRT) and 4.38 (STM over CUT). The table below shows the sensitivity of the percentage probabilities to the pairwise range reflecting the "far more likely" judgment from a 4 - 5 range to a 7 – 8 range.

SENSITIVITY OF PROBABILITIES TO THE "FAR MORE LIKELY" JUDGMENT

Pairwise Range	Percentage Probabilities			More Likely Values	
	CRT	CUT	STM	CUT/CRT	STM/CUT
4 – 5	14	16	70	1.14	4.38
5 – 6	12	14	74	1.17	5.19
6 – 7	10	12	78	1.20	6.50
7 - 8	9	11	80	1.22	7.27

This undemanding technique can be used by anyone wishing to think probabilistically.