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The Fall of "Adams' Thesis"?

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Abstract The so-called 'Adams' Thesis' is often understood as the claim that the assertibility of an indicative conditional equals the corresponding conditional probability—schematically:

$$\text{(AT)} \qquad As(A \rightarrow B) = P(B|A), \text{ provided } \quad P(A) \neq 0.$$

The Thesis is taken by many to be a touchstone of any theorizing about indicative conditionals. Yet it is unclear exactly what the Thesis *is*. I suggest some precise statements of it. I then rebut a number of arguments that have been given in its favor. Finally, I offer a new argument against it. I appeal to an old triviality result of mine against 'Stalnaker's Thesis' that the *probability* of a conditional equals the corresponding conditional probability. I showed that for all finite-ranged probability functions, there are strictly more distinct values of conditional probabilities than there are distinct values of probabilities of conditionals, so they cannot all be paired up as Stalnaker's Thesis promises. Conditional probabilities are too fine-grained to coincide with probabilities of conditionals across the board. If the assertibilities of conditionals are to coincide with conditional probabilities across the board, then assertibilities must be finer-grained than probabilities. I contend that this is implausible—it is surely the other way round. I generalize this argument to other interpretations of '*As*', including 'acceptability' and 'assentability'. I find it hard to see how any such figure of merit for conditionals can systematically align with the corresponding conditional probabilities.

Keywords Adams' Thesis · Assertability · Assertibility · Probabilities of conditionals · Conditional probability · Triviality results

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1 Introduction

Conditionals are to philosophers what Rush Limbaugh is to Democrats: an ongoing irritant. In fact, even worse than Limbaugh, they have been irritating philosophers for over 2000 years. Indicative conditionals alone are troublesome enough. The material conditional analysis of them has well known problems; yet possible worlds analyses of them have not found many advocates. Indeed, do indicative conditionals have truth conditions at all? What is their relationship to counterfactuals? Why are some iterations of them natural (right-nestings) while others are unnatural (left-nestings)? Why are some Boolean combinations of them natural (e.g. conjunctions), while others are unnatural (e.g. disjunctions)? What are we to make of 'Sly Pete' pairs of conditionals with the same antecedent and contradictory consequents, both assertable? And what about so-called "biscuit conditionals" ("there are biscuits on the sideboard if you want some"), and "Dutchman conditionals" ("if Palin becomes president then I'm a Dutchman")? It's enough to make a philosopher turn to something easier, like solving the mind-body problem or the problem of free will.

Adams (1965, 1975, 1998) pioneered an important approach to the semantics of indicative conditionals[1] by denying that they have truth conditions, and fitting them into a probabilistic framework for assessing the cogency of arguments. His goal was to supplement the traditional truth-conditional notion of validity of arguments with his notion of "probabilistic validity". Roughly, a probabilistically valid argument is one for which it is impossible for the premises to be probable while the conclusion is improbable.[2] And while Adams was happy to interpret the probability of a conditional-free premise or conclusion as the probability of its truth, he handled conditionals differently. A conditional of the form $A \rightarrow B$ could still be assigned a "probability", but its value was the corresponding conditional probability $P(B|A)$. Adams argued that the resulting scheme respected intuitions about which inferences were reasonable and which not; for example, he neatly avoided the so-called fallacies of the material conditional.

Said this way, his proposal sounds like the so-called *Stalnaker's Thesis* that the probabilities of conditionals are the corresponding conditional probabilities—schematically:

$$\text{(ST)} \qquad P(A \rightarrow B) = P(B|A), \text{ provided } P(A) \neq 0,$$

where as usual $P(B|A)$ is given by the ratio formula $P(A\&B)/P(A)$ (see Stalnaker 1970). However, Adams' "probabilities" of conditionals do not conform to the usual probability calculus of Kolmogorov—hence my caginess in enclosing the word in scare quotes. They do not attach to Boolean combinations of sentences in the usual ways. As he writes in his (1975): "we should regard the inapplicability of probability

[1] Henceforth, when I speak just of "conditionals" (without qualification), I will mean "indicative conditionals".

[2] Less roughly, it is one for which, for all probability functions, the uncertainty of the conclusion is less than or equal to the sum of the uncertainties of the premises. (The uncertainty of X for probability function P is $1 - P(X)$.)

to compounds of conditionals as a fundamental limitation of probability, on a par with the inapplicability of truth to simple conditionals" (35).

In earlier writings, he spoke instead of their "assertabilities". Thus, the so-called 'Adams' Thesis' is often understood as a claim about the assertability of an indicative conditional—schematically:

$$\text{(AT)} \qquad As(A \rightarrow B) = P(B|A), \text{ provided } P(A) \neq 0.$$

Adams' Thesis has assumed such an important status in the conditionals literature that it is taken by many to be a touchstone of any theorizing about indicative conditionals—see e.g. Lewis (1976; 1986), Jackson (1987).

However, I have a number of misgivings about the Thesis—some I will raise only in passing, but one I will develop in some detail. A seemingly happy consequence of Adams' flight from genuine probability assignments to conditionals is that it is immune to various 'triviality results' that eventually beset Stalnaker's Thesis, and that assume more probability theory than Adams will allow. Nonetheless, I will parlay an old triviality result of mine against Stalnaker's Thesis into a new argument against Adams' Thesis, on various understandings of it.

So how should we understand it?

