Expressivism about Chance

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Framework for talking about chances

Basic ideology: for each proposition A, there is a real number ch(A): the *timeless chance* of A being true.

Derived ideology:

- the chance of A given background assumptions B = ch(A|B) ≈ ch(AB)/ch(B).
- the *time-dependent indeterministic chance* of A at t = ch(A|complete history up to t).
- the *statistical-mechanical chance* of A at t = ch(A|macrohistory up to t).
- 'A is nomically necessary' ≈ 'ch(A) = 1'

Framework for talking about rational belief

If x is ideally rational, then we can find

- a probability function $\mathbf{C}_x$ (x's *prior credence function*) and
- a function $\mathbf{E}_x$ from times to propositions (x's *evidence function*), such that

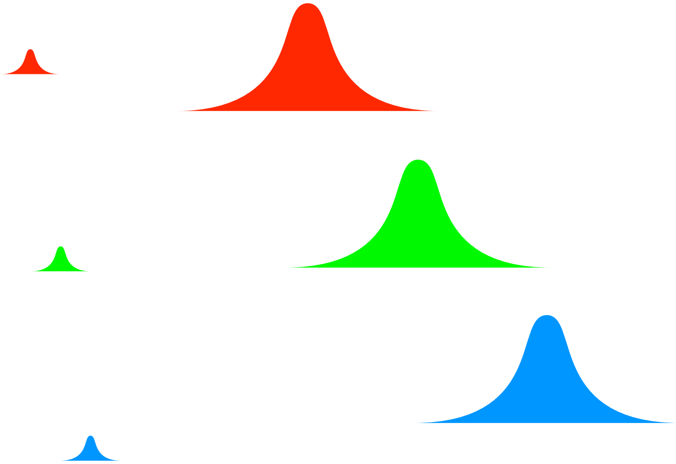
x is disposed, at each time t, to believe each proposition A to degree

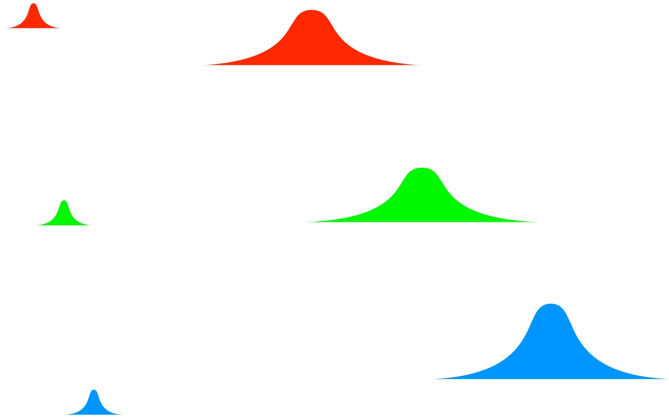
$$\mathbf{C}_x(A|\mathbf{E}_x(t)).$$

The Principal Principle

PP: $\mathbf{C}(A|P = ch) = P(A)$
(if the LHS is defined)

- **C** is any ideally rational prior credence function.
- A is any proposition.
- P is any probability function on propositions.
- 'P = ch' abbreviates '∀B.ch(B) = P(B)'





PP: $\mathbf{C}(A|P = ch) = P(A)$

(if the LHS is defined)

Corollary: $P(P = ch) = \mathbf{C}(P = ch|P = ch) = 1$

if C(P=ch|P=ch) is defined

Bracketing technical worries about infinity, PP is equivalent to the claim that rational priors are weighted averages of *self-assured* probability functions:

$$\mathbf{C} = a_1P_1 + a_2P_2 + a_3P_3 + \ldots$$

where P is "self-assured" iff P(P=ch) = 1

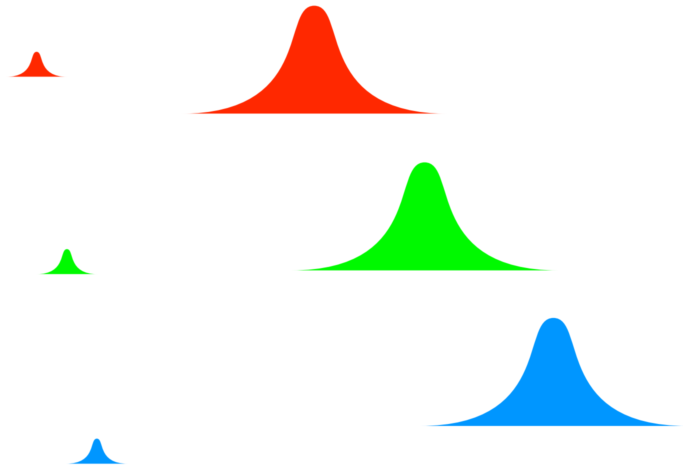
A priori reductionism

Each proposition of the form 'ch(A)=x' is *a priori* equivalent to some proposition about the total history of the world.

