Title:
Control of Generalized Error Rates in Multiple Testing
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Consider the problem of testing s hypotheses simultaneously. The usual approach to dealing with the multiplicity problem is to restrict attention to procedures that control the probability of even one false rejection, the familiar familywise error rate (FWER). In many applications, particularly if s is large, one might be willing to tolerate more than one false rejection if the number of such cases is controlled, thereby increasing the ability of the procedure to reject false null hypotheses One possibility is to replace control of the FWER by control of the probability of k or more false rejections, which is called the k-FWER. We derive both single-step and stepdown procedures that control the k-FWER in finite samples or asymptotically, depending on the situation. [**?**] derive some exact methods for this purpose, which apply whenever p-values are available for individual tests; no assumptions are made on the joint dependence of the p-values. In contrast, we construct methods that implicitly take into account the dependence structure of the individual test statistics in order to further increase the ability to detect false null hypotheses. We also consider the false discovery proportion (FDP) defined as the number of false rejections divided by the total number of rejections (and defined to be 0 if there are no rejections). The false discovery rate proposed by [**?**] controls $E(\text{FDP})$. Here, the goal is to construct methods which satisfy, for a given γ and α, $P\{\text{FDP} > \gamma\} \leq \alpha$, at least asymptotically.