PROBABILITY, TRUTH, AND THE OPENNESS OF THE FUTURE: REPLY TO PRUSS

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ABSTRACT: Alexander Pruss's recent argument against the open future view (OF) is unsound. Contra Pruss, there is no conflict between OF, which holds that there are no true future contingent propositions (FCPs), and the high credence we place in some FCPs. When due attention is paid to the semantics of FCPs, the relation of credence to chance, and the distinction between truth *simpliciter* and truth *at a time*, it becomes clear that what we have good reason for believing is not that some FCPs *are* true, but rather that some FCPs have a good chance of *becoming* true.

INTRODUCTION

In a recent paper,[1] Alexander Pruss poses a formidable challenge to the 'open future' (OF) view. This is the view that the future is alethically open with respect to future contingents. Roughly stated, alethic openness means that there is no complete true story depicting a unique sequence of events as *the* actual future.[2] As for future contingents, these are events that are neither guaranteed to occur nor precluded from occurring by anything that has yet happened. Thus, if the chance of a sea battle's occurring tomorrow is currently neither zero nor one, then it is a future contingent and, according to OF, neither 'There will be a sea battle tomorrow' nor 'There will not be a sea battle tomorrow' is now true.[3] Pruss argues against OF that it conflicts with the high credence we accord to some 'future contingent propositions' (FCPs). Stripped to its essentials, his argument's core is this:

(1) According to OF, no FCPs are true.

(2) We have excellent reasons for believing that some FCPs are true.

Therefore,

(3) We have excellent reasons for believing that OF is false.

If sound, this argument is devastating against OF and, as Pruss notes, amounts to a dialectical setback for open theists, many of whom would like to affirm OF in order to avoid the awkwardness of admitting truths that an omniscient God can't know.

In defense of OF, I will argue that (2) is false. We have no good reason for believing that any FCPs are true. Rather, what we have good reason for believing is that some FCPs have a high chance of *becoming* true—something OF proponents can happily admit. After setting out a more adequate account of FCPs than Pruss provides, I develop my positive case that (2) is false. Following that, I examine a more technical version of Pruss's argument and diagnose what I take to be its chief error.

FUTURE CONTINGENT PROPOSITIONS

Pruss characterizes a 'future contingent proposition' (FCP) as a proposition "not entailed by the past and present states of the world" and affirming "what will be the case." This is not apt. For one thing, it allows future-tensed necessary falsehoods (e.g., *that 2+2 will equal 5*) to qualify as FCPs, when surely they aren't. To block this we should say that neither FCPs *nor their denials* are entailed by past and present states of the world (or, better, by complete, true descriptions of past and present states of the world). Pruss's characterization also misleadingly suggests that FCPs affirm what will *actually* be the case. But that would make FCPs true by definition, begging the question against OF. It would have been better to say that FCPs affirm of a possible event that it will be the case.

At any rate, a more exact definition of FCPs is needed. Here is my proposal. First, a 'future contingent' relative to time *t* is any event E whose single-case objective probability or chance of occurring given the history of the world up to and including *t* is neither zero nor one. In those terms, a 'future contingent proposition' (FCP) relative to time *t* is a proposition which (i) implies of a future contingent relative to *t* that it either does or does not occur subsequently to *t*, and (ii) does not imply that its chance of occurring as of *t* is either zero or one.[4]

I say ‘does’ and ‘does not’ in condition (i) rather than ‘will’ and ‘will not’ because the latter expressions mask an important ambiguity. Consider

(4) “S will not win the lottery”

where ‘S’ names a typical person and ‘win the lottery’ means winning the jackpot in the next drawing of a large state lottery. Assuming that the lottery setup is indeterministic, there is now a non-zero chance of S’s winning and a non-zero chance of S’s not winning. It might seem clear under these conditions that (4) expresses an FCP. But that would be hasty. The future tense marker ‘will’ has both a modal and an amodal usage. In its modal usage, to say without qualification that an event will occur connotes, minimally, that it has a high chance of occurring. It implies, in other words, that the present state of the world is tending strongly toward that event’s occurring. In its modal usage ‘will’ is thus elliptical for something like ‘will probably’ (chance > .5) or ‘will definitely’ (chance = 1). For example, a mother might warn her child, “If you play with matches, you will get burned,” meaning that the chance of getting burned is fairly high (but not one). Or an astronomer might predict, “No doubt about it, there will be a solar eclipse tomorrow,” intending to convey the inevitability of the event. In contrast, in its amodal usage, to say that an event will occur connotes only that it *does* occur *subsequently* (i.e., later than some contextually specified ‘present’). In this usage, ‘will’ implies nothing about the chance of the event, other than that it is non-zero. Colloquially, the amodal usage appears mostly in retrospective or conative contexts. Thus, a historical narrative might say, “Unfortunately for Saddam, he will not long enjoy his conquest of Kuwait.” There is a mere pretense of inevitability here, reflecting our *ex post facto* knowledge of how the story ends. Similarly, someone might say, “I hope she will accept my proposal,” where the hope is for a particular outcome, regardless of its chance.