2 What *is* Adams' Thesis?

Despite the centrality of Adams' Thesis in the conditionals literature, it is unclear exactly what it is. Adams (1965) used the term "assertability", so he invited the interpretation of his Thesis that has become prevalent. However, all talk of assertability disappears from his writings by the time of his (1975) book, and it remains absent in his (1998) book, which I take to be the definitive statement of his final views. Instead, we find the Thesis stated once more in terms of "probability", again with the rider that it is not probability à la Kolmogorov, because of the prohibition on Boolean compounds involving conditionals. I would prefer a less firmly entrenched term.[3] Adams informed me (personal communication) that what he had in mind involved reasonableness of belief more than appropriateness of utterance (which the term 'assertability' evokes). Some authors—e.g. Bennett (2003), Leitgeb (MS)—use the term 'acceptability' for this purpose. Or a new term could be minted—perhaps 'assentability'. More on that later.

If truth is inapplicable to simple conditionals, as Adams claims, it seems surprising to me that probability is applicable to them (or acceptability or assentability, for that matter). After all, in all other cases, the probability of a sentence is the probability of the sentence's *truth*: the probability of X is the probability of X *being true*. If X is not truth-apt, then nor is it probability-apt. How are we to understand a locution

[3] To be sure, I don't want to insist on a slavish adherence to Kolmogorov's usage of the term—indeed, I depart from Kolmogorov in my preferred approach to conditional probability as a primitive notion (see my 2003). But this prohibition on Boolean compounds is so severe that I believe it departs too far from familiar theories of probability to deserve the name. See Lewis (1976) for a similar reaction, calling Adams' quantities "probabilities only in name" (303).

like 'X is probable, but it is not probably true'? Indeed, Adams is committed to odd-sounding claims such as: "if A then B is probable, but it is guaranteed that it is *not true*", whenever $P(B|A)$ is high.

Or consider paradigmatic cases of sentences that lack truth values—for example, imperatives and questions. 'Shut up!' is just not the sort of thing that has a truth value; nor is "What time is it?". For that very reason they are just not the sorts of things that one can assign probabilities either. Conditionals, on the Adams view, are an anomalous halfway house between declarative sentences on the one hand, and imperatives and questions on the other. Like declarative sentences, they putatively have probabilities; like imperatives and questions, they putatively do not have truth values. But they are anomalous, unlike declarative sentences, imperatives, questions, and indeed any other kind of sentence, in their putative *combination* of having probabilities *and* lacking truth values.

I submit that to the extent that a sentence is appropriate to be the content of a belief-like attitude (such as a degree of belief), it must have truth conditions, and the attitude concerns those conditions being met. To assign a probability to a sentence that lacks a truth value seems like a category mistake. In that case, it would seem that by Adams' lights, probability should be inapplicable not only to compounds of conditionals as he claims, but also to the conditionals themselves. Obviously this would be disastrous for his program.[4] This gives us further reason not to regard his "probabilities" of conditionals as probabilities at all. Otherwise, we seem to be saddled with two kinds of probabilities: alethic ones (whose bearers have truth values), and non-alethic ones.

On the other hand, it is a little more plausible that sentences that lack truth values can nonetheless be more or less reasonably uttered. "Advance!" might be an appropriate command by a general with a superior battalion to his enemy's, the more so the greater the superiority. Perhaps it is not too much of a stretch to speak of "assertabilities" attaching even to truth valueless sentences: figures of merit measuring their appropriateness of utterance. This may suggest, then, that Adams would have done better to stick with his original proposal of attaching assertabilities to conditionals after all.

However, while the quantity on the left-hand side of (AT) may now be defined, the new problem is that it is implausible that this quantity equals the corresponding conditional probability on the right-hand side. Utterances of conditionals can be inappropriate in ways that will not show up in conditional probabilities—they can be long-winded, uninformative, undiplomatic, and so on, even though the corresponding conditional probabilities may be high. And appropriateness is surely context-sensitive in a way that conditional probability is not. So 'assertability' cannot simply be a matter of appropriateness of utterance if it is to figure in Adams' Thesis.

Be that as it may, the Thesis has taken on a life of its own as one concerning 'assertability', and that's the version that has been endorsed by Lewis (1976) and Jackson (1987)—soon we will see how Jackson gives the term a proprietary sense (and spelling). Moreover, he remarks that "[t]here is a great deal of evidence for [AT], and

[4] Note that by Adams' lights, conditionals are even more anomalous than imperatives from the point of view of orthodox probability theory. For at least imperatives enter into Boolean combinations straightforwardly (e.g. "Shut up or go outside!").

he begins by observing that "[t]here is head-counting evidence. Very many philosophers of otherwise differing opinions have found [AT] highly intuitive" (12). Similarly, Skyrms (1980) writes: "The idea that the assertibility of the indicative conditional of natural language goes by the corresponding conditional probability is so attractive that it has been advanced again and again…" (87–88). And in the much more recent *Stanford Encyclopedia of Philosophy* entry on "Assertion" we find: "Adams (1965, 176–177) proposed that a conditional *if A, then B* is assertible just if the corresponding conditional subjective probability of B given A, $p(B|A)$, is high. This … is widely accepted" (Pagin 2008). While this is weaker than (AT), still the assertability/assertibility of the conditional and the corresponding conditional probability are thought to play center stage. Soon we will look at some of the other evidence for (AT) provided by Jackson; for now, its popularity is reason enough to scrutinize it further, quite apart from its intrinsic interest and potential fecundity.

So what *is* 'assertability'? For (AT) to play such a pivotal role in our theorizing about conditionals, we had better have a good grip on it. Well, do we? There is a somewhat unhappy consequence of switching from the 'probability' of Stalnaker's Thesis to 'assertability': while at least the formal theory of 'probability' is comparatively well-understood, there is apparently no such theory of 'assertability' (although Adams' Thesis itself may be regarded as a good start). And while the interpretation of probability is a fraught issue, we do have some handle on the notion of subjective probability, or credence, that is relevant here.[5] We can appeal to the usual betting interpretation, or better, the representation theorem of some version of expected utility theory, to give us some insight into the notion. (I did not say "an analysis of the notion".) But we have nothing comparable for assertability.

