Review of: "On Probabilities in Quantum Mechanics"

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A new version of a preprint, “On Probabilities in Quantum Mechanics,” by Prof. Inge Svein Helland, represents an interesting, detailed study of tiny aspects behind the statisticians' angle of view on probabilities in quantum mechanics, being centered around its statistical cornerstone: the Born rule. I am grateful for the author's attention to my remarks about the first version of this preprint. In my opinion, the new version of this material provides a detailed and very informative review of I.S. Helland's approach to the statistical backgrounds of quantum probabilities. This approach introduces some new, original mathematical starting points, such as the author's Focused Generalized Likelihood Principle (FGLP), the concepts of likelihood measure, and the difference between accessible and inaccessible theoretical variables. Special attention in this approach is also paid to the mathematical meaning of the reproducibility of random quantum variables/observables measurements by different observers: In my opinion, this is an especially interesting point of how one can define the reproducibility of an abstract quantum measurement statistics independently from the statistical samples being accessible for different observers. Another interesting point, which, in my opinion, would need separate future study, is the possible deep connection between Helland's concept of an inaccessible (ideal) theoretical variable in a given measurement and a corresponding Hamiltonian construction. In my opinion, the concrete forms of quantum Hamiltonians within a traditional quantum mechanical approach could be treated as examples of such “inaccessible (ideal) theoretical variables” Helland is discussing in this preprint. This is because the Hamiltonian's structure is known with probability equal to 1 (i.e., it is prescribed and fixed by the quantum-classical correspondence principle), and, at the same time, on one hand, this Hamiltonian structure is prescribed by preceding common empirical knowledge shared by all observers, and, on the other hand, this structure defines the observable spectrum of corresponding eigenvalues, thus implying the connection to probabilistic measurement outcomes for all accessible variables in such the system.

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