In light of the modal/amodal distinction, there are at least three possible readings of (4):

(4a) S will definitely (chance = 1) not win the lottery. (modal)

(4b) S will probably (chance > .5) not win the lottery. (modal)

(4c) S subsequently fails to win the lottery. (amodal)

Given that S's winning the lottery is a future contingent, only the last of these, (4c), expresses an FCP. (4a) doesn't because it implies that the chance of S's winning is zero, thereby violating condition (ii) in the definition above. And (4b) is disqualified because it implies neither that S does nor that S does not win the lottery, thereby violating condition (i). Only (4c) satisfies both conditions. In general, then, FCPs should be expressed in amodal (does / does not) terms in order to avoid possible conflation with non-FCP expressions like (4a) and (4b).

It should also be clear that neither (4a) nor (4b) pose any problems for OF. Its proponents can happily admit, as they almost certainly should, that (4a) is false, that (4b) is true, and that we have good reason for believing them to have those truth values. If there's a problem for OF, then it has to come from the likes of (4c). Given that S's winning is a future contingent, the question to address is whether we have good reason for believing that (4c) is true. If so, then (2) is true, and Pruss's anti-OF argument succeeds. Otherwise, (2) is false, and the argument fails.

ARE SOME FCPs TRUE?

OF says there are no true FCPs. None of them are true *now*. None of them are true *simpliciter*. Pruss aims to refute OF by identifying an FCP that we have good reason for believing to be true. (4c) seems like a prime example. Against Pruss, I maintain that we have no good reason for believing that (4c) is true. We do, however, have excellent reason for believing that (4c) has a good chance of *becoming* true.

First, what is truth *simpliciter* and how does it relate to truth *at a time*? To say that a proposition is true *simpliciter* means that it is true from an absolute vantage point, one which includes all and only what obtains. *That Columbus sailed the ocean blue* is, I take it, true *simpliciter*. It is also true at the present time and true at the actual world.[5] But there are worlds and there have been times at which that proposition is not true. To say that a proposition is true at a world is to say that it would be true *simpliciter* if that world were actual. To say that a proposition is true at a time is to say that it would be true *simpliciter* if that time were present. More generally, to say that a proposition is true at an index is to say that it would be true

simpliciter if all states of affairs associated with that index obtained. In essence, truth at an index is what would be true *simpliciter* from the vantage point of a *locally* omniscient being, one whose perspective was centered at that index and restricted to whatever is accessible from it.[6]

Now, I claim that we have no good reason to believe that (4c) is true, either now or *simpliciter*. Naturally, I offer an epistemological argument. (4c) says that S subsequently fails to win the lottery. What evidence could justify belief in (4c)? Since we don't have a crystal ball by which to inspect the future, justification for (4c) has to come by extrapolation from the past and present. We thus have to take past history to provide a *reliable* basis for extrapolation, hence a basis pervaded by regularities governing the possibilities for future development. In short, to be justified in believing (4c) we have to believe that the world is presently tending, more strongly than not, in the direction of S's not winning. We have to believe, in other words, that the current chance of S's not winning is greater than one-half. Evidence for (4c) therefore has to come via inference from something like (4a) or (4b). How is that inference supposed to go? It may seem that we could *deduce* (4c) from (4a). But that's not right. (4a) says it is inevitable (chance = 1) that S fails to win. Suppose (4a) is true. It doesn't *follow* that (4c) is true. What follows, rather, is that (4c) will definitely be true in the future.[7] And, of course, once the lottery drawing has taken place and S has failed to win, *then* (4c) will be true. What holds for (4a) holds *a fortiori* for (4b). (4b) says there is a high probability (chance > .5) that S fails to win. It doesn't follow from (4b) that (4c) is true, or even probably true. What follows, rather, is that (4c) will probably be true in the future. Generalizing yields the result that reasons to believe an FCP are not reasons to believe that it is true, but only reasons to believe that it has a good chance of being true in the future.