An earlier time-slice of Frank Jackson (1987) probably has defended Adams' Thesis as well as anyone. Jackson distinguishes "assertability" (with an "a"), and "assertibility" (with an "i"), and casts the Thesis in terms of the latter.[6] He explains it thus:

> The aspect of a sentence's usage which tells us something about its meaning are the conditions governing when it is justified or warranted—in the epistemological sense, not in a purely pragmatic one—to assert it, or, as this comes in degrees, to what extent it is justified to assert it in various circumstances. (8)

Assertibility is "the justifiability of what is said" (11), while assertability concerns more the appropriateness of what is said. But notice that Jackson's casting of the Thesis still involves *saying*, rather than merely accepting or assenting.

In his review of Jackson's book, Adams (1990) writes: "while I am the Adams in question, Jackson graciously (and rightly) absolves me from responsibility for his formulations." I find this a little puzzling, since Jackson's formulation sounds rather like Adams' (1965) own formulation: "… reasonable inferences involving conditionals asserted in 'everyday' situations should be analysed in terms of requirements of justification or '*assertability*' …" (172, my emphasis), and in his formal analysis these requirements for indicative conditionals are given by their corresponding conditional

[5] John Collins (1991) also makes this point.

[6] When I quote other authors, of course I will follow their spelling, even though this will mean there will not be consistent spelling of 'assertability'/'assertibility' throughout.

probabilities (“iv)” on p. 185). But I should stress that Jackson believes that conditionals have truth conditions—in fact, those of the material conditional—thus departing significantly from Adams’ account according to which they are truth-valueless.

My qualms above about attaching belief-like attitudes to truth-valueless sentences now return as qualms about attaching assertibilities to them. “Justifiability of what is said” sounds like a measure of how much evidence there is for what is said; but it is unclear how there can be evidence for something that lacks a truth value. If X is not truth-apt, then nor is it apt to enter into evidential relations. How are we to understand a locution like ‘E is evidence for X, but it is not evidence for X’s truth’? It’s evidence for *what* about X, instead? And what sense can we make of “if A then B’ is well supported by evidence, but it is guaranteed that it is *not true*’? As before, perhaps no-truth-value theorists about conditionals would do better to attach assertabilities to them (much as I can make more sense of attaching assertabilities to imperatives than attaching assertibilities to them), although again Adams’ thesis then appears to be implausible. At least my qualms do not apply to Lewis and Jackson, who think that indicative conditionals do have truth conditions.

So let’s understand the ‘*As*’ of (AT) as assertibility in Jackson’s sense. His statement of Adams’ Thesis is exactly (AT), so understood. But (AT) has a number of free variables: *As*, A, B, and P. P of course ranges over probability functions, and presumably *As* ranges over assertibility functions. A and B apparently range over sentences (although this is not obvious, as they could be taken to range over propositions instead). (AT) does not make a genuine statement—these variables await quantifiers to bind them. Again, getting the quantifiers right is surely important for a thesis that is to do so much philosophical work. And the quantification is not obvious, so we could use some help in filling it in. A natural interpretation is that Jackson intends all the quantifiers to be universal, with no further restriction on their domains. (The only restriction that he mentions is “to cases where $P(A) > 0$”, which (AT) already takes care of.) But there be demons.

For starters, presumably Adams’ Thesis concerns *rational* assertibility and probability functions. We should restrict our quantification over *As* and P accordingly. (Stalnaker imposes a similar restriction on his Thesis.) Moreover, the assertibility function must surely be tied to the probability function. If Adams’ Thesis universally quantified over assertibility functions without any regard to the probability function on the right-hand-side, then it would be obviously false—e.g., *your* assertibility for $A \to B$ need not equal *my* $P(B|A)$! We had no such problem with the statement of Stalnaker’s Thesis, since the same probability function appeared on both sides of (ST).

We also have to be careful about which A and Bwe quantify over. If P is a genuine probability function, its domain must be an algebra, whereas if we impose Adams’ prohibition on Boolean compounding of conditionals, the domain of *As* is not an algebra. In that case *As* and P must have different domains. So we cannot blithely let A and B range over all sentences in the domain of *As and* all sentences in the domain of P. We must therefore restrict our quantification over sentences somehow—but how? Again we had no such problem in stating Stalnaker’s Thesis—the same function P appeared on both sides of (ST), so there was no danger of this sort of mismatch between the arguments of the functions on the two sides. While various authors are not careful about stating the restriction on the scope of (AT), Adams offers a clear restriction to *simple* (uniterated) conditionals, ones in which A and B are themselves conditional-free.[7]

With all this ground-clearing behind us, we can now state Adams' Thesis more precisely:

> For each probability function P that could represent a rational agent's credences and associated assertibility function As_P:
>
> (Adams' Thesis) $As_P(A \rightarrow B) = P(B|A)$, for all A and B in the domain of As_P, if $P(A) > 0$ and A and B are conditional-free.

