As the level of significance increases, the power efficiency of the rank sum test increases slightly whereas the power efficiencies of the median and maximum deviation tests decrease.

TABLE II. When tests for samples of size 5 are randomized to the single level of significance $\alpha = .025$, it is easy to compare the tests and note that the rank sum test has greater power than the median and maximum deviation tests. Particularly for near alternatives, the maximum deviation test has greater power than the median test.

TABLE III. The local power efficiencies for the rank sum test are very high. For all cases computed they are greater than $3/\pi$, the limiting local power efficiency for large samples.

REFERENCES

[1] W. J. DIXON, "Power functions of the sign test and power efficiency for normal alternatives," *Ann. Math. Stat.*, Vol. 24 (1953), pp. 467–473.
[2] A. M. MOOD, "On the asymptotic efficiency of certain nonparametric two-sample tests," *Ann. Math. Stat.*, Vol. 25 (1954), pp. 514–522.
[3] W. L. NICHOLSON, "A computing formula for the power of the analysis of variance test," *Ann. Math. Stat.*, Vol. 25 (1954), pp. 607–610.
[4] I. R. SAVAGE, "Bibliography of nonparametric statistics and related topics," *J. Amer. Stat. Assn.*, Vol. 48 (1953), pp. 844–906.
[5] H. R. VAN DER VAART, "Some remarks on the power of Wilcoxon's test for the problem of two-samples, I and II," *Indagationes Math.*, Vol. 12 (1950), pp. 146–172.

Addendum

Papers on this topic appearing since submission of this paper include:
[6] E. L. LEHMANN, "The power of rank tests," *Ann. Math. Stat.*, Vol. 24 (1953), pp. 23–43.
[7] B. L. VAN DER WAERDEN, "Order tests for the two sample problem," *Nederl. Akad. Wetensch. Proc. Ser. A.*, Vol. 56 (1953), pp. 303–316.

A REMARK ON THE JOINT DISTRIBUTION OF CUMULATIVE SUMS

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Let X_k, $k = 1, \cdots, n$, be any finite number n of independent random variables with respective distribution functions $F_k(x) = \Pr[X_k \leqq x]$. Let $T_k = X_1 + \cdots + X_k$ be the successive cumulative sums of the X_k, with individual distribution functions $G_k(t) = \Pr[T_k \leqq t]$ and joint distribution function $G(t_1, \cdots, t_n) = \Pr[T_1 \leqq t_1, \cdots, T_n \leqq t_n]$. Since the T_k are not in general stochastically independent, the function $G(t_1, \cdots, t_n)$ will not in general be equal to the product of the n functions $G_k(t_k)$, but we shall show that the *inequality*

$$G(t_1, \cdots, t_n) \geqq \prod_1^n G_k(t_k) \tag{1}$$

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