This conclusion may be supported by reflecting on how credences relate to chances. They differ in that credences depend on a subject's state of information at a time, whereas chances depend on the causal disposition of the world at a time. But they are similar in that both are primarily future-oriented. The chance that an event *has occurred* is either zero or one. After all, there are only two possibilities—either it has occurred or it hasn't. Likewise, if *p* is entailed by

S's background knowledge, *k*, then S's credence that *p* should be one, and his credence that ~*p* zero.[8] Again, there are only two possibilities—either *k* entails *p* or it doesn't. Chances and credences take intermediate values only when applied to what is *not yet* known for certain either to be or to have been the case. Since we are rarely in such a nice epistemic position, chances and credences are typically forward-looking, toward epistemically possible futures. Indeed, credences are standardly understood as 'betting quotients', as measures of the strength of a person's disposition to act as if a proposition *will be* or *will have been* true. Thus, the forecast has just informed me that there is a 30% chance of rain tomorrow. Since I have no other relevant information, my credence is 30% that *p* (= 'It rains') *will be* true tomorrow (at *t**). Equivalently, my credence is 30% that *p-at-t** (= 'It rains tomorrow'). Or suppose I know the Derby was held yesterday (at *t**) but don't yet know the results. According to my latest relevant information, prior to the race Eclipse was estimated to have a 30% chance of winning. Based on that information, my credence is 30% that *p* (= 'Eclipse wins') *will have been* true at *t**. Equivalently, my credence is 30% that *p-at-t** (= 'Eclipse wins yesterday'). In each case, my credence is based on my most recent estimate of the chance that *p-at-t**.

Let us state the credence–chance connection more exactly.

Let $CR_{S,t}(p)$ stand for S's credence at *t* that *p*.

Let $CH_{S,t}(p)$ stand for S's best estimate as of *t* of the chance that *p*.

Let T_t stand for the predicate '_ is true at *t*'.

Let *p* be a *simple event description* (e.g., 'E occurs'), one in which the main verb has no temporal qualifications, explicit or implicit.

Let p_t stand for a *temporally qualified event description* (e.g., 'E occurs at *t*').

Let *t* denote the contextually specified present time.

Let *t** denote the time at which the event described by *p* putatively occurs.

In these terms, credence and chance should relate as follows (on pain of irrationality):

(5) $CR_{S,t}(p_{t^*}) = CH_{S,t}(p_{t^*})$

(5) says that S's credence that E occurs at *t** should equal S's estimate of the chance that E occurs at *t**. Equivalently, we can use the truth predicate to strip the temporal index off of p_{t^*}, thereby replacing the temporally qualified event description, p_{t^*}, with the corresponding simple event description, *p*.

(6) $CR_{S,t}(T_{t^*}p) = CH_{S,t}(T_{t^*}p)$

In other words, S's credence that 'E occurs' is true at *t** should equal S's estimate of the chance that 'E occurs' is true at *t**.[9]

It is important to note that (4c) is a temporally qualified event description. It represents the simple event *S's failing to win* as occurring *subsequently*. Hence, our credence in (4c) should match our estimate of the chance that its simple event kernel, 'S fails to win', will be true. To generalize, let's represent (4c) as p_{t^*} and its simple event kernel as *p*. Equivalence between (5) and (6) yields the principle that $T_{t^*}p \leftrightarrow p_{t^*}$ (i.e., *p* is true at *t** iff *p*-at-*t**). Since all FCPs are temporally qualified event descriptions, this means that reasons for believing an FCP (p_{t^*}) are reasons for believing that its simple event kernel (*p*) *will be* true at *t**. Apart from further, question-begging assumptions, they are not reasons for believing that p_{t^*} is true, now or *simpliciter*.

What's more, not only is there no reason for believing that (4c) is true, but there is reason for believing that it isn't true. Simply combine the fact that a proposition is true at a time if and only if it would be true *simpliciter* were that time present with a plausible truthmaker principle: What is true *simpliciter* is true in virtue of what obtains *simpliciter*.[10] Given that S's winning is a future contingent, what obtains at present does not suffice to make (4c) true because there are causally possible futures in which S wins and causally possible futures in which S does not. But then it is not the case that (4c) *would* be true *simpliciter* given only what presently obtains. Hence, it is not the case that (4c) is true *now*. And if it's not true now, then it seems plausible to think that it just isn't true.

