

When coherent preferences may not preserve indifference between equivalent random variables: A price for unbounded utilities.

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Abstract

We extend de Finetti's (1974) theory of coherence to apply also to unbounded random variables. We show that for random variables with mandated infinite prevision, such as for the St. Petersburg gamble, coherence precludes indifference between equivalent random quantities. That is, we demonstrate when the prevision of the difference between two such equivalent random variables must be positive. This result conflicts with the usual approach to theories of Subjective Expected Utility, where preference is defined over lotteries. In addition, we explore similar results for unbounded variables when their previsions, though finite, exceed their expected values, as is permitted within de Finetti's theory. In such cases, the decision maker's coherent preferences over random quantities is not even a function of probability and utility. One upshot of these findings is to explain further the differences between Savage's theory (1954), which requires bounded utility for non-simple acts, and de Finetti's theory, which does not. And it raises a question whether there is a theory that fits between these two.

Subjects: [Specific Sciences: Probability/Statistics](#)
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