# TABLES FOR A NONPARAMETRIC TEST OF LOCATION

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**1. Introduction.** These tables are complementary to the set for a test of dispersion which has already appeared [1], and are derived on the same lines. Acknowledgements are again due to S. S. Wilks [2] in whose paper on tolerance limits (1942) the basic formulas were first given.

To test whether two samples come from the same population, we merely count the number of points in one sample which lie outside an extreme value of the other sample. In the following account the end point is taken to be the greatest value, but the argument is identical if the smallest is chosen instead.

**2. Test that the samples come from the same population.** If two independent random samples of $n$ points and $m$ points are drawn from a population with a continuous distribution function, the probability that $s$ points of the sample of $m$ will lie to the right of the greatest value of the sample of $n$ is [2]

$$Q_s = n \binom{m}{s} B(n + m - s, s + 1) \tag{1}$$

where $B$ is the complete Beta function.

For $s_0 \leqq m$, $\sum_{s=0}^{s_0} Q_s$ is the probability that the value of $s$ is not greater than $s_0$, or equivalently, $1 - \sum_{s=0}^{s_0} Q_s$ is the probability that $s$ is greater than or equal to $s_0 + 1$. We can therefore fix a probability level $\epsilon$ and determine $s_0$ such that

$$\sum_{s=0}^{s_0-1} Q_s \leqq \epsilon < \sum_{s=0}^{s_0} Q_s .$$

Tables of $s = s_0 + 1$ are given for $\epsilon = 0.95$ and $\epsilon = 0.99$ over the range $n = 1, \cdots, 50$, $m = 1, \cdots, 50$.

For sufficiently large and approximately equal values of $m$ and $n$, $Q_s$ is approximately equal to $2^{-(s+1)}$, and the critical values of $s_0 + 1$ are

$$s_0 + 1 = 5 \text{ for } \epsilon = 0.95,$$

$$s_0 + 1 = 7 \text{ for } \epsilon = 0.99.$$

REFERENCES

[1] S. Rosenbaum, "Tables for a nonparametric test of dispersion," *Ann. Math. Stat.*, Vol. 24 (1953), pp. 663-668.

[2] S. S. Wilks, "Statistical prediction with special reference to the problem of tolerance limits," *Ann. Math. Stat.*, Vol. 13 (1942), pp. 400–409.

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