The undermining problem

Premise: For some distinct P_1, P_2 and total history H:
(a) $P_1(H)$ and $P_2(H)$ are positive
(b) it would be irrational to be certain *a priori* that $P_1 \neq ch$ or $P_2 \neq ch$.

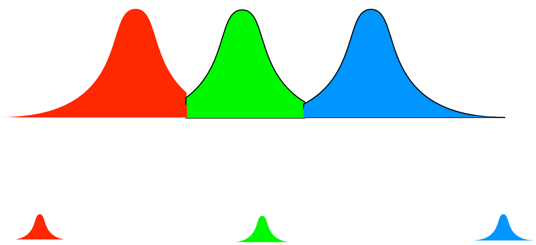
1. $\mathbf{C}(H|P_1{=}ch)$ and $\mathbf{C}(H|P_2{=}ch)$ are positive (by PP).
2. So $\mathbf{C}(H \wedge P_1{=}ch)$ and $\mathbf{C}(H \wedge P_2{=}ch)$ are positive.
3. H *a priori* settles whether $P_1{=}ch$ or $P_2{=}ch$ or neither (by *a priori* reductionism)
4. H *a priori* entails either $P_1 \neq ch$ or $P_2 \neq ch$ (since $P_1{=}ch$ and $P_2{=}ch$ are *a priori* inconsistent).
5. So either $\mathbf{C}(H \wedge P_1{=}ch) = 0$ or $\mathbf{C}(H \wedge P_2{=}ch) = 0$.



The 'New Principle' to the rescue?

~~*PP:* $\mathbf{C}(A|P = ch) = P(A)$ (if the LHS is defined)~~

NP: $\mathbf{C}(A|P = ch) = P(A|P = ch)$ (if the LHS is defined)



Problems for a priori reductionism + NP

1. *Jaggedness.*
   Implausible that ideal prior credence functions make sudden, unsmooth transitions at the boundaries between P_i=ch and P_j=ch.
2. *Forced agreement*
   Implausible that all ideal prior credence functions draw these boundaries in exactly the same places.
3. *Vagueness*
   Surely it's vague where the boundaries are. But if so, NP entails that no prior credence function is *definitely* ideally rational, which is implausible.

A posteriori reductionism to the rescue?

P_1: probability function in which the coin is biased 2-1 towards Heads.

P_2: probability function in which the coin is biased 2-1 towards Tails.

H_1: total history in which the coin lands Heads every time.

H_2: total history in which the coin lands Tails every time.

Surely ideally rational believers can at least know *this* much:

if $H_1 \vee H_2$ is consistent with P_1=ch $\vee$ P_2=ch,

then H_1 entails P_1=ch and H_2 entails P_2=ch.

A problem for reductionists of all stripes: interpreting aliens

- Suppose the Martians follow some weird inductive method. E.g.: for any given coin, they assign bizarrely low credence to the hypothesis that that coin lands heads *exactly* 50% of the time.
- It's tempting to attribute correspondingly bizarre *beliefs about chances* to these Martians—e.g. that the chance that the coin will land heads exactly 50% of the time is low.
- But for the reductionist, such ascriptions are hard to justify! Even if the Martians have a word 'chance' that they use to make these bizarre remarks, we should deny that it means *chance*.

Expressivism to the rescue?

Expressivism about whether P: the psychological state we call "believing [to such-and-such degree] that P" is not, *strictly speaking*, the state of believing any proposition [to any degree].

Machinery for stating expressivist semantics

The semantic value of a sentence is a set of *quasi-worlds*—<world, probability function over sets of worlds> pairs.

Where ϕ is a sentence not about chance and S is the set of worlds where ϕ is true:

$$|\phi| = \{<w,P>|w \in S\}$$

$$|ch(\phi)=x| = \{<w,P>|P(S)=x\}.$$

For arbitrary ϕ:

$$|ch(\phi)=x| = \{<w,P>|P^*(|\phi|)=x\}$$

where P^* is the self-assured extension of P:

$$P^*(S) =_{df} P(\{w|<w,P>\in S\}.$$

The expressivist goal

Explain, in terms of one's attitudes towards *genuine* propositions, what it is to have a given "quasi-credence" in a given set of quasi-worlds.

First steps to the goal

First: explain quasi-credences in terms of *prior* quasi-credences:

- *x*'s quasi-credence in A is *x*'s prior quasi-credence in A, conditional on $\{<w,P>:\mathbf{E}_x \text{ is true at } w>\}$

Second: explain prior quasi-credences in terms of prior credences in genuine propositions.

The simplest possible strategy

Where **C** is one's prior credence function, one's quasi-prior credence function is $\mathbf{C}^*$ (the self-assured extension of **C**).

Problem: one never assigns positive credence to any two inconsistent (quasi)-propositions of the form P=ch.

