INTERIM ANALYSIS FOR NORMALLY DISTRIBUTED OBSERVABLES

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We address the problem of whether an experiment should be continued or aborted when N observations are in hand and a total of $K > N$ have been scheduled for a decision. A Bayesian predictive approach is used to determine the probability that if one continued the trial with a further sample of size M where $N + M \geq K$ one would come to a particular decision regarding some set of parameters. In particular, sampling from a multivariate normal distribution will be discussed.

1. **Introduction.** Often experiments will consist of a series of independent observations with some minimum sample size required, say K, before a conclusion is reached concerning the efficacy of a new treatment. Many such trials are costly and time consuming. Frequently an investigator would like to know at some interim point whether the continuation of the trial is worthwhile. With regard to a new treatment or a therapy, the issue is invariably whether continuation will lead to a conclusion that the treatment is at least as effective as some standard. There are frequentist methods which control type I and type II errors if interim analyses are made at preset sample sizes in a sequential trial. Depending on the number of such interim analyses, the required sample difference can be much larger than in a trial where no interim analyses are made. Also it is not always convenient to conduct such analyses at preset sample sizes in a trial. Other methods that allow for analyses at arbitrary sample sizes involve highly conservative tests which render even more difficult the detection of differences.

Although Bayesian statisticians ordinarily do not suffer from such restrictions they also may be subject to an important trial which requires at least some fixed number of observations before a conclusion is reached. This is