Notice that this involves two functions, As_P itself a function of P. Stalnaker's Thesis was simpler in this regard: both sides of *its* equation of probabilities of conditionals with conditional probabilities involved a single probability function P. As such, Adams' Thesis does not have the immediate appeal that Stalnaker's Thesis does. After all, surely the best reason to believe Stalnaker's Thesis is that all of its instances *sound right.* 'The probability that I fall asleep if I go to a curriculum committee meeting is high' seems to say the same thing as 'the probability that I fall asleep given that I go to a curriculum committee meeting is high'. And so on for all probability assignments to all conditionals. But switching the first 'probability' to 'assertibility' deprives the thesis of this immediate intuitiveness. Moreover, if Adams' Thesis seems intuitively correct to you, ask yourself whether you are instead intuiting the correctness of Stalnaker's Thesis (in which it really is *probability* that figures in the left-hand side of the equation). But *that* intuition should be jettisoned, as the many triviality results against that Thesis show us. (See Hájek and Hall 1994 for a survey.)

3 Why Believe Adams' Thesis?

The 1987 time-slice of Jackson makes the best case for Adams' Thesis of which I am aware. One of his arguments derives from 'Ramsey's test'. Ramsey (1965) suggests that you evaluate the conditional 'if A, then B' as follows: first, hypothetically add A to your system of beliefs, minimally revising what you currently believe in order to do so; second, evaluate B on the basis of your revised body of beliefs. In my notation, $As_P(A \rightarrow B)$ measures how well the conditional performs on Ramsey's test by the lights of your probability function P. But apparently $P(B|A)$ does too. For conditioning on A prima facie seems to capture the notion of 'minimally revising what you currently believe in order to accommodate A'; and your evaluation of B in your new belief state $P(\_|A)$ is just $P(B|A)$.

Another of Jackson's arguments is from "case-by-case evidence":

> Take a conditional which is highly assertible, say, 'If unemployment drops sharply, the unions will be pleased'; it will invariably be one whose consequent is highly probable given the antecedent. And, indeed, the probability that the

[7] We can envisage various intermediate versions, which allow various iterations of conditionals, but not unrestricted iterations. For example McGee (1989) offers a version (stated in terms of probabilities rather than assertibilities) that allows right-nested, but not left-nested conditionals.

> unions will be pleased given unemployment drops sharply is very high. Or take a conditional with 0.5 assertibility, say, 'If I toss this fair coin, it will land heads'; the probability of the coin landing heads given it is tossed is 0.5 also. Or take a conditional with very low assertibility, say, 'If I spend this afternoon trying to solve Fermat's last theorem, I will succeed'; the probability of my solving it given I spend this afternoon on it is correspondingly very low. (12)

Jackson cites as more evidence for Adams' Thesis our attitude to pairs of 'divergent' conditionals: $(A \to B)$ and $(A \to \text{not-}B)$:

> When A is consistent, there is something quite generally wrong with asserting both $(A \to B)$ and $(A \to \text{not-}B)$. We cannot assert in the one breath 'If it rains, the match will be cancelled' and 'If it rains, the match will not be cancelled'. This conforms nicely with [AT]; for, by it, we have $As(A \to B) = 1 - As(A \to \text{not-}B)$, from the fact that $P(B/A) = 1 - P(\text{not-}B/A)$. Thus, the fact that $(A \to B)$ and $(A \to \text{not-}B)$ cannot be highly assertible together when A is consistent is nicely explained by [AT] as a reflection of the fact that $P(B/A)$ and $P(\text{not-}B/A)$ cannot both be high when A is consistent. Indeed, [AT] explains the further fact that $(A \to B)$ and $(A \to \text{not-}B)$ have a kind of 'see-saw' relationship. As the assertibility of one goes up, the assertibility of the other goes down. (12)

Finally, Jackson gives this argument involving conditional assertion:

> There is also evidence for [AT] from the fact that, by and large, an assertion of a conditional is a conditional assertion in the following sense: to assert 'If A, then B' is to commit oneself *ceteris paribus* to asserting B should one learn A…[AT] explains this connection between asserting conditionals and conditional assertions because, by and large, the probability of B given A is high just when learning A makes the probability of B high. (13)

4 Why Not Believe Adams' Thesis?

I have spoken of the earlier (1987) "time-slice" of Jackson who defended Adams' Thesis. That's because, with admirable intellectual honesty, Jackson later goes on to reject the Thesis, and in fact his (2008) time-slice gives some strong arguments against it:

> First, assertibility is more of an "on-off" notion than [AT] allows. It doesn't come in smooth degrees in the way portrayed by [AT]. Second, if the truth of [AT] is to be the touchstone, the notion of assertibility that appears in it needs to be clarified. Assertibility, generally speaking, is the product of many factors, some of which have nothing especially to do with the conditional probability of consequent given antecedent. If [AT] is true, it must be employing a special notion of assertibility. As far as I know, no one has been able to say exactly what this special notion is…Finally, there is the suspicion that one might be able to 'do a Lewis or a Hájek' on [AT]. The trouble they make for [ST] depends on certain

> properties of probability that, for all we know, may be shared by the special notion of assertibility that appears in [AT]. This worry is especially pressing if we haven't got an account of the special notion, or are happy to say (as I wouldn't be) that it is *sui generis*. (462–463)