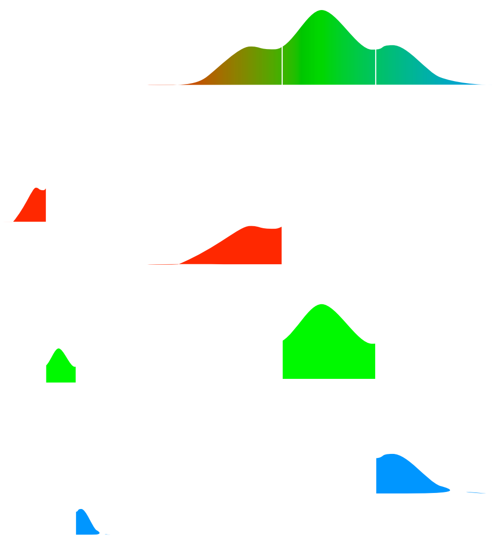
The "objectivisation" strategy (Skyrms, Jeffrey)

Takes as input a special partition $\{H_i\}$.
Where one's prior credence function is **C**, one's quasi-prior credence function is the weighted sum

$\mathbf{C}+ = \mathbf{C}(\cdot|H_1)*\mathbf{C}(H_1) + \mathbf{C}(\cdot|H_2)*\mathbf{C}(H_2) + ...$

Corollary: where ϕ is not about chance,

$\mathbf{C+}(ch(\phi) = x) = \mathbf{C}(\vee\{H_i: \mathbf{C}(\phi|H_i)= x\})$



Objections to the objectivisation strategy:

1. Where do we get $\{H_i\}$?
2. Even if you start with a **C** that is a weighted average of nice simple probability functions, typically **C+** will end up assigning zero credence to the chance function being any of these nice and simple functions.
3. One cannot rationally be uncertain what the chances are conditional on a completely detailed proposition about total history.

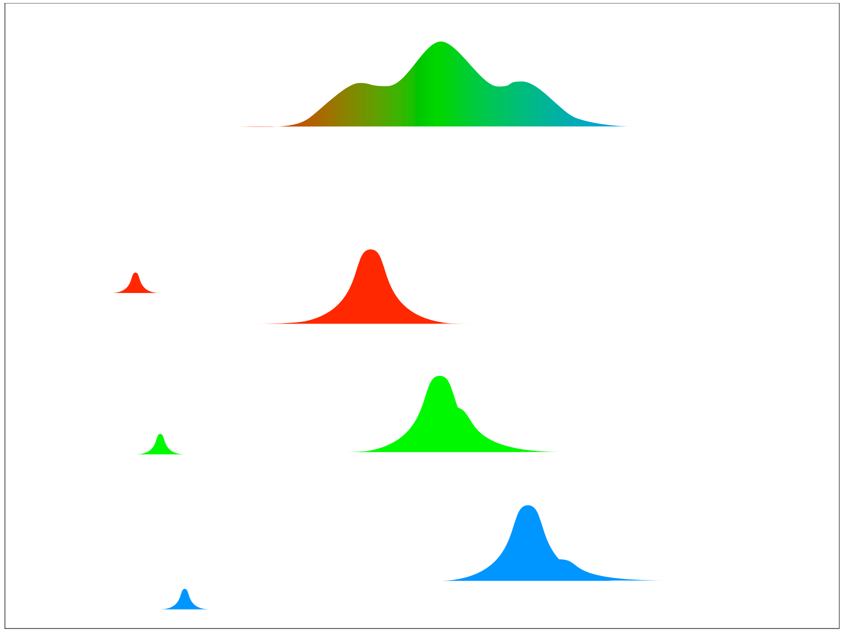
The "best decomposition" strategy

Suppose one's prior credence distribution admits of a best decomposition as a weighted sum of relatively simple probability distributions:

$$a_1P_1 + a_2P_2 + a_3P_3 + ...$$

Then one's prior *quasi*-credence distribution is the weighted sum

$$a_1P_1* + a_2P_2* + a_3P_3* + ...$$



What makes a decomposition 'best'?

- As far possible, give higher weight to simple probability functions.
- Give similar weight to similar probability functions.
- Maybe we should also look at the actual computational processes that underlie assigning the person those prior credences.
- To the extent that there's no unique best way to do it, it'll just be vague what one believes about chance.

How we avoided the Frege-Geach problem

- The semantic machinery applies in the same way to all sentences, including those where 'ch(A)=x' occurs embedded.
- The "best decomposition" strategy allows that even the ideally rational can have high credence in a disjunction of claims about chance without having high credence in any disjunct.

Challenges and Objections

1. What about agents whose degrees of belief aren't probabilistically coherent, or whose inductive dispositions are too unstable to be encoded by a prior credence function?
2. Isn't it possible, even without having incoherent credences, to acquire crazy beliefs about chance by picking them up from other language-users without "full understanding"?
3. Does expressivism about chance require expressivism about lots of other subject matters? Would that be bad? (What if one of the subject matters was belief itself?)