

ON SOME RESULTS AND PROBLEMS IN CONNECTION WITH STATISTICS OF THE KOLMOGOROV-SMIRNOV TYPE

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1. Introduction

Since Kolmogorov and Smirnov established their limiting distribution theorems concerning maximal deviations between empirical and theoretical distributions, an increasing amount of scientific work has been done by statisticians in this field. Practical importance and theoretical interest give the motivation. Researchers have worked on distribution laws, power considerations and the limiting process in the last five years with considerable results. The present paper will consider only a few results, those nearest to the author's work and interest of the past few years. The first part, Section 2, concerns the case when the parent distribution is noncontinuous, the third and fourth sections consider the one and two sample problem, in the fifth section an analogous question for a density function due to Révész is discussed, while in the last section the two dimensional problem is considered.

2. The Gnedenko-Korolyuk distribution for discontinuous random variables

In his paper Schmid [12] has given the limiting distribution law of the Kolmogorov and of the Smirnov statistics, that is, of

$$(2.1) \quad \begin{aligned} D_n &= \sup_{(x)} |F_n(x) - F(x)|, \\ D_n^+ &= \sup_{(x)} [F_n(x) - F(x)] \end{aligned}$$

for discontinuous $F(x)$, where $F_n(x)$ denotes the empirical distribution function of a sample of size n from a population distributed according to $F(x)$. Using the ballot lemma Csáki [2] determined the exact distribution of D_n^+ for finite n which corresponds to the well known Smirnov-Birnbaum-Tingey distribution for continuous $F(x)$. His formula has a fairly complicated form.