

Asymptotic behavior of the St. Petersburg sum conditioned on its maximum

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In this paper we revisit the classical results on the generalized St. Petersburg sums. We determine the limit distribution of the St. Petersburg sum conditioning on its maximum, and we analyze how the limit depends on the value of the maximum. As an application we obtain an infinite sum representation of the distribution function of the possible semistable limits. In the representation each term corresponds to a given maximum, in particular this result explains that the semistable behavior is caused by the typical values of the maximum. We also provide exact asymptotics for the ratio $P\{S_n > x\}/P\{X_1 > x\}$, as $x \rightarrow \infty$. We show that although the St. Petersburg distribution is only O-subexponential, the subexponential property almost holds.