

Peer Review

Review of: "Fixing the Measure: Deriving $|\Psi|^2$ From Symmetry in Deterministic Geometry"

Inge Svein Helland¹¹. Department of Mathematics, University of Oslo, Norway

As judged from the introduction, the author may not seem to be aware that there are many other derivations of the Born rule from physical principles. Some examples are Caves et al. (2002) Physical Review. A 65, Wright and Weigert (2019) Journal of Physics A 52 (5), Auffeves and Granger (2019) arXiv: 1910.13738, and Helland (2021), Epistemic Processes.

This impression is removed when we come to Appendix A. However, the references above are not mentioned.

Compared to these other derivations, the approach by Blore is very simple and thus seems to be very clarifying: It is based upon two symmetries of the probability amplitude: invariance of the sought measure under multiplication with a complex scalar, and invariance under unitary transformations. Given these conditions, the simplest form of the Born formula follows.

The background for this is a dynamic system S with some properties. Among other things, there is a flow on S . As for the presentation, it seems a little strange that this flow is indexed by time t but at the same time is said not to depend explicitly on time.

S is given a partition which is defined by the inverse function of the values of the actual variables. Each region in the partition is assumed to have a measure that is invariant under the given symmetries.

Using this, the simple Born rule is derived. The qubit is used as an example. The derivations are given in detail, and after that, the steps are reviewed,

Among other issues, the possible extension to more general observables is posed as an open question. It should be remarked that the steps from the simple Born formula to a more advanced formula involving a density operator are given in many references, for instance Helland (2021).

In conclusion, this is a very thorough discussion around a valuable derivation from simple premises of the Born rule.

Declarations

Potential competing interests: No potential competing interests to declare.