Let me pick up on the first of these arguments now, and the second and third later on. Adams' Thesis is not a stipulative definition of a new term of art, 'assertibility'. If it were, it would make no sense to argue *either* for it or against it, any more than one can sensibly argue about whether 'the material conditional' picks out a connective with a particular truth table. Rather, Adams' Thesis is supposed to be a substantive claim concerning two notions that we antecedently understood—assertibility and probability. It is not, for example, a claim about some hitherto unfamiliar quantity, 'schmassertibility', which we can stipulate to behave however we like. In particular, we are supposed to understand the idea of assertibilities coming in the various numerical degrees in the [0, 1] interval, as probabilities do. But like the later Jackson, I am not sure that we do—as he observes, assertibility seems to be more of an on/off notion, or I would say at best a qualitative notion, as we will see. For example, if *knowledge* is the norm of assertion, as Williamson (2000) argues, then assertibility may not come in intermediate degrees at all. To be sure, knowledge had better *not* be the norm of assertion for conditionals by the lights of Adams' no-truth-value account. After all, knowledge of X implies X's *truth*. The link between knowledge and truth is even surer than those between probability and truth, and between evidence and truth, which I insisted upon earlier. But again, far from saving his account, I take this to be another strike against it, for conditionals are surely fit to be the contents of factive attitudes, such as knowledge. I know that if Collingwood wins this Saturday, they will win the premiership.[8]

Or even allowing that we can order various conditionals according to their assertibilities, can we really assign these assertibilities *real numbers*? Again, if you intuit that they do, ask yourself whether your intuition is really about *probabilities* instead; and again, we know that *probabilities* of conditionals cannot in general be identified with conditional probabilities.

But let's allow that assertibilities can be assigned real numbers. Let's go through the earlier Jackson's (1987) arguments that these numbers align with corresponding conditional probabilities, for they are interesting and important in their own right.

The argument from the Ramsey test assumes that $As_P(A \rightarrow B)$ measures how well the conditional performs on Ramsey's test by the lights of your probability function P. But does it? At least as plausibly, it is $P(A \rightarrow B)$ that does so. But then we are unhappily led to Stalnaker's Thesis rather than Adams' Thesis.

It is not clear to me that Jackson's subsequent arguments support anything stronger than merely a qualitative version of Adams' Thesis that replaces (AT) with

> (Qualitative AT) $As_P(A \rightarrow B)$ is high/middling/low iff $P(B|A)$ is high/middling/low, for all A and B in the domain of As_P, if $P(A) > 0$ and A and B are conditional-free.

[8] Note added subsequently: they did, and they did! (This was written just after the 2010 Grand Final.)

We may agree that the cases of high assertibility and of low assertibility that he discusses conform to Adams' Thesis, but no more so than they conform to the Qualitative version.

As for the case of the coin landing heads, I wonder whether we have grounds for thinking that the conditional has 0.5 assertibility apart from a prior appeal to Adams' Thesis—so I wonder whether that judgment counts as evidence for Adams' Thesis at all, rather than Adams' Thesis being evidence for it. In fact, I am more inclined to say that the assertibility of the conditional is *very low*. This is surely the case if assertion is governed by a knowledge norm: you clearly do not *know* the conditional to be true. But we need not appeal to this putative norm to make the point. Since I am well aware of the fair coin toss's chanciness, the following conditional seems extremely, perhaps even maximally assertible by my lights: 'If I toss this fair coin, it *might not* land heads'. Yet it seems highly *unassertible* to add in the one breath: 'If I toss this fair coin, it *will* land heads'. But the justifiability of saying this has not changed—the conditions governing how justified or warranted it is in the epistemological sense remain the same. So the assertibility of the latter conditional is presumably very low all along. Note that I am not assuming here that that the 'will' and 'might not' conditionals are incompatible—just that they are not co-assertible. DeRose (2010) is similarly skeptical of the claim that 'if I toss this fair coin, it will land heads' has 0.5 assertibility:

> To the extent that I can just intuit the degree to which the conditional is assertable, I would give it a value *much* lower than 0.5… After all, it is a fair coin. So I have *no idea* which of its two sides it will land on if I toss it. I would have to say that I am in no position to assert either that it will land heads if I toss it, or that it will land tails if I toss it. And it does not seem a close call: neither conditional seems close to being half-way assertable… Indeed, I suspect the only way someone would reach the conclusion that Jackson's conditional has an assertability of 0.5 is if one were already assuming that its assertability was equal to the relevant conditional probability, which we know to be 0.5. (12–13)[9]

Finally, the Qualitative version of Adams' Thesis explains as well as Adams' Thesis does the connection Jackson posits between asserting conditionals and conditional assertions, and the fact that $A \rightarrow B$ and $A \rightarrow \neg B$ cannot both be asserted in the one breath. But the latter datum can be redescribed in a way that is uncongenial to Adams' Thesis, and even to the Qualitative version: for some A and B, *both* of these conditionals are *highly unassertible*. Indeed, I submit that this is exactly the situation in the coin example: both 'If I toss this fair coin, it *will* land heads' and 'If I toss this fair coin, it *will not* land heads' are highly unassertible. After all, conjoining the former with the extremely, and perhaps even maximally assertible 'If I toss this fair coin, it *might not* land heads' yields something highly unassertible. And conjoining the latter with the extremely, and perhaps even maximally assertible 'If I toss this fair coin, it *might* land heads' yields something highly unassertible.

This, in turn, calls into question the putative 'see-saw' relationship that such divergent pairs have. *Contra* (AT), and even *contra* its Qualitative counterpart, I submit

9 Collins (1991) also argues that the conditional is highly unassertible, though in a rather different way.

that divergent pairs of conditionals with overtly chancy consequents both are highly unassertible, at least where the chances are middling.[10]

To be sure, there is a less committal qualitative version of Adams' Thesis that can handle this case. And while some philosophers may not commit themselves to the full strength of (AT), they still find appealing its implication for *assertible* indicative conditionals. For example, Gibbard (1981) speaks of "the central fact about indicative conditionals: that their assertability goes with high conditional credence" (238); similarly Appiah (1984, 174). This suggests the following weakening of (AT) and even of its Qualitative version[11]:

(High Assertibility AT) $As_P(A \to B)$ is high iff $P(B|A)$ is high,
for all A and B in the domain of As_P, if $P(A) > 0$.

