from which we can find

$$\rho_{VC^2}\sigma_V\sigma_{C^2} = \frac{2n(1-m)}{m(n+2)(m+n)}$$

and

$$\rho^2_{UC^2} \cong \rho^2_{VC^2} = \frac{(n+3)(n+4)(m+n-1)}{(n+1)(m+n+1)(m+n+2)}.$$

If $n/m = \gamma$ (a fixed constant) and n is large

$$\rho^2 \cong \frac{n}{n+m}.$$

ρ^2 will be near 1 when n is much larger than m. This corresponds, in computing C^2, to dividing the smaller sample into subgroups by the larger. In this case U and C^2 give essentially the same information. When m and n are more nearly equal the two criteria are quite different. For $n > m$, C^2 has fewer possible values than for $n < m$, and is therefore a more sensitive test when $n < m$.

While it is doubtful that this test is biased for large samples, this question will not be considered in the present note.

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SIGNIFICANCE TEST FOR SPHERICITY OF A NORMAL n-VARIATE DISTRIBUTION

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1. Introduction. This note is concerned with testing the hypothesis that a sample from a normal n-variate population is in fact from a population for which the variances are all equal and the correlations are all zero. A population having this symmetry will be called "spherical." Under a linear orthogonal transformation of variates, a spherical population remains spherical, and consequently the features of a sample which furnish information relevant to this hypothesis must be invariant under such transformations.

A situation for which this test is indicated arises when the sample consists of N n-dimensional vectors, for which the variates are the n components along coordinate axes known to be mutually perpendicular, but having an orientation which is, a priori at least, quite arbitrary. A specific application for two dimensions, treated elsewhere [1], may be mentioned. Each of N days furnishes a sine and a cosine Fourier coefficient for a given periodicity, and these, when plotted as ordinate and abcissa, yield a somewhat elliptical cloud of N points. The sine and cosine functions are orthogonal, and their variances have