

Degrees of Belief — IV

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1 The Variety of Probability Talk

‘CHANCES’ – the kind of lawlike probabilities dished up by scientific theories, tied to metaphysical/nomological possibility.

- * ‘The particle is more likely than not to decay in the next five minutes.’

EVIDENTIAL PROBABILITIES – measuring plausibility and evidential support, tied to epistemic possibility.

- * ‘The Twin Prime Conjecture is more likely false than true.’

The dichotomy often becomes murky:

- * ‘The ball in the box is more likely black than red.’

Question. Are these probability attributions really distinct types? How are they related?

2 Subjective and Objective Probability

Titelbaum: distinguish two kinds of subjective/objective distinctions in the air.

2.1 Semantic Distinction

The Issue. Are probability ascriptions subjective or objective?

THE ANALOGUE IN ETHICS. Contrast four conversations:

- (1) Murder is wrong. / Murder is right.
- (2) Murder is illegal. / Murder is legal. [Asserting a fact.]
- (3) I abhor murder. / I admire murder. [Reporting abhorrence.]
- (4) Boo murder! / Hooray murder! [Expressing abhorrence.]

MORAL OBJECTIVIST: (1) is semantically parallel to (2); ‘wrong’ tries to pick out a property, *wrongness*, and (1) involves direct factual disagreement.

MORAL SUBJECTIVIST: (1) means something like (3) or (4) which do not presuppose there is a such a property, and which do not involve direct disagreement. So too:

Objectivist: ‘Rain is probable’ is semantically parallel to (2), asserting that rain has a certain property, *probableness*.

Subjectivist: ‘Rain is probable’ (3’) either *reports* confidence, like ‘I am confident it will rain’; or (4’) *expresses* confidence, not outright asserting anything.

FRIENDLY CASE FOR THE OBJECTIVIST: ‘There’s a 0.63 chance the atom will decay in the next five minutes.’

FRIENDLY CASE FOR THE SUBJECTIVIST: ‘What’s the capital of Bangladesh?’ / ‘It’s probably Dhaka.’

2.2 Normative Distinction: Subjective vs Objective *Bayesianism*

The Issue. Are there credences that are objectively correct, given your evidence?

Constraints so far: *probabilism* and *conditionalisation* – but these leave a lot of leeway.

REFORMULATION. Clearer to talk in terms of **ur-priors**. First pass: ur-prior Cr_0 are ‘what your credences were before you had any evidence’. Your *current* credences are $Cr(P) = Cr_0(P|E)$.

Reformulated Issue. Is there an objectively correct ur-prior?

Extreme subjectivism: There are no constraints (other than Probabilism). So wide latitude when it comes to your current credences too.

Extreme objectivism: There is exactly one correct ur-prior. So unique appropriate credences given your evidence.

Note: Normative objectivity suggests semantic objectivity: if there are objectively correct credences, then we can talk about *them*. Constraints might correspond to *objective chances* or *objective evidential probabilities*.

MORE ON UR-PRIORS: Classic Bayesians think of your epistemic state as being given entirely by your credences. Instead, think of it as

1. Your current evidence E – something like what you know.
2. Your ur-prior Cr_0 , reflecting current judgements about antecedent plausibility.

Instead of Conditionalisation, just have the synchronic norm $Cr(P) = Cr_0(P|E)$.

- See week 2 handout and readings for more on ur-priors.

3 Objective Chance

General Idea: If the chance of P is x , then you should have credence x in P .

LEWIS’S CONCEPT OF CHANCES. At each time t , each proposition P has a chance, which depends on two things: the laws L of nature and the history H_t of the world up to t .

$$Ch_{LH_t}(P)$$

Lewis’s Principal Principle (PP): $Cr_0(P|LH_t) = Ch_{LH_t}(P)$.

EXAMPLE 1. If P is about what happened in the past, then its chance now is either 0 or 1. Why: if P is true, then $Cr_0(P|LH_t) = 1$, so $Ch_{LH_t}(P) = 1$.

EXAMPLE 2. Similarly, if the laws L are deterministic, then every P has chance 0 or 1.

Determinism and Chance? The thought that determinism and chance are incompatible is intuitive. But potentially mistaken in two ways. One suggests a revision to PP, and the second illustrates its power.

High-Level Laws. High-level theories – e.g. population genetics, statistical mechanics – often posit lawlike probabilities while allowing that the *fundamental* laws are deterministic. Loewer, Meacham, and others think we should reformulate PP to count these as ‘chances’.

PP AS A FUNCTIONAL DEFINITION. Lewis: PP says ‘everything we know about chance’ – *whatever* fits into it gets to count as chance.

- * Lewis: Humean regularities constrain credences – hence determine chances.
- * Wallace: ‘Many worlds’ branching structure constrains credences – hence determines chances.

Upshot: Thinking about credences can help metaphysics!

4 Objective Evidential Probability

Indifference principle: If there’s no reason for confidence in one over another of a set of alternatives, then each should get equal credences.

