Accuracy of tests for multi-categorical Bernoulli data

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Abstract

Suppose samples are taken from two g-category Bernoulli populations. The first sample has n observations while the second sample has only 1. Testing for homogeneity between the two samples can be done with Pearson's Chi-squared test, Fisher's exact test, and Hotelling's T^2 test. However, there is no gold standard for comparing p-values resulting from these three tests. The accuracies of p-values for various g's and samples sizes are compared. The possibility of considering a setting with $g = 2^k$ in terms of k binary variables is examined.