Neither 'if I toss this fair coin, it *will* land heads' nor 'if I toss this fair coin, it *will not* land heads' has high assertibility, since neither of the corresponding conditional probabilities is high; they are merely 0.5. My arguments may not scathe this version of the Thesis.[12] But of course Adams' Thesis and even the Qualitative version are stronger, for they also cover conditionals of putatively middling assertibility, which I maintain in fact have low assertibility.

So I believe that the Qualitative version is just as well supported as Adams' Thesis is, and even the Qualitative version's support is questionable. The High Assertibility version is, I believe, the best fallback position. Moreover, the High Assertibility version does not commit us to assertibilities that are as finely grained as Adams' Thesis requires them to be. After all, such sensitive assertibilities appear not to be detectable in linguistic usage. And yet Jackson himself writes: "A theory of indicative conditionals is a theory about a fragment of ordinary language. Accordingly, it is—unlike a theory of electrons or of the mind—*peculiarly* responsive to the linguistic intuitions and practices of ordinary speakers." (8) With this I completely agree—but far from supporting Adams' Thesis, I think that this is a reason to be suspicious of it,

10 The situation is rather like that for middling degrees of belief. When you assign credence 0.5 to the coin landing heads, you definitely *do not believe* that the coin will land heads, and you also definitely *do not believe* that it will not land heads—0.5 credence definitely does not suffice for belief. (Thanks here to Wolfgang Schwarz.) And you are definitely not justified in asserting something that you definitely do not believe.

11 Thanks here to David Etlin and Hannes Leitgeb who independently suggested this to me.

12 Perhaps they do. For example, suppose I know that that the chance of the coin landing heads is 0.99, so that my P(coin lands heads | coin is tossed) = 0.99, which is high. Still, I clearly do not *know* the conditional

$$\text{coin is tossed} \to \text{coin lands heads}$$

to be true. And since I am well aware of the fair coin toss's chanciness, the following conditional still seems extremely, perhaps even maximally assertible by my lights: 'If I toss this fair coin, it *might not* land heads'. Yet it seems highly *unassertible* to add in the one breath: 'If I toss this fair coin, it *will* land heads'. But the justifiability of saying this has not changed—the conditions governing how justified or warranted it is in the epistemological sense remain the same. So the assertibility of the latter conditional is presumably very low all along.

I realize that this argument is more controversial than it was in the case where the chance of heads was middling, and that there are replies available here that were not available there. That said, I still find this argument rather compelling.

for it commits us to a notion of assertibility that apparently outruns our intuitions and practices.

At this point one might agree that the data generated by our linguistic intuitions and practices may only be qualitative, but that we may *represent* them numerically. Think of how decision theory represents preferences that are qualitative with numerical utility and probability functions. Assertibilities, then, may be theoretically fruitful quantities, much as utilities and probabilities are. They may figure, moreover, in the best explanation of the Qualitative version of the Thesis.

I think this is the best prospect for a Jackson-style rendition of Adams' Thesis. However, as it stands it is at best a promissory note: one would like to see proven a *representation theorem* for numerical assertibilities, paralleling the ones that we find in various formulations of decision theory. And perhaps the promissory note promises too much. To drive home this point, I will appeal to an old triviality result of mine against Stalnaker's hypothesis. It will turn out that for Adams' Thesis to be tenable, assertibility will need to be *peculiarly* nuanced. The same is true of acceptability, assentability and other such figures of merit, should we wish to couch the Thesis in those terms. In the words of the later Jackson's final concern, quoted above, I now want to 'do a Hájek' on (AT).

5 Why Disbelieve Adams' Thesis? The 'Wallflower' Argument

Consider a fair 3-ticket lottery, and the Boolean algebra generated by the three sentences 'ticket i wins' for $i = 1, 2, 3$. Let P be the natural function defined on this algebra that assigns probability 1/3 to each of these sentences. It follows that each member of the Boolean algebra has a probability that is a multiple of 1/3. However, various conditional probabilities are not a multiple of 1/3—for example, P(ticket 1 wins | ticket 1 wins or ticket 2 wins) = 1/2. So there are conditional probabilities that find no match among the unconditional probabilities. On the other hand, every unconditional probability trivially has a match among the conditional probabilities: for all X, $P(X) = P(X|T)$, where T is a tautology. So P has more distinct conditional probability values than distinct unconditional probability values.

In my (1989) I showed that this result generalizes: *any* non-trivial finite-ranged probability function has more distinct conditional probability values than distinct unconditional probability values. This means that the function's unconditional probabilities cannot all be matched with its conditional probability values. A fortiori, this means that its unconditional probabilities *of conditionals* cannot all be matched with its conditional probability values (given that probabilities of conditionals are probabilities of their truth). There will always be some conditional probability that finds no match among the unconditional probabilities, and this will be a counterexample to Stalnaker's Thesis: it will be a conditional probability of the form $P(B|A)$ that does not equal $P(A \rightarrow B)$ [or indeed anything of the form '$P(X)$'].

We may picture the situation poignantly as follows. Take any non-trivial probability function P with finite range. Imagine a dance, for which various men and women have entry tokens. Suppose that for each distinct value of $P(\_ \rightarrow \_)$, there is exactly one man with that value written on his token, and that for each distinct value of $P(A \rightarrow B)$, there is exactly one woman with that value written on hers. There are no other men or women at the dance. It is a rule that for any couple that dances, the woman must have the same number on her token as her partner does. (I assume here that each couple consists of a woman and a man.) Stalnaker's Thesis promises that everyone has a partner to dance with. The result shows that this is not so—there is at least one unmatched man who must remain a wallflower. For example, in the dance corresponding to the lottery above, the man with $1/2$ on his token will be a wallflower. (This picture was inspired by a 'Waltz Night' at Princeton's Graduate College, at which wallflowers among the men *abounded*.)

