Indicatives, Counterfactuals, Truth, and Probability

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The Ramsey Test

If two people are arguing 'If p, then q?' and are both in doubt as to p, they are adding p hypothetically to their stock of knowledge and arguing on that basis about q; so that in a sense 'If p, q' and 'If p, $\neg$q' are contradictories. We can say that they are fixing their degree of belief in q given p. If p turns out false, these degrees of belief are rendered void. If either party believes not p for certain, the question ceases to mean anything to him except as a question about what follows from certain laws or hypotheses.

The Ramsey Test Rephrased

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- For any individual, the acceptability of a conditional $A \longrightarrow B$ is the degree to which she would accept B on the supposition that A, provided A is epistemically possible for her.

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Conditional probability approach: The acceptability of a conditional is to be defined in terms of conditional probabilities–e.g., as the conditional probability of the consequent given the antecedent.

Truth-conditional approach: The truth value of a conditional is determined by the truth value of the consequent at the closest possible world where the antecedent is true.

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- I'll assume that any given predictive is ambiguous between an indicative reading and a counterfactual reading.

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Transitivity $A \rightarrow B, B \rightarrow C \nvdash A \rightarrow C$

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- $Cr(jack|face) = \frac{Cr(jack \,\&\, face)}{Cr(face)} = 1/3$

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- Note: it's best to say "acceptability" rather than "probability", because we can't assume that conditionals are propositions with probabilities.

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- An informant, whom you suspect is Sherlock Holmes, tells you: "I am certain that this was a murder. *If Brown didn't kill Murdoch, someone else did.*"

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- So you come to believe that *if Brown didn't kill Murdoch, someone else did.*
- But suppose that after hearing the contestant's testimony, you were to conditionalize on the proposition that Brown did not kill Murdoch. You would then believe that Murdoch's death was an accident.

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- When the shipment reached its destination, all broken vases and all plastic vases were discarded.
- Of the discarded vases, 75% were plastic.
- Probably, *if vase x was dropped, it broke*.

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- But learning that the vase was discarded can't possibly affect your conditional credence in the proposition that it broke, given that it was dropped. *All* the dropped vases were discarded.

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Kaufmann's Thesis Where the possible values of X are $X_1, X_2, \ldots X_n$,
The acceptability of $A \rightarrow B$ is $\sum_{i=1}^{n} Cr(B|A \,\&\, X_i) Cr(X_i)$

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  2. Take the average of the results from the first step weighted by the initial probabilities of the background hypotheses.

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  3. Take a weighted average of all the conditional probabilities according to their revised weights.

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- The acceptability of an indicative conditional (or a predictive conditional that's the future tense of an indicative) goes by Adams' Thesis.
- The acceptability of a counterfactual conditional (or a predictive conditional that's the future tense of a counterfactual) goes by Kaufmann's thesis, at least when the antecedent is epistemically possible.

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    "Ah, but if it had been dropped, it probably wouldn't have broken."
- It also gains support from causal decision theory: one uses Kaufmann's Thesis to compute the counterfactual probabilities of outcomes conditional on one's actions (making sure that the salient partition is appropriately causal).

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- You should think of what the world would be like if A, and check whether, if the world were like that, B would be the case.
- In other words, $A \rightarrow B$ is true at a world w just in case at the closest world to w where A is true, B is true ("the closest A world to w is a B world").

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- For indicatives, there's an extra constraint: the closest world to any doxastically (epistemically) possible world must be doxastically (epistemically) possible.
    - This means that the propositions expressed by indicative conditionals are highly context-dependent: change what you know, and you change what "If A, then B" means.

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- We know this won't work in the case of indicatives.

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(Note the quantifier order: we're allowing the meaning of the conditional to be context-dependent.)

Ugly Results

- **Perturbation** For any connective $\rightarrow$, any probability function P, and any propositions A and B such that $P(A \rightarrow B) = P(B|A)$, there is a perturbation of P P' such that $P'(A \rightarrow B) \neq P'(B|A)$.

Ugly Results

- Perturbation
- **Finitude**

If P is nontrivial and assigns probabilities to only finitely many propositions, there is no interpretation of the conditional $\rightarrow$ such that for any two propositions A and B, $P(A \rightarrow B) = P(B|A)$.

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- **No Atoms**

Let a proposition A be a *P-atom* just in case $P(A) > 0$ and for all B, either $P(A \& B) = P(A)$ or $P(A \& B) = 0$. Then if P is nontrivial, $\rightarrow$ is any connective that validates modus ponens, and for any two propositions A and B, $P(A \rightarrow B) = P(B|A)$, then P has no atoms.

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- **Constructibility**

Assume there is a conditional connective that validates modus ponens and entailment within the consequent, and that there are three disjoint propositions A, B, and C each with positive probability. And assume that for any two propositions A and B, $P(A \rightarrow B) = P(B|A)$. Then given any rational number $n \in [0, 1]$, we can construct a sentence ϕ using A, B, C, $\&$, $\neg$, and $\rightarrow$ such that $P(\phi) = n$.

More Ugly Results

- **Local Perturbation** For any connective $\rightarrow$, any probability function P nontrivial with respect to some $X_j \in X$, and any propositions A and B which entail X_j such that $P(A \rightarrow B) = \sum_{i=1}^{n} P(B|A \,\&\, X_i)P(X_i)$, there is a local perturbation of P P' such that $P(A \rightarrow B) = \sum_{i=1}^{n} P(B|A \,\&\, X_i)P(X_i)$.

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If P is nontrivial for some $X_j \in X$ and assigns probabilities to only finitely many propositions, there is no interpretation of the conditional such that for any two propositions A and B, $P(A \rightarrow B) = \sum_{i=1}^{n} P(B|A \,\&\, X_i)P(X_i)$.

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- **Constructibility for Kaufman**

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  - in the most sophisticated case, a probability distribution over a set of possible worlds.

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More generally, we can say that

- Where W_A is the probability distribution you get by imaging W on proposition A, $Acc(A \rightarrow B) = \sum_W Cr(W) W_A(B)$

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- The meaning of $A \rightarrow B$ will be context-dependent.

Adams' Thesis and Kaufmann's Thesis

$$Acc(A \rightarrow B) = \sum_{W} Cr(W) W_A(B)$$

Adams' Thesis

- For indicatives, let $W_A(W') = Cr(W'|A)$
- The meaning of $A \rightarrow B$ will be context-dependent.

Kaufmann's Thesis

- Let X_W be the member of X that holds at W.
- For counterfactuals, we might let $W_A(W') = Cr(W'|A \& X_W)$.
- The meaning of $A \rightarrow B$ will be context-dependent.
- Plausibly, where $\rightarrow$ is a non-backtracking causal conditional and X is an appropriate causal partition, the Principal Principle requires that $Cr(W'|A \& X_W) = P_{X_W}(W'|A)$

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