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## Why Political Scientists Are Wrong 15% of the Time

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# Why Political Scientists are Wrong 15% of the Time

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## Abstract

An experimental study has shown that among situations when political scientists claimed that a political outcome was impossible, this outcome actually occurred in 15% of the cases. In this paper, we provide a possible explanation for this empirical fact.

## 1 Formulation of the Problem

**Empirical fact.** A detailed study [5] has shown that among situations when political scientists claimed that a political outcome was impossible, this outcome actually occurred in 15% of the cases.

**Clarification.** It should be noted that we are not talking about bizarre possibilities that everyone considers to be practically impossible – like aliens landing on the White House. If we include such bizarre options, then, of course, the percentage of actual occurrence would be much much smaller.

The above research only dealt with outcomes which are realistic enough, so that at least some political scientists claim them to be possible.

**What we do in this paper.** In this paper, we propose a possible explanation for the above empirical fact.

## 2 Analysis of the Problem

**Seven plus mins two law: reminder.** It is known that we usually divide each quantity into 7 plus plus minus 2 categories – this is the largest number of categories whose meaning we can immediately grasp; see, e.g., [2, 3]. For some people, this “magical number” is  $7 + 2 = 9$ , for some it is  $7 - 2 = 5$ .

**Consequences for estimating how possible are different events.** As a result, in situations of high uncertainty, when we estimate how possible is an

outcome, instead of providing an exact probability  $p$ , we simply divide the range  $[0, 1]$  of possible values of the probability into  $n = 7 \pm 2$  subintervals, and return the value corresponding to one of these subintervals.

Since we have no reason to believe that different subintervals have different width, it makes sense to conclude that these intervals are equally wide, i.e., that they have the form

$$\left[0, \frac{1}{n}\right], \quad \left[\frac{1}{n}, \frac{2}{n}\right], \quad \dots, \quad \left[\frac{n-1}{n}, 1\right].$$

The first subinterval contains value 0 corresponding to impossibility. Thus, if the probability  $p$  is in the first interval, the expert will conclude that the corresponding outcome is impossible.

Specifically:

- experts with  $n = 9$  consider all the outcomes with probability

$$p < \frac{1}{9} \approx 0.111$$

to be impossible;

- experts with  $n = 8$  consider all the outcomes with probability

$$p < \frac{1}{8} = 0.125$$

to be impossible;

- experts with  $n = 7$  consider all the outcomes with probability

$$p < \frac{1}{7} \approx 0.143$$

to be impossible;

- experts with  $n = 6$  consider all the outcomes with probability

$$p < \frac{1}{6} \approx 0.167$$

to be impossible;

- experts with  $n = 5$  consider all the outcomes with probability

$$p < \frac{1}{5} = 0.2$$

to be impossible.

We are interested in outcomes with probability  $p$  for which at least one expert considers them possible, but the current expert considers them impossible. The condition that at least one expert considers the outcome possible means that

$$p < \frac{1}{9} \approx 0.111.$$

Thus:

- for experts with  $n = 9$ , such mislabeled outcomes are impossible;
- for experts with  $n = 8$ , we are interested in the outcomes for which

$$\frac{1}{9} < p < \frac{1}{8} = 0.125;$$

- for experts with  $n = 7$ , we are interested in the outcomes for which

$$\frac{1}{9} < p < \frac{1}{7} \approx 0.143;$$

- for experts with  $n = 6$ , we are interested in the outcomes for which

$$\frac{1}{9} < p < \frac{1}{6} \approx 0.167;$$

- for experts with  $n = 5$ , we are interested in the outcomes for which

$$\frac{1}{9} < p < \frac{1}{5} = 0.2.$$

Let us show that this idea explains the above empirical fact.

**Frequency of different probabilities  $p$  and different values  $n$ .** Similarly to the above argument, we do not have any reason to believe that different probabilities  $p$  are more or less probable. Thus, it is reasonable assume that all the values  $p \in [0, 1]$  are equally probable, i.e., that the probability  $p$  is uniformly distributed on the interval  $[0, 1]$ ; see, e.g., [1].

