Probability, Truth, and the Openness of the Future: A Reply to Pruss

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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, to the relation of epistemic to objective probabilities, and to 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 has posed 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 possible 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 according to OF neither 'There will be a sea battle tomorrow' nor 'There will not be a sea battle tomorrow' is true either *now* or *simpliciter*.[3] Against this, Pruss argues that OF conflicts with the high epistemic probability or credence we sometimes accord to 'future contingent propositions' (FCPs). Stripped of its technical trappings, the core of his argument is this:

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[1]Alexander Pruss, "Probability and the Open Future View," *Faith and Philosophy* 27.2 (this issue).

[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 of their tense-neutral analogues, 'X does obtain at t^*' and '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), pp. 432–459. For a defense of the second option, see Dale Tuggy, "Three Roads to Open Theism," *Faith and Philosophy* 24 (2007), pp. 28–51.

(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, 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 his 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, Pruss should have said 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). A further problem is that his account misleadingly suggests that FCPs affirm what will *actually* be the case. But that reading makes FCPs true by definition, thereby begging the question against OF. What Pruss should have said is that FCPs affirm of a *possible* event that it will be the case.

Anyway, rather than simply patching Pruss's characterization of FCPs, I want to develop an alternative, one that more explicitly reflects the thinking of OF proponents like myself, whose views Pruss is targeting. I begin by defining a 'future contingent' relative to time t as an event E whose single-case objective probability (i.e., propensity or 'chance') given the history of the world up to and including t is neither zero nor one. Next, I define a 'future contingent proposition' (FCP) relative to time t as a proposition which (i) implies of a future contingent relative to t that it either does or does not occur subsequent to t, and (ii) does not imply that its chance of occurring is either zero or one.[4]

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[4]Note 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.

My reason for saying 'does' and 'does not' in condition (i) rather than 'will' and 'will not' is because the latter expressions mask an important ambiguity. Consider the sentence:

(4)   "S will not win the lottery"

where 'S' names a typical person and where 'winning the lottery' means winning the jackpot in the next drawing of a large state lottery. Assume 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. Under those conditions it might seem obvious that (4) expresses an FCP. But not so fast. 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. 'Will,' in its modal usage, 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 emphatically predict, "There *will* be a solar eclipse on this date," 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 indexed '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 primarily in retrospective or conative contexts. Thus, a historical narrative might say, "Unfortunately for Saddam, he will not long enjoy his conquest of Kuwait." The pretense of inevitability here reflects 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 certain future 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.

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

(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 be clear that neither (4a) nor (4b) pose any problems for OF. The OF proponent can happily admit, as he 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 (4c) and its ilk. 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 his 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. Given that S's winning the lottery is a future contingent, (4c) seems like a prime example. Against Pruss, I maintain that we have no good reason for believing that (4c) *is* true, even though we have excellent reason for believing it 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 that obtains 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 might have been 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 is 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*. 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 justify (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*

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

[6]By 'accessible' I mean *alethically* accessible. For example, according to the modal system S5, all worlds are accessible to each other. 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, however, what's true at *w* about other worlds is limited to the proper subset of worlds which are accessible from *w*.

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). But how is that inference supposed to go? It may seem that we can *deduce* (4c) from (4a), but that's not right. (4a) says it is inevitable (chance = 1) that S fails to win. Suppose that is true. Still, it doesn't *follow* that (4c) *is* true. What follows, rather, is that (4c) *will be* true.[7] 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 that (4c) is true, or even probably true. What follows is that (4c) has a good chance of being true *in the future*. In sum, what reasons we have to believe (4c) are not reasons to believe it *is* true, but at most reasons to believe it *will be* true, which is compatible with the OF-friendly idea that (4c) will (probably) *become* true.

This conclusion can be supported by reflecting on how epistemic probabilities (or 'credences') relate to chances. The two 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. Intermediate values are excluded because 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, intermediate values are ruled out—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 to be or to have been the case. Since we are rarely in such a nice epistemic position, most applications of chances and credences are forward-looking, toward epistemically possible futures. Indeed, S's credence in p at time t is standardly understood as a measure of the strength of S's disposition to act as if *p will be* or *will have been* true. For example, the forecast has just informed me that there is now (at t) a 30% chance of rain tomorrow. As a result, my credence at t is 30% that it *will be* true tomorrow (at t^*) that p (= 'It rains'). Equivalently, I have a credence at t of 30% that *p-at-t** or p_{t^*} (= 'It will rain tomorrow'). Or suppose I know the Derby was held yesterday (at t^*) but I don't yet (at t) know the results. Suppose further that as of the day before yesterday (t^{**}), the time of my latest relevant information update, Eclipse was projected to have a 30% chance of winning. Based on my information as of t^{**}, I have a credence at t of 30% that it *will have been* true at t^* that p (= 'Eclipse wins'). Equivalenly, I have a credence at t of 30% that p_{t^*} (= 'Eclipse won yesterday'). In each case, my credence at t is based on my most recent estimate of the chance that *p-at-t**.[9] More formally,

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[7]It also follows from (4a) that (4c) is *supertrue*. But, again, that only shows that it *will be* true on all possible future developments, not that it *is* 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]This accords 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).

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

Let $CH_t(p)$ stand for the chance as of t that p.

Let $Est_{S,t}(n)$ stand for S's best estimate as of t of a value, n.

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 is devoid of temporal qualifications.

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

Let t denote the contextually specified present moment.