COIN TOSS. Equal evidence for H and T , hence equal credences.

URN. An urn contains some balls, black or red. You pick one...

- * The ball is black / the ball is red?
- * The ball is black / the ball is dark red / the ball is light red?

CUBE FACTORY. A factory makes cubes. Each one is smaller than 2 inches in height. Credence the next cube is smaller than 1 inch in height?

- * 0–1 inches in height / 1–2 inches in height?
- * 0–1 cubic inches / 1–2 cubic inches / ... / 7–8 cubic inches?

COIN SEQUENCE. A coin is flipped 10 times. $2^{10} = 1024$ different sequences; give each one probability $1/1024$. Note this is just like assuming the coin is fair!

- * E : First 9 flips are heads. P : The last one is heads. $\text{Cr}_0(P|E) = 1/2 = \text{Cr}_0(P)$. This is bad news for inductive reasoning!

What this shows: It’s not *easy* to apply the indifference principal. When is it valid?

Logical Probability (Carnap). Purely logical criteria for probability?

CARNAP’S TWO FLIPS. Two coin flips, f_1, f_2 . Consider predicates:

$$\text{Hails}(x) = \begin{cases} x = f_1 \text{ and Heads}(x) \\ x = f_2 \text{ and not Heads}(x) \end{cases} \quad \text{Heads}(x) = \begin{cases} x = f_1 \text{ and Hails}(x) \\ x = f_2 \text{ and not Hails}(x) \end{cases}$$

GOODMAN’S ‘NEW RIDDLE’.¹

- Carnap wants to say that $\text{Heads}(f_1)$ supports $\text{Heads}(f_2)$.
- By the same logic, $\text{Hails}(f_1)$ supports $\text{Hails}(f_2)$.
- $\text{Heads}(f_1)$ is equivalent to $\text{Hails}(f_1)$.
- But $\text{Heads}(f_1)$ cannot support both $\text{Heads}(f_2)$ and $\text{Hails}(f_2)$.

So:

- * It’s not clear when/why the Principle of Indifference is valid; we can’t appeal to purely logical criteria.
- * Fallback Objectivist Position: there just *is* a uniquely appropriate ur-prior, and we don’t *need* to analyse it in other terms.

¹Goodman’s original example of this kind is the predicate ‘grue’: ‘it applies to all things examined before t just in case they are green but to other things just in case they are blue’ (pp. 73–4).

Further Reading

Interpretations of Probability

Hájek, A. (2012) 'Interpretations of Probability', *The Stanford Encyclopedia of Philosophy* (Winter 2012 Edition), Edward N. Zalta (ed.), online.

[A survey.]

Rothschild, D. (2012) 'Expressing Credences', *Proc. Aristotelian Soc.* 112: 99–114.

[Recent expressivist treatment of probability talk.]

Evidential Probability

Carnap, R. (1955) 'Statistical and Inductive Probability', reprinted in Eagle.

[Very short introduction to Carnap's project.]

Goodman, N. (1979) 'The New Riddle of Induction', chapter 3 in *Fact, Fiction, and Forecast*. Harvard University Press.

[Original discussion of gruesome predicates like 'Hails']

Van Fraassen, B. C. (1989) 'Indifference: The Symmetries of Probability', chapter 12 in his *Laws and Symmetries*; extracted in Eagle.

[Argues that 'the principle of indifference cannot be salvaged so as to yield a foundation for probability judgements'; the origin of the cube factory example.]

Meacham, C. J. G. (2013) 'Impermissive Bayesianism', *Erkenntnis* (S6):1–33.

[Considers various arguments for and against normatively objective Bayesianism; in particular responds to the following papers:]

White, R. (2005). 'Epistemic permissiveness', *Philosophical Perspectives* 19 (1):445–459.

[General arguments against permissive epistemology.]

White, R. (2009). 'Evidential Symmetry and Mushy Credence' In T. Szabo Gendler & J. Hawthorne (eds.), *Oxford Studies in Epistemology*, OUP. pp. 161–186.

[Defends the principle of indifference.]

Principal Principle

Lewis, D. (1980) 'A subjectivist's guide to objective chance', in R. C. Jeffrey (ed.), *Studies in Inductive Logic and Probability*, U. California Press; reprinted in Eagle.

[The seminal account of the Principal Principle.]

Loewer, B. (2001). 'Determinism and chance', *Stud. Hist. Phil. Sci. B* 32(4), 609–620.

[Gives a brief account of Lewis's theory and argues that it can and should be adapted to make chance compatible with determinism.]

Meacham, C. J. G. (2009). 'Two mistakes regarding the principal principle', *British Journal for the Philosophy of Science*, 61(2): 407–431.

[Carefully goes through different possible variations on the principle principal to find the most promising version.]

Wallace, D. (2014). 'The Probability Puzzle', ch. 4 in *The Emergent Multiverse*, OUP.

[Argues that chance can make sense in deterministic branching universes.]