Comment on Lockwood[1]

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Michael Lockwood describes two variants of the Many Minds interpretation of quantum theory that I'll call the Continuing Minds View (CMV) and the Instantaneous Minds View (IMV). In 'Interpreting the Many Worlds Interpretation' David Albert and I also discussed these views. We claimed that the CMV provides a consistent interpretation of quantum theory according to which i) the quantum state of a system is its complete *physical* state, ii) the quantum state evolves in conformity with Schroedinger's equation, and iii) the quantum mechanical probabilities are understood as the dynamical chances of observers' minds evolving to occupy various mental states. The IMV is also a consistent interpretation of quantum theory that satisfies (i) and (ii). But the IMV denies that there are temporally persisting minds at least in the way that we normally think of a person persisting through time. Because of this we did not see how the quantum mechanical probabilities could be given a satisfactory interpretation on the IMV and for that reason we thought it inadequate. It must be admitted, however, that the CMV has some unsettling, many would say outlandish, features. The probabilistic dynamics of minds requires there to be a matter of fact concerning whether one instantaneous mind associated with a brain's quantum state is transtemporal identical to another instantaneous mind associated with a subsequent state as opposed to distinct instantaneous minds associated with that state. Since there are no physical facts that ground such identities the account is robustly dualist. We thought that this is the price that must be paid to have a viable interpretation of quantum mechanical probabilities within the many minds framework.

Lockwood disagrees. He elaborates the IMV and argues that the quantum mechanical probabilities can be interpreted within it. Further he thinks that the IMV and the CMV are 'experientally equivalent' so that there can be no empirical reason to prefer the latter to the former. And *if* that is the case he is certainly right to prefer the IMV since its metaphysical commitments are far less problematic than those of the CMV. However, I think that Lockwood underestimates the difficulty of interpreting probability in the IMV. And if a satisfactory account of the quantum mechanical probabilities is not forthcoming then the IMV cannot be a satisfactory interpretation of QM since it is through these probabilities that QM makes contact with evidence.

[1] These comments are distilled from many hours of discussion with David Albert.

Lockwood's idea concerning probability is to posit a measure on the set of instantaneous minds associated with a brain at time t. He stipulates that the value this measure assigns to a set of minds is identical to the probability defined in terms of the chance distribution posited by the CMV. However, unlike the CMV, it doesn't make any sense on the IMV to speak of the probability of an instantaneous mind at t evolving to exemplify a mental state M at t′ since there is no fact of the matter concerning the trans-temporal identity of minds (in the usual way we think of such identities).

How are we to understand this measure? What does the measure measure? None of the familiar notions of probability seems appropriate. Clearly it cannot be construed as measuring the chances in a stochastic law (as are the CMV probabilities) since the IMV is a deterministic theory. Nor does it measure the actual frequency of proportion of minds associated with a particular brain that exemplify a particular kind of mental state (e.g. minds that experience a live cat upon a measurement of Schroedinger's cat). There is a continuous infinity of such minds so the proportion of minds that exemplify a particular mental state is not well defined and there is no natural specification of a limit of a sequence of finite frequencies that would permit identifying the measure with a limit. Nor does it measure the limiting frequency of a kind of mental state on independent repetitions of experiments. It is true that if an observer were to measure e.g. the x-spin of an infinite sequence of z-spin electrons and keep track of the result, then in the limit the measure of the set of minds that record a frequency close to 1/2 of 'up' results will be 1. But this is of no help unless we can construe the measure as a probability and that is just what is at issue. Finally, the measure doesn't seem to be reasonably interpretable as a degree of belief. Prior to measuring the x-spin of a z-spin electron, a rational observer who believes the IMV ought not have a degree of belief of 1/2 that she will observe spin up. Either she will think that this degree of belief is 0 because she will not exist at the later time or, if she identifies herself with all the minds associated with her brain at the end of the measurement, she will believe that at the conclusion of the measurement she will certainly perceive that x-spin is up and also she will believe that x-spin is down and so assign a degree of belief of 1 to each of these.

