Two-sided Exact Tests and Matching Confidence Intervals for Discrete Data

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There is an inherent relationship between two-sided hypothesis tests and confidence intervals. A series of two-sided hypothesis tests may be inverted to obtain the *matching* 100(1-α)% confidence interval defined as the smallest interval that contains all point null parameter values that would not be rejected at the α level. Unfortunately, for discrete data there are several different ways of defining two-sided exact tests, and the most commonly used two-sided exact tests are defined one way, while the most commonly used exact confidence intervals are inversions of tests defined a different way. This can lead to inconsistencies where the exact test rejects but the exact confidence interval contains the null parameter value. The R packages **exactci** and **exact2x2** provide several exact tests with the matching confidence intervals avoiding these inconsistencies as much as is possible. Examples are given for binomial and Poisson parameters and the paired and unpaired 2×2 tables.