A note to s-map

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Conditional probability plays a basic role in the classical probability theory. Some of the most important areas of the theory such as martingales, stochastic processes rely heavily of this concept. Conditional probabilities on a classical measurable space are studied in several different ways, but result in equivalent theories.

The situation charges when non-standard spaces are considered. For example, it is a well known that the set of random events in quantum mechanics experiments is a more general structure than Boolean algebra.

In the quantum logic approach the set of random events is assumed to be a quantum logic (orthomodular lattice L). Such model we can find not only in the quantum theory, but for example, in the economics, biology etc. For such model it is possible to define a function for simultaneous measurements (an s-map). By using the s-map we can introduce for example a joint distribution also for noncompatible observables, a conditional state, which have the same properties as conditional probability on a Boolean algebra. Moreover, if x is an obsevable on L and B is Boolean sub-algebra of L, we can construct an observable $z = E(x|B)$, which is a version of conditional expectation of x but

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it need not to be necessarily compatible with x.

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