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

Let t^{**} denote the putative time of S's latest information relevant to whether the event described by p occurs at t^*.

In these terms, credence and chance relate as follows:

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

Or, equivalently, using the truth predicate to strip the temporal index off p_{t^*}, we get:

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

The key point is that (4c) is, like p_{t^*}, a temporally qualified event description. It represents the simple event *S's failing to win* as occurring *subsequently*. Our credence at t in (4c) therefore depends on our most recent estimate that S subsequently fails to win. By the truism that $T_{t^*}p \leftrightarrow p_{t^*}$ (p is true at t^* iff p holds at t^*), this means that our reasons for believing (4c) are reasons for believing that it *will be* true (at t^*) that S fails to win. They are not reasons for believing that it *is* true (at t) that S subsequently fails to win.

What's more, there is reason for *denying* that (4c) is true *now*. Recall that a proposition is true at a time if and only if it would be true *simpliciter* if that time were present. Combine this with a plausible truthmaker principle: What is true *simpliciter* is true in virtue of what obtains *simpliciter*.[10] Now, given that S's winning is a future contingent, what obtains at present does not suffice to make (4c) true because there are, as of now, 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 what presently obtains. Hence, it is not the case that (4c) is true *now*.

Perhaps it will be countered that (4c) is probably true *simpliciter*. If what obtains *simpliciter* is the actual world ('alpha'), and if possible worlds (including alpha) necessarily include a complete history—a linear past, present, *and future*—then, since we have good reason for believing that (4c)

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[10]Restricting this to logically contingent truths won't affect my argument.

will be true, we have good reason for believing that alpha includes (4c) and thus that (4c) is true *simpliciter*. Alas, this line of reasoning begs the question against OF. Some OF proponents concede that possible worlds necessarily include a complete history, but they would insist that no possible world, not even alpha, obtains *simpliciter*.[11] Others, like myself, grant that some possible world (alpha) obtains *simpliciter*, but deny that possible worlds must include a complete history. Accordingly, I take 'alpha' to be an indexical, not a rigid designator, and hold that *which* possible world is actual changes over time.

I have argued that we have no good reason for believing that (4c) is true, either *now* or *simpliciter*. Hence, (2) is false and Pruss's argument fails. But Pruss's argument is more sophisticated than my (1)–(3) summary suggests. In closing, then, I'd like to step through a more rigorous version of his argument and pinpoint where his chief mistake occurs.

Pruss's Mistake

I will now state Pruss's argument more formally in my own terms, beginning with his fourth premise. (His first three premises serve as inference rules later in the argument. They'll come up in due course.) Pruss begins by arguing that there is an FPC, which I'll represent with (4c), that we now have good reason for believing:

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

He then notes what he takes to be an straightforward implication of OF:

(6) $OF \rightarrow \sim T(4c)$,

where Tp stands for the claim that p is true. To be more explicit, we should take Tp to be short for 'either true *now* or true *simpliciter*' (thus, $OF \rightarrow \sim(T_{now}(4c) \lor T_{simp}(4c))$. Next, from (6) and two principles which Pruss regards as platitudes, namely, (a) 'if $p \rightarrow q$, then $CR_{S,t}(p) \leq CR_{S,t}(q)$' and (b) '$CR_{S,t}(\sim p) = 1 - CR_{S,t}(p)$' there follows:

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

This moves too quickly, however. As stated, 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 for Pruss, this isn't a serious problem. There are workarounds. We can either restate the argument in terms of chances rather than credences (not hard to do), or we can 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 (6) is *believed*. For these reasons, let's pass on (7).

We now come to Pruss's crucial mistake: his use of the principle $p \rightarrow Tp$ to get

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

[12]An analogous principle, 'if $p \rightarrow q$ then $CH(p) \leq CH(q)$', applies to chances.

(8)   (4c)→T(4c).

If this step be conceded, the rest of the argument goes through with only minor adjustments. Thus, from (8), (a*), and the added assumption that p→Tp is *believed*, it follows that

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

From (7) and (9) it follows that

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

And, finally, from (5) and (10) it follows that

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

The problem is the derivation of (8) from p→Tp, for that principle is false, or at least question-begging. Its apparent plausibility derives from its similarity to other principles which are undoubtedly correct. Thus, if p holds in a model, then it is true *in that model* that p. Using indicies, p_i → T$_i p$. Also, if p holds *simpliciter* then it is true *simpliciter* that p. Thus, p_{simp}→T$_{simp} p$. But what Pruss needs is p_{t*}→$(T_{now} p \vee T_{simp} p)$. That is, he needs a temporally qualified event proposition (which is what (4c) is) to imply the truth *now* or *simpliciter* of the simple event description 'S fails to win the lottery.' But that looks downright false—how can S's failing to win the lottery obtain prior to the lottery drawing?[13] Moreover, it begs the question against OF. If I'm right that we have no good reason for believing that (4c) *is* true and that we only have good reason for believing there is a high chance that (4c) *will be* true, then no OF proponent should feel compelled to accept p→Tp. And without that principle, no Pruss-style argument against OF can get off the ground.[14]

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[13]On one reading, 'S fails to win the lottery' represents S's participation in a lottery drawing which has taken place without S winning. On that reading, the proposition is not true since the drawing hasn't happened yet. Alternatively, we can read it as saying 'It is not the case that S wins the lottery.' On that reading, the proposition is true, but not in virtue of future events. Indeed, arguably, it would be true even if nothing had ever been created.