

Bayesian skepticism justified

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Bayesian analysis of juridical proof may be either normative or descriptive: it may either explain the existing fact-finding practices or provide prescriptions as to how they should be conducted. In practice, there are virtually no examples of 'trial by mathematics' (see, generally, Tribe, 1971). Juridical Bayesianism therefore has no explanatory power (see Stein, 1996a). (I use the term 'juridical' following the convention set by Allen.)

This statement should not be interpreted as a wholesale denial of any utility for probability theory in law. It holds true with regard to determination of facts in individual cases (subject to exceptional cases where the rights of the parties are to be determined by probabilities under the controlling substantive law¹). At the same time, my Bayesian skepticism does not extend to denying the utility of probabilistic analysis as a heuristic device. I believe that probabilistic analysis (among other methods) may further our understanding of important evidentiary doctrines, such as those regulating burdens of proof,² relevancy,³ hearsay,⁴ expert testimony⁵ and character evidence.⁶ Models constructed through this analysis may usefully explain, and perhaps even predict, the operation and the overall utility of the examined doctrines.⁷ This descriptivity is ultimately confined to conversation about longruns, either directly or by focusing upon typical or average cases. Models exhibiting it are all macro-models, as contrasted to efforts to understand the nature of fact finding in individual cases. At the micro-level, the prevailing evidentiary doctrine seems to have endorsed the famous saying that for statistics there are no individuals, and for individuals no statistics.

But is this the right approach to take? Given that juridical Bayesianism has a manifestly limited explanatory power, does it have any normative appeal?

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1 See the Introduction, in Twining and Stein (1992) at xv, xxiii; nn. 58-62 and accompanying text.

2 See Kaplan (1968) at 1071-2; Kaye (1980) at 605, n. 19; Kaye (1982); Orloff and Stedinger (1983); Stein (1996b).

3 See Lempert (1977).

4 See Friedman (1987).

5 See generally Robertson and Vignaux (1995).

6 See Friedman (1991).

7 Allen would contest this.

Friedman argues that it does. His argument is more qualified than that of some other Bayesians, such as Robertson and Vignaux (1993), who maintain that adherence to probability theory is the only rational way to conduct juridical proof. To this imperialistic view,⁸ Friedman prefers a relaxed version of Bayesianism. His version is prepared to account for the relative strength of the evidential base that underlies every probabilistic proposition; and it also opens itself to processing evidence *en masse*, when the evidence is organised into narratives.⁹ Friedman also responds to a number of challenges to the Bayesian approach, which point to its different paradoxes. At the same time, Friedman admits that the Bayesian method is 'of analytical assistance only', and that 'for the most part, probability theory should not be presented to the fact finder, even though it helps shape the evidence that the fact finder receives'. According to him, probability theory can thus still play an important role in assessing the propriety of juridical reasoning about uncertain events.

I find even this limited form of juridical Bayesianism most problematic. Friedman's Bayesianism straightforwardly places every factual proposition (stories and individual inferences alike) under the umbrella of an ordinary probability calculus. By maintaining some minimal resiliency threshold, it would also differentiate between probability arguments that are more and less evidenced.¹⁰ Friedman claims this system to be normatively superior to ordinary commonsense reasoning, which is labelled as 'Baconian'¹¹ and reputed to be prone to fallacies, when perceived through lenses of mathematical probability.¹² The logic of Friedman's system strikes me as impeccable. His discussion, however, does not specify the epistemic standards that should be fed into this system. Friedman is obviously aware that logic alone will not do, and that juridical fact finding without epistemic warrant can never be justified. It therefore appears that he assumes that the standards regarded as good for non-Bayesian fact finding, as presently conducted by judges and jurors, will be good enough for his system as well. I have reservations about this assumption, and in what follows will briefly lay them out.¹³

Consider the following example:

X's surgery was negligently delayed by doctors, which reduced his chances of recovery from 75 per cent to 25 per cent: according to undisputed medical statistics, 75 per cent of the patients in X's condition have recovered when operated on in good time, which happened with only 25 per cent of the patients whose operations were delayed. The delayed surgery was performed impeccably, but X did not recover and is now suing his doctors. He attributes his terminal illness to the doctors' malpractice rather than to his pre-existing misfortune. (Adapted from *Hotson v East Berkshire Area Health Authority* [1987] 1 AC 750 (HL).)

8 For its critique see Stein (1996a).

9 This, however, cannot be done without a price. There is nothing inherent in the fact finding process which requires that evidence should be sliced and diced into propositions amenable to the Bayesian calculus. On the contrary, slicing and dicing of the evidence into clusters seems artificial and thus problematic: fact finders will often do better by adjudicating between the competing stories by considering the evidence in its totality.

