Bonferroni Correction for Multiple Comparisons

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When there is m comparisons, the probability of falsely rejecting at least one of the m null hypotheses is

$$\alpha_{\mathrm{E}} = 1 - (1 - \alpha_{\mathrm{I}})^m,$$

where α_{E} is the experimentwise type I error rate, and α_{I} is the individual comparisons Type I error rate. Easy to see that as the number of tests m increases for a given value of α_{I}, the probability of falsely rejecting H_0 on at least one of the m tests can be quite large. In practical problems, where tests will not be independent, we have the upper bound as follows:

$$\alpha_{\mathrm{E}} \leq 1 - (1 - \alpha_{\mathrm{I}})^m$$

and

$$1 - (1 - \alpha_{\mathrm{I}})^m \leq m \cdot \alpha_{\mathrm{I}}$$

(we can show that $(1 - x)^m \geq 1 - xm, x \in (0, 1)$) Let $m \cdot \alpha_{\mathrm{I}} = \alpha$, we can guarantee that the chance of a Type I error is at most α, that is, $\alpha_{\mathrm{I}} = \frac{\alpha}{m}$