Perhaps it will be countered that (4c) is nevertheless true *simpliciter*. If what obtains *simpliciter* is the actual world ('alpha'), and if possible worlds (including alpha) necessarily

include a complete history—a complete past, present, *and future*—then, since we have good reason for believing that (4c) *will be* true, we have good reason for believing that alpha includes (4c) and thus that (4c) is true *simpliciter*. While clever, this line of reasoning begs the question against OF. No OF proponent will concede *both* that possible worlds must include a complete history *and* that some such world obtains. Some, like Tuggy, concede that possible worlds necessarily include a complete history, but insist that no possible world, not even alpha, obtains.[11] Others, like myself, grant that some possible world obtains, but deny that possible worlds must include a complete history. On this view, *which* possible world is actual changes over time.

In sum, I've argued that we have no good reason for believing that (4c) is true, either *now* or *simpliciter*. Moreover, we have plausible grounds for saying that (4c) isn't true. It follows that (2) is false and that Pruss's argument fails. His actual argument, however, is more sophisticated than my (1)–(3) suggests. So, in closing, it may help to step through the more rigorous version of his argument and pinpoint where the chief mistake occurs.

PRUSS'S MISTAKE

I now state Pruss's argument more formally, beginning with his fourth premise. (His first three premises serve as inference rules later in the argument, so they'll come up in due course.) The argument begins with the claim that there is an FPC, which I'll continue to represent with (4c), that we now have good reason for believing:

(7) $CR_{us,now}$(4c) is close to one.

The OF proponent will accept this *provided* it is understood that our credence in (4c) is not our credence that (4c) is true, but rather our credence that its simple event kernel, 'S fails to win the lottery', will be true.

Pruss then notes a straightforward implication of OF:

(8) OF $\rightarrow$ ~T(4c).

Here T(4c) should be read as the claim that (4c) is either true *now* or true *simpliciter*, i.e., OF → ~(T_{now}(4c) ∨ T_{simp}(4c)). Note, (7) and (8), understood as stipulated, are compatible. Denying that (4c) is true now or *simpliciter* is consistent with believing that either it or its kernel will be true.

Next, from (8) and supplementary principles (a) 'if $p \rightarrow q$, then $CR_{S,t}(p) \leq CR_{S,t}(q)$' and (b) '$CR_{S,t}(\sim p) = 1 - CR_{S,t}(p)$' Pruss derives:

(9) $CR_{us,now}(OF) = 1 - CR_{us,now}(T(4c))$.

This is too quick, however, for principle (a) is false.[12] From the mere fact that $p \rightarrow q$, nothing follows regarding what S's *credences* in p and q should be unless S *believes* $p \rightarrow q$. Fortunately, this isn't a serious problem for the argument. There is a workaround. Simply replace (a) with (a*) 'if $B_{S,t}(p \rightarrow q)$, then $CR_{S,t}(p) \leq CR_{S,t}(q)$', reading this as 'if S *believes* at t that $p \rightarrow q$, then …', and add the assumption that (8) is *believed*. Let's pass on (9).

Next, Pruss employs the principle that $p \rightarrow Tp$ to derive

(10) (4c)→T(4c).

This is the crucial step. If this be granted, the rest goes through with only minor adjustments. Thus, from (10), (a*), and the assumption that $p \rightarrow Tp$ is *believed*, it follows that

(11) $CR_{us,now}(4c) \leq CR_{us,now}(T(4c))$.

From (9) and (11) it follows that

(12) $CR_{us,now}(OF) \leq 1 - CR_{us,now}(4c)$.

And, finally, from (7) and (12) it follows that

(13) $CR_{us,now}(OF)$ is close to zero.

As I've already hinted, however, the problem with this argument is the derivation of (10) from $p \rightarrow Tp$. The latter is valid when p is a simple event description—that E occurs suffices for its being true now or *simpliciter* that E occurs—but not when p is a temporally qualified event description, which is what the argument requires. What the argument needs, in other words, is the

assumption that $p_{t^*} \rightarrow (T_{now}p_{t^*} \vee T_{simp}p_{t^*})$. But given OF this is simply not the case. E's occurring at *t** suffices for its being true *then* (at *t**) that E occurs at *t**, but not for its being true now or *simpliciter* that E occurs at *t**. Indeed, if 'E occurs at *t**' is an FCP, the OF proponent is committed to denying that it is true now or *simpliciter*, regardless of whether E subsequently occurs at *t**. In short, then, Pruss's argument begs the question.