I think that Lockwood agrees that the measure on the set of minds cannot be interpreted as any familiar notion of probability. He suggests a way of thinking about the measure that I think is supposed to explain what it measures. He thinks of a mind's future as including all the minds that are associated with the evolution of the state corresponding to the component of the quantum state with which that mind is associated. He then suggests that we think of the measure as analogous to measuring temporal duration. If a person experiences pleasure for 2 hours and experiences pain for 1 hour then she experiences twice as much pleasure as pain. Similarly, if the measure at a given time of the set of her minds that experience pleasure is twice as great as the measure of the set of her minds that experience pain then she experiences (at that time) twice as much pleasure as pain. If a person (i.e. a mind) knows that she will soon evolve so that the measure associated with the set of her future minds at time t assigns 2/3 to the set experiencing pleasure and 1/3 to the set experiencing pain, then she should think of herself as soon to be experiencing twice as much pleasure as pain.

There are various issues that this construal of the measure raises concerning personal identity (I am not sure how seriously Lockwood takes the account) but here I only want to raise the point that whatever this measure measures it is not probability. Satisfying the axioms of probability is not enough to make a measure a probability measure! For example, the area of a region in a bounded region satisfies the probability axioms but no one would say that this is a probability. The fact that the measure on minds assigns the same values as a genuine probability measure (the chance distribution posited by the CMV) doesn't make it a probability and Lockwood has given us no reason to think that it is a probability measure. Further, there are reasons to think that the measure is not a probability. Not only is it not any of the familiar kinds of probability but it fails to satisfy the following conditions that all those concepts of probability satisfy:

1. If it is rational for A to assign a probability of p to a future event E then A must be some matter of fact (e.g. whether or not A will occur) of which A is ignorant.
2. If A believes that the probability of an event e on experiment e is p then it is rational for A to believe that on many independent repetitions of E the frequency of e will be approximately p.
3. If the probability of e on E is p then it is possible that on many independent repetitions of E the frequency of e will be approximately p.

The measure on minds posited by the IMV satisfies none of the above conditions. As for (1), prior to measuring e.g. the x-spin of a z-spin electron A need be ignorant of no matter of fact concerning the outcome of the measurement. She can know the future physical state and what minds will be associated with her brain and yet the measure assigns 1/2 to set of her minds that experience spin up (spin down). As for (2) and (3), on the IMV the frequency of minds that e.g. experience spin up on repeated independent measurements of x-spin on z-spin electrons is undefined. So if IMV is true it would not be rational to believe that the frequency of experiencing an up result on repeated measurement is 1/2; *it isn't even possible for this frequency to be 1/2*!

Lockwood argues that if the IMV is experientially equivalent to the CMV then there can be no evidential reason to prefer the latter. It is true that the two accounts are experientially equivalent in that each predicts that exactly the same experiences will be occurring at any time. However, if the measure on the two sets of minds is not a genuine probability measure then the two accounts are not *evidentially equivalent*. In fact, I will argue, the IMV cannot make sense of its being rational for a person (or mind) to believe in the truth of the IMV on the basis of evidence. Consider an instantaneous mind M that believes that she has had the experiences that we would take to provide evidence for quantum theory; i.e. experiences of pointer readings, etc. Call this collection of experiences E. On both the CMV and the IMV the members of E are (most likely) literally false since the quantum state of the universe is (most likely) not an eigenstate of pointer positions, etc. However, M can reason that if CMV is true then it is likely that she would have those or very similar experiences (or that having these experiences is more likely on CMV than on the alternatives) and so conclude that it is rational to believe that CMV is probable (or at least believe that it is probably empirically adequate). But given the IMV nothing follows concerning the likelihood of Ms having the experiences in E. The IMV does imply that the measure of the set of minds having E or very similar experiences is close to 1 but unless this measure can be interpreted as a probability it cannot be rationally concluded from this evidence that IMV is probable (or probably empirically adequate). And I have argued that the IMV's measure is not a probability. If this is correct then although the IMV and the CMV are experientially equivalent they are not evidentially equivalent. Thus, if the IMV is true we could have no reason to believe that it is true or empirically adequate. In fact if it were true we would have reason to believe that the CMV is true or empirically adequate. I conclude that given a choice between the IMV and the CMV we should chose that latter.

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