10 This will not be devoid of problems: see Stein (1996a) at 32, fn. 14 and accompanying text; 33-4; 41-3.

11 Owing to Jonathan Cohen's famous works. See Cohen (1977).

12 The classical account of these fallacies is Tversky and Kahneman (1974), reprinted in Kahneman, Slovic and Tversky (1982) at 3 (a collection of essays unfolding and examining these fallacies).

13 See also Stein (1996a).

As everyone would agree, this case is highly unusual: objective frequentist data are normally not available in litigation, which usually arises out of unique events.¹⁴ If such data were available, then, subject to their resiliency (and to the 'trial by mathematics' problems, which I leave aside¹⁵), many Bayesioskeptics (including myself) would agree that they should be processed statistically. In the present case, the data should be processed by applying Bayes' theorem:

$p(D)$ = the likelihood of a delayed patient becoming afflicted either by natural causes (N) or through malpractice (M), which amounts to 0.75.

$p(M)$ = the probability of malpractice, which in the present case is known to be 1.

$p(D|N)$ = the *ex ante* probability of affliction, given natural causes only, which amounts to 0.25.

$p(D|M)$ = the *ex ante* probability of affliction, given malpractice only, which amounts to 0.50.

$p(M|D)$, i.e. the probability that X's damage originated from his doctors' malpractice (represented by the *ex post* inferrability of malpractice from affliction) is what needs to be established. This probability equals:

$$p(M) \times \frac{p(D|M)}{p(D)}$$

i.e. to 0.667.

Consequently, X should be allowed to recover from his doctors under the preponderance-of-the-evidence standard.¹⁶ More important for our purposes is the inferential progress made by processing the evidence statistically. This processing of the evidence has produced a new piece of knowledge. Will a similar progress be made under the subjectivist Bayesian framework of reasoning?

This question should be answered in the negative. Let it now be assumed that our case is of the usual sort, so that we have the same problem, but no frequentist data. For any such case, Friedman and other proponents of juridical Bayesianism prescribe the following method:

1. The judge should first specify the propositions probabilistically relevant to her decision;
2. Based on her experience, she should subjectively ascribe probability values to each of these propositions;
3. In doing this, she should maintain coherence and obey the general postulates of probabilistic calculus;
4. Finally, she should compute the above values by following Bayes' theorem, as if these values were objective.¹⁷

To see how this system works, assume that the values subjectively ascribed by our judge to the probabilistically relevant propositions coincide with the frequentist data

14 See, e.g. Kaye (1980) at 609-10.

15 An excellent discussion of these problems can be found in Thomson (1986), reprinted in Twining and Stein (1992) at 209.

16 Cf. Kaye (1982). I would favour recovery on different grounds: see Porat and Stein (1997).

17 See, e.g. Cohen (1988) at 58-74.

in the former example. To be epistemically justifiable, each of these subjective values must rest on some information known to the judge. This means that the judge's epistemic conditions (which I assume to be rational, rather than whimsical or otherwise idiosyncratic) *allowed her* to determine $p(D|N)$ and $p(D|M)$ (and thus $p(D)$) individually, in order subsequently to combine these findings with her certainty about the doctors' malpractice and thus compute the value of $p(M|D)$.

I think it should be obvious that these epistemic conditions will also allow the judge to determine the posterior probability directly. There is nothing epistemically special in $p(M|D)$, when compared with the other probability values. Like the latter, $p(M|D)$ will be located in the web of the judge's relevant knowledge.¹⁸ This point should be obvious because the judge's knowledge of the other probability values logically entails her knowledge of $p(M|D)$. If, for instance, the judge's task were to determine $p(D|M)$ as her final hypothesis, then, by standing on the same evidential platform, she would have discharged this task by determining $p(M|D)$ first. Her subjective probability estimates can be determined only as part of a comprehensive network, which encapsulates *ab initio* their mutual dependency and interrelationships as cardinal numbers (otherwise, distortions are bound to occur).¹⁹ Because the required network (or web of beliefs) needs to be comprehensive, the subjectivist Bayesian computation can generate no inferential progress. This vacuousness marks the subjectivist version of juridical Bayesianism as redundant.²⁰

18 See Tversky and Kahneman, in Kahneman, Slovic and Tversky, *supra* n. 12 at 20 ('For judged probabilities to be considered adequate, or rational, internal consistency is not enough. The judgments must be compatible with the entire web of beliefs held by the individual.')

19 See Stein (1996a).

20 In more common cases, which involve many evidential items that need to be translated into a substantial number of relevancy quotients and thus go through a long series of Bayesian computations, direct determination of the posterior probability will not only be possible, but also more intuitive. This probability can be determined by directly examining the evidential support that underlies the competing factual allegations. See Stein (1996a). It can also be determined by assessing the relative plausibility of the competing stories. See Allen (1994).