But isn't $p \rightarrow Tp$ sufficiently *obvious* that denying it should count heavily against OF? No. Its apparent plausibility derives, I believe, from either conflating the distinction between simple and temporally qualified event descriptions or by confusing it with the closely related and undeniably correct principle that if *p* holds at an index, then it is true *at that index* that *p* (i.e., $p_i \rightarrow T_ip$). In fact, $p \rightarrow Tp$ should be far from obvious. It is not, for example, a trivial claim that if E occurs at world *w* then it is true now or *simpliciter* (i.e., at alpha) that E occurs at *w*. Given S5 that would follow, but it is controversial whether S5 gives the right account of metaphysical modality. Moreover, there are substitution instances for which $p \rightarrow Tp$ is arguably false. Consider (4c) → T(4c). This says that if S subsequently fails to win, then it is true now or *simpliciter* that S subsequently fails to win. But how can S's subsequent failure to win obtain *now*, prior to the lottery drawing? And how can it obtain *simpliciter* unless a controversial eternalist theory of time is correct? On one reading of 'S subsequently fails to win', 'fails' has narrow scope and the proposition represents S's subsequent participation in a lottery drawing which takes place without S's winning. But then the proposition isn't true *simpliciter* unless that subsequent event obtains *simpliciter*, which seems to require eternalism. On another reading, 'fails' has wide scope ('It fails to be the case that S subsequently wins the lottery'), in which case the proposition is certainly true both now and *simpliciter*, but not in virtue of future events. Indeed, it would have been true even if nothing had ever been created. Thus, on the wide scope reading not only is (4c) not an FCP, but (7) is false. So either (4c) → T(4c) is true in a way that undermines the argument elsewhere, or it commits one to a controversial metaphysical position that begs the question against OF, or it is simply false. In general, then, $p \rightarrow Tp$ is not a metaphysically innocuous principle, and OF

proponents should not feel at all embarrassed about denying it. Needless to say, without that principle, no Pruss-style argument against OF can succeed.[13]

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NOTES

[1] Alexander Pruss, "Probability and the Open Future View," *Faith and Philosophy* (forthcoming).

[2] More exactly, the future is *alethically open* at time *t* if and only if for some state of affairs X and some future time *t** (i) neither 'X will obtain at *t**' nor 'X will not obtain at *t**' is true at *t* and (ii) neither 'X does obtain at *t**' nor 'X does not obtain at *t**' is true *simpliciter*.

[3] Perhaps both are false, or perhaps both are neither true nor false. I take no stance on that issue here. Elsewhere I defend the first option. See Alan R. Rhoda, Gregory A. Boyd, and Thomas G. Belt, "Open Theism, Omniscience, and the Nature of the Future," *Faith and Philosophy* 23 (2006): 432–459. Dale Tuggy defends the second option in "Three Roads to Open Theism," *Faith and Philosophy* 24 (2007): 28–51.

[4] It follows that *being an FCP* is not an intrinsic property of a proposition. A proposition qualifies as an FCP only so long as it represents a future contingent as part of a supposedly determinate actual future. Once the event it represents ceases to be future or its chance of occurring becomes either zero or one, the proposition in question ceases to be an FCP.

[5] In the present context it cannot be assumed that the actual world includes a complete future history. If OF is correct, future contingency precludes *any* complete future history from obtaining. Actuality should thus be understood here in a time-relative sense: *actual as of t*.

[6] What is accessible from an index depends on the relevant modal system. According to S5, all possible worlds are accessible to each other. Hence, given any pair of worlds, *w* and *w**, if *p* is true at *w*, then it is true at *w** that *p* is true at *w*. On other modal systems, it may turn out that only a proper subset of possible worlds is accessible from any given world.

[7] In supervaluational terms, (4a) entails that (4c) is *supertrue*, i.e., that (4c) will be true at some point on all possible future developments. Being supertrue, however, does not entail being true.

[8] Using CR() for the credence function, CR($p \mid k$) = CR(p & k) / CR(k). If k entails p, then CR(p & k) = CR(k). Hence, CR($p \mid k$) = 1.

[9] Compare with David Lewis's 'Principal Principle'. See his "A Subjectivist's Guide to Objective Chance," in his *Philosophical Papers*, volume II (Oxford: Oxford Univ. Press, 1986).

[10] Restrict this, if you want, to logically contingent truths. It won't affect the argument.

[11] As does Tuggy in "Three Roads to Open Theism."

[12] The analogous principle, 'if $p \rightarrow q$ then CH(p) ≤ CH(q)' does apply to chances.

[13] I thank Dale Tuggy and Tom Belt for helpful comments on earlier versions of this paper.