Adams' Thesis implies that if we replace the unconditional probabilities of conditionals with their assertibilities, then there will be no such wallflowers: every conditional probability will find a partner. This in turn implies that the assertibilities of conditionals must be more fine-grained than the unconditional probabilities: there are not enough partners to go round among the unconditional probabilities, but there are among the assertibilities. Previously I questioned whether assertibilities come in intermediate degrees at all. Now we see that Adams' Thesis implies not only that they do so, but that they come in even *more* intermediate degrees than unconditional probabilities do; indeed, that even assertibilities just of *indicative conditionals* come in more intermediate degrees than unconditional probabilities do; indeed, that even assertibilities just of *simple* indicative conditionals come in more intermediate degrees than unconditional probabilities do.

I think that this creates a problem for Adams' Thesis. Take a particular finite-ranged P that represents the credences of a particular rational agent. These credences are associated with a raft of dispositions of the agent: to believe, to revise beliefs, to suppose, to infer, to hope, to regret, to bet, to act more generally, …—and to assert. But offhand, assertibilities are associated with just one such disposition: to assert.[13] How do they get to be richer than credences? Offhand, one would expect them if anything to be more impoverished.

To make the concern vivid, imagine two ideal interpreters whose tasks are, respectively, to assign a *probability* function to you, and to assign an *assertibility* function to you, based on your behavioural dispositions. The former interpreter has a plentiful supply of data: she studies your dispositions to go to the pub on a Friday night, to pay 50 cents for a dollar bet on the coin landing heads, to cheer when Collingwood wins the Grand Final, to assert that Obama is the US president, and so on. The latter interpreter has a sparser set of data: she studies your dispositions to assert that Obama is the US president, and so on. The crucial point is that the set of dispositions on her "and so on" list is a proper subset of those on the former's "and so on" list. Offhand, I would find it surprising if nonetheless the latter interpreter could do a more nuanced job of attributing assertibilities to you than the former could do of attributing probabilities to you.

Now, perhaps this "offhand" picture of assertibilities sells them short. Perhaps they are associated with all these dispositions after all. They may not *fully determine* these dispositions, but then nor do credences, which only do so in tandem with

13 Here I am indebted to discussion with Hannes Leitgeb.

desires/utilities. Still it seems that assertibilities cannot undergird all these dispositions to the extent that credences can. Recall that according to Jackson, assertibility is "the justifiability of what is said". Arguably much of what we believe to varying degrees *cannot be said*, and some of these dispositions depend on such ineffable contents. For example, I cannot articulate the full content of my visual experience at the moment, but arguably I believe it to have the content that it has, and various inferences that I am disposed to make depend on this content. But for anything that can be said, there is an associated credence; in fact, there is even an associated credence for its being assertible.

I realize that this is not a decisive argument. It is meant to convey my puzzlement at the thought that assertibilities could yield such a comparatively rich profile. It's surprising enough that assertibilities can outrun probabilities, in order to keep pace with conditional probabilities. My puzzlement is then exacerbated twice over. All the more, it is surprising that assertibilities *of indicative conditionals* can keep pace; and it is even more surprising that assertibilities of *simple* indicative conditionals can keep pace.

A friend of Adams' Thesis might insist that the way that the assertibilities of simple indicative conditionals can keep pace with conditional probabilities is *by being* conditional probabilities—what's so surprising about that?! To be sure, I cannot rule out there being some quantity—call it "assertibility"—that is stipulated to attach to simple indicative conditionals in just such a way that always equals the corresponding conditional probability. Or call it "schmassertibility". To repeat a point I made earlier, Adams' Thesis is meant to be a substantive claim about conditionals—so substantive that it is thought by many to be a touchstone for all theorizing about conditionals. We are supposed antecedently to have a handle on assertibilities. I think my handle on them is good enough to earn my surprise at the claim that they outrun probabilities. If I'm wrong, I would like to hear more about the rules of the game—and here I am in complete agreement with the later Jackson's second argument, quoted above, that "the notion of assertibility that appears on [AT] needs to be clarified". What constraints are assertibilities supposed to obey, *besides* their agreement for simple indicative conditionals with the corresponding conditional probabilities—a constraint that I hereby stipulate is obeyed by schmassertibilities!—and without them simply collapsing into probabilities everywhere else? To the extent that I am only able to give a somewhat hand-wavy argument—or "offhand" argument—it is largely because I find what we have been told about assertibilities to be itself somewhat hand-wavy. As such, I don't regard Adams' Thesis to be fit to be a touchstone for our theorizing about conditionals.

It's worth noting that there are close relatives of Adams' Thesis that remain entirely unscathed by my argument. For example, a version that replaces the *exact* equality of the Thesis with *approximate* equality may well be tenable for all that the argument shows. (If the dance's rule is relaxed so that for any couple that dances, the woman must have *approximately* the same number on her token as her partner does, then for all my result shows, everyone might still find a partner to dance with[14]—though of course not all at the same time!) The Qualitative and High Assertibility versions that I

[14] Princeton's Waltz Night, by contrast, was beyond saving.

have canvased above have nothing to fear from this argument. In particular, the latter fallback to Adams' Thesis may well suffice to do much of the work of the Thesis in illuminating our intuitions about and patterns of usage of conditionals.

