ABSTRACTS OF PAPERS

(Abstracts of papers to be presented at the Eastern Regional Meeting of the Institute, April 20–22, 1961. Additional abstracts will appear in the June, 1961 issue.)

1. **On the Theory of Univariate Successive Sampling.** S. G. PRABHU AJGAONKAR AND B. D. TIKKIWAL, Karnatak University. (By title)

This paper discusses the earlier results (Tikkiwal, Ph.D. thesis, N. C.) on the theory of univariate successive sampling from a finite population having a specified correlation pattern when an alternate approach is adopted utilizing the concept of super-population and newly defined terms of unbiasedness and the variance in the extended sense by Tikkiwal (*J.R.S.S.*, Vol. 22). The results are further extended to the case where the various correlation and regression coefficients occurring in the best estimator Y_h of the population mean on the hth occasion are estimated from the sample. It is shown that a consistent and asymptotically unbiased estimator of the variance of the best estimator is $s_h^2(\phi_h/n_h'' - 1/N)$ with usual notations. This paper also presents the theory when specified correlation pattern breaks down. If $n_t' \leqq n_{t-1}''$ for all $t \geqq 2$, it is shown that Y_h is still the best estimator and its variance V_h under any possible correlation pattern is given by

$$[(\phi_h/n_h'' - 1/N)\sigma_h^2] = L_1 \leqq V_h \leqq [(E(\hat{\phi}_h)/n_h'' - 1/N)\sigma_h^2] = L_2,$$

$\hat{\phi}_h$ being the estimator of ϕ_h. When the condition $n_t' \leqq n_{t-1}''$ is not satisfied, then, provided the correlations between occasions more than two apart are greater than what are given by the specified correlation pattern, V_h is given by (1) $V_h < L_1$ for known correlation and regression coefficients, (2) $V_h < L_2$ for estimated coefficients.

2. **On the Foundations of Statistical Inference, III** (Preliminary Report). ALLAN BIRNBAUM, New York University. (By title)

Let $\text{Ev}(x \mid E)$ denote the *evidential meaning* of outcome x of experiment E: a basic function in empirical scientific work is the appraisal and reporting of $\text{Ev}(x \mid E)$ in various cases in terms appropriately representing the character of x as evidence relevant to parameter values or statistical hypotheses. This function of *informative inference* is widely served by use of standard estimation and testing techniques. The essential mathematical structure of statistical evidence, or evidential meanings of outcomes, is clarified by the following formal considerations: E is a *mixture* of components E_h if it is mathematically equivalent to selection according to fixed known probabilities of an experiment E_h which is then carried out; thus each outcome x of a mixture E has a representation (E_h, x_h). A *principle of conditionality* of delimited scope is the assertion (C): $\text{Ev}((E_h, x_h) \mid E) = \text{Ev}(x_h \mid E_h)$; that is, any outcome of any mixture experiment has the same evidential meaning as a corresponding outcome of a corresponding component experiment with the overall structure of the mixture otherwise ignored. From (C) it can be deduced that the evidential meaning of any outcome of any experiment is characterized by the observed likelihood function, ignoring otherwise the structure of the experiment. (Of course experimental structure is crucial at the design stage.)

3. **Nonparametric Methods for Additive Effects.** J. L. HODGES, JR. AND E. L. LEHMANN, University of California, Berkeley. (By title)

It is now widely recognized that, in the two-sample problem, certain nonparametric procedures have great advantages over the classical normal-theory methods: Not only are they robust with regard to validity under weak assumptions, but they also have superior power for many types of nonnormality in particular in the presence of gross errors. The present investigation is aimed at overcoming the main drawback of these nonparametric methods by extending them to a wide class of designs, including randomized blocks, multiway layouts, Latin squares, and regression models. The effects other than treatment are removed in accordance with the structural assumptions of the model, and nonparametric tests or estimates applied to the pooled residuals. The null distributions are exact, assuming only random assignment of treatments subject to the restrictions of the design. Preliminary investigation indicates that the methods have efficiency advantages comparable to those well known in the two-sample problem.

4. **Null Distribution and Bahadur Efficiency of the Hodges Bivariate Sign Test** (Preliminary Report). A. JOFFE AND JEROME KLOTZ, McGill University.

The results of Kemperman (*Ann. Math. Stat.*, Vol. 30 (1959), pp. 448–462) are used to obtain the exact null distribution of the Hodges bivariate test statistic (*Ann. Math. Stat.*, Vol. 26 (1955), pp. 523–527). The limiting null distribution is given by

$$\lim_{n \to \infty} P[H/n^{\frac{1}{2}} < r] = 1 - 2r \sum_{i=-\infty}^{\infty} \varphi((2i + 1)r)$$

where $H = n - 2K$, K is Hodges' statistic and φ is the standard normal density. This result can be obtained from the exact expression or from the Brownian approximation to the random walk. The Bahadur limiting efficiency (*Ann. Math. Stat.*, Vol. 31 (1960, pp. 276–295) relative to Hotelling's T^2 test is obtained for bivariate normal alternatives. In the case where the two components of each observation are identically distributed the value of the Bahadur efficiency is $2/\pi$ corresponding to the one dimensional sign test.

5. **A Bayes Surveillance Procedure.** JOHN E. NYLANDER, Boeing Airplane Company. (By title)

Lots of size N come to an inspection station where a sample of size n is drawn and inspected. If the number of defectives is less than a specific number r the lot is passed without the defective items found. If the number of defectives in the sample is greater than r, the entire lot is inspected and only those items which are found to be good are passed. If $c_1(n)$, $c_2(N, n, p)$ are the cost of inspecting a lot, and cost of permitting a bad lot to pass. Assuming convex cost functions it is shown that for given N and arbitrary *a priori* distribution $F(p)$ the optimal rejection number r_0; for a fixed n is given by that r_0 such that,

$$\int_0^1 \{c_2(N, n, p) - c_1(N - n)\} \binom{Np}{i} \binom{N - Np}{n - i} dF(p) \leqq 0 \text{ for any } i \leqq r_0$$

$$\int_0^1 \{c_2(N, n, p) - c_1(N - n)\} \binom{Np}{i} \binom{N - Np}{n - i} dF(p) > 0 \text{ for any } i > r_0$$

A method for calculating the optimal pair (n_0, r_0) is then given.