V ASYMPTOTICALLY MOST POWERFUL TESTS AND ASYMPTOTICALLY SHORTEST CONFIDENCE INTERVALS[9)]

As we have seen, if a uniformly most powerful (unbiased) test and a shortest (unbiased) confidence interval exist, they provide a satisfactory solution of the problem of testing a hypothesis and the problem of interval estimation. Unfortunately, they exist only in a restricted class of cases. As substitutes for them the use of a critical region of type A and a short confidence interval, respectively, have been proposed. The appropriateness of the region of type A seems somewhat doubtful, since we are more interested in the behavior of the power function at values of θ far from the value θ_0 to be tested than at values of θ near to θ_0. Similar objections can be raised to the use of a short confidence interval. Recent investigations show, however, that the situation is much more favorable than appears at first glance. It is shown that the difficulties arising because of the non-existence of uniformly most powerful unbiased tests and shortest unbiased confidence intervals gradually disappear with increasing size of the sample, since so-called asymptotically most powerful unbiased tests and asymptotically shortest unbiased confidence intervals practically always exist.

We shall assume that the observations $x_1,\ldots,x_n$ are n independent observations on the same random variable X whose distribution function involves a single unknown parameter θ. We shall also assume that X has a probability density function,

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9) See references 17-20