On the other hand, the wallflower argument only has more bite against another close relative of Adams' Thesis, one that replaces the conditional probabilities on the right-hand-side given by the usual ratio formula, with primitive conditional probabilities. I have argued in a number of places (2003, 2007, 2011) that there are various problems with the ratio formula, and that conditional probability should be taken as the primitive notion in probability theory. One line of argument that I have emphasized is that various conditional probabilities may intuitively have well-defined values, while the ratio formula is unable to deliver them—notably when the denominator is 0, or when either or both of the unconditional probabilities in the ratio are undefined. It's as if there are even *more* men at the dance than we originally thought: not just the ones that correspond to values of ratio-conditional probabilities, but also further ones that the ratio formula is unable to deliver. So all the more, conditional probabilities outrun unconditional probabilities. All the more, I would find it surprising if assertibilities of simple indicative conditionals could keep up!

6 Why Disbelieve Various Reformulations of Adams' Thesis? The 'Wallflower' Argument Generalized

Earlier I noted various unclarities in the literature over exactly what Adams' Thesis is, beginning with the quantity on the left-hand side that is sometimes called "probability", and sometimes "assertability". I suggested that it might better be called "acceptability" or "assentability"; Jackson (1998) also mentions "*advisability* of acceptance" (53). These seem more in keeping than "assertability" with Adams' professed intention that his Thesis should govern reasonableness of belief, and as such may have nothing to do with a sentence's usage. My wallflower result has similar consequences for the Thesis understood those ways: it would imply that assentabilities or acceptabilities or advisabilities-of-acceptances of simple indicative conditionals are more fine-grained than unconditional probabilities. Again, I wonder how this is possible—even more so, in fact, since these notions seem more purely cognitive than assertibilities, and thus more akin to unconditional credences. And so I think that my result casts doubt on formulating Adams' Thesis in terms of any of these '*a*'-words. (Indeed, I think it even casts doubt on the Thesis stated in terms of assert**a**bility, and its associated '*a*'-word: *appropriateness* of utterance—but I won't pursue that further here.) Whatever these figures of merit amount to, I doubt that they yield richer profiles than good old unconditional credences.

The later Jackson, we saw, rejects Adams' Thesis. In its place, he proposes a counterpart of it that replaces "assertibility" with "intuitive probability":

Intuitively, $P(\text{If } A \text{ then } C) = P(A\&C)/P(A)$,

or in our symbolism,

Intuitively, $P(A \rightarrow C) = P(C|A)$.

I agree that this equation *is* intuitive, and indeed its intuitiveness—as opposed to its truth—might well be considered a proper touchstone for theorizing about the conditional. Moreover, Jackson goes on to give an ingenious explanation of why we should have this intuition.[15] He reads this equation "as a claim about the intuitive probability of 'If A then C'." Here and elsewhere (1998), Jackson speaks as if there is a function, 'intuitive probability', whose value for the argument 'If A then C' is $P(C|A)$. He writes that "this intuitive probability plays for indicative conditionals the role that (subjective) probability of truth typically plays elsewhere in governing assertion" (1998, 54). Said that way, it sounds like the form of the equation is more like:

$$IP(A \to C) = P(C|A) \qquad (*)$$

where *IP* designates a probability-like function, 'intuitive probability'. I am not sure what quantifiers are meant to govern (*). There are surely *many IP* functions, so the default is that (*) governs *all* of them. And I am not sure what rules govern *IP* functions—for example, how they are supposed to be updated—but it does seem that the triviality results collectively show that *IP* cannot be a probability function. Perhaps we already knew that from various other mistaken intuitions people have about probability—they get the wrong answer in the Monty Hall problem, commit the conjunction fallacy, ignore base rates, and so on. I think that there's a good sense in which the intuition that Stalnaker's Thesis is true is in the same ballpark, although to be sure it is both a more refined intuition, and it is not so easily shown to be a *faulty* intuition.

We know from the wallflower result that if (*) is really correct, then the values of *IP* must outrun those of P. Offhand, I find that a little odd: do we really have probabilistic intuitions that are so finely grained? In fact, this suggests that intuitive probability *cannot* "play the role for indicative conditionals that (subjective) probability of truth typically plays elsewhere", for it is part of that role to be exactly as fine-grained as probability of truth elsewhere. Perhaps more promising would be to settle for approximate equality in (*), or a qualitative version.

7 Conclusion

I have argued that these various putative figures of merit that we might attach to indicative conditionals—assertibility, acceptability, assentability, advisability of acceptance, intuitive probability, or what have you—do not seem to have the plentiful, proliferating, profuse profile that they need to have to sustain versions of Adams' Thesis. But if I am wrong, my wallflower result still places *strict lower bounds* on the profusion of their values: in particular, they out-proliferate unconditional probabilities. This might even be regarded as part of the positive theory of these quantities. In that case, I urge proponents of the Thesis, however it is formulated, to give us more details about what

[15] Roughly, the truth conditions of the indicative conditional $A \to C$ are those of the material conditional $P(A \supset C)$, but $A \to C$ also conventionally signals that $A \supset C$'s probability is robust with respect to the learning of its antecedent: $P(A \supset C|A)$ is nearly as high as $P(A \supset C)$. But $P(A \supset C\,|A) = P(C|\,A)$. For 'if A then C' to be assertible, the probability of its truth needs to be high, so $P(A \supset C)$ needs to be high; but also $P(A \supset C|A)$ needs to be nearly as high, which means that $P(C|A)$ must be nearly as high.

determines these quantities that are its starting point, so that we can understand *why* they have such profuse profiles. Much theorizing about conditionals, which takes some version of the Thesis as *its* starting point, apparently awaits these details.[16]

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