**Resulting estimates.** Under the uniformity assumptions, we get the following estimates:

- For an expert with  $n = 8$ , the (conditional) probability  $p_8$  of encountering a possible outcome that this expert will claim to be impossible is equal to the width of the corresponding interval  $\left(\frac{1}{9}, \frac{1}{8}\right)$ , i.e., to the difference

$$p_8 = \frac{1}{8} - \frac{1}{9}.$$

The average value  $a_8$  of such probability  $p$  is equal to the midpoint of this interval. i.e., to

$$a_8 = \frac{\frac{1}{9} + \frac{1}{8}}{2}.$$

- For an expert with  $n = 7$ , the (conditional) probability  $p_7$  of encountering a possible outcome that this expert will claim to be impossible is equal to the width of the corresponding interval  $\left(\frac{1}{9}, \frac{1}{7}\right)$ , i.e., to the difference

$$p_7 = \frac{1}{7} - \frac{1}{9}.$$

The average value  $a_7$  of such probability  $p$  is equal to the midpoint of this interval. i.e., to

$$a_7 = \frac{\frac{1}{9} + \frac{1}{7}}{2}.$$

- For an expert with  $n = 6$ , the (conditional) probability  $p_6$  of encountering a possible outcome that this expert will claim to be impossible is equal to the width of the corresponding interval  $\left(\frac{1}{9}, \frac{1}{6}\right)$ , i.e., to the difference

$$p_6 = \frac{1}{6} - \frac{1}{9}.$$

The average value  $a_6$  of such probability  $p$  is equal to the midpoint of this interval. i.e., to

$$a_6 = \frac{\frac{1}{9} + \frac{1}{6}}{2}.$$

- For an expert with  $n = 5$ , the (conditional) probability  $p_5$  of encountering a possible outcome that this expert will claim to be impossible is equal to the width of the corresponding interval  $\left(\frac{1}{9}, \frac{1}{5}\right)$ , i.e., to the difference

$$p_5 = \frac{1}{5} - \frac{1}{9}.$$

The average value  $a_5$  of such probability  $p$  is equal to the midpoint of this interval. i.e., to

$$a_5 = \frac{\frac{1}{9} + \frac{1}{5}}{2}.$$

**Frequency of different values  $n$ .** Similarly, since we have no reason to believe that experts with some values of  $n$  are more probable, it is reasonable to assume that all the five  $n = 5, 6, 7, 8, 9$  values are equally probable, i.e., that each of these values occurs with the same probability  $\frac{1}{5}$ .

**Resulting probability.** Since experts with different values  $n$  are equally frequent, the average probability  $\bar{p}$  of a possible outcome erroneously labeled as impossible can be obtained by averaging the conditional averages  $a_n$  corresponding to different values  $n$  – with the weights proportional to the  $n$ -conditional probabilities  $p_n$  of such erroneous labeling. Thus, we arrive at the following formula:

### 3 Resulting Explanation

According to the above analysis, the average probability  $\bar{p}$  of a possible outcome which is erroneously labeled as impossible is equal to:

$$\bar{p} = \frac{p_8 \cdot a_8 + p_7 \cdot a_7 + p_6 \cdot a_6 + p_5 \cdot a_5}{p_8 + p_7 + p_6 + p_5}.$$

Substituting the above values of  $p_i$  and  $a_i$  into this formula, we conclude that  $\bar{p} \approx 0.14$  – which is very close to the empirical value 15%.

Thus, we have indeed justified the empirical observation.

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### References

- [1] E. T. Jaynes and G. L. Bretthorst, *Probability Theory: The Logic of Science*, Cambridge University Press, Cambridge, UK, 2003.
- [2] G. A. Miller, “The magical number seven, plus or minus two: Some limits on our capacity for processing information”, *Psychological Review*, 1956, Vol. 63, No. 2, pp. 81–97.
- [3] S. K. Reed, *Cognition: Theories and application*, Wadsworth Cengage Learning, Belmont, California, 2010.
- [4] N. Silver, *The Signal and the Noise: Why So Many Predictions Fail – But Some Don't*, Penguin Press, New York, 2012.
- [5] P. E. Tetlock, *Expert Political Judgment*, Princeton University Press, Princeton, New Jersey, 2006.