Distorted Statistics based on Choquet Calculus

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abstract

In this study we discuss statistics with distorted probabilities by applying Choquet calculus which we call ‘distorted statistics’. To deal with distorted statistics, we consider distorted probability space on the non-negative real line. A (non-additive) distorted probability is derived from an ordinary additive probability by the monotone transformation with a generator. First, we explore some properties of Choquet integrals of non-negative, continuous and differentiable functions with respect to distorted probabilities. Next, we calculate elementary statistics such as the distorted mean and variance of a random variable for exponential and Gamma distributions. In addition, we introduce the concept of density function for distorted exponential distribution.

Further, we deal with Choquet calculus of real-valued functions on the real line and explore their basic properties. Then, we consider distorted probability pace on the real line. We also calculate elementary distorted statistics for uniform and normal distributions. Finally, we compare distorted statistics with conventional skew statistics.