ABSTRACTS OF PAPERS

(Abstracts of papers presented at the Eastern Regional meeting, Upton, Long Island, New York, April 27–29, 1966. Additional papers appeared in the April 1966 issue.)

7. Ratio and regression estimators as minimax procedures for estimating the mean of a population. Om Aggarwal, Iowa State University.

The author has considered earlier the cases of simple random sampling and stratified sampling [*Ann. Math. Statist.* **30** (1959) 206–218] as well as the case of two-stage sampling [*Ann. Math. Statist.* **36** (1965) 1596, abstract #10] from Bayes and minimax point of view by assuming that the loss in estimating the mean is a linear function of the squared error of the estimator and the cost of observations. By using similar approach in this paper, conditions have been derived under which the usual ratio method of estimation is a minimax procedure. It is further shown that if X and Y are distributed jointly, and only their variances, the covariance between X and Y, and the mean of Y are known, then a minimax estimator for the mean of X is the usual regression estimator. The results are extended to the case of sampling from finite populations in each case. (Received 7 March 1966.)

8. k-sample nonparametric life tests (preliminary report). A. P. Basu, University of Minnesota.

Let X_{ij} $(j = 1, 2, \cdots, n_i)$ be a sample of size n_i from the ith population with continuous cdf $F_i(x)$ $(i = 1, 2, \cdots, k; \sum_{i=1}^k n_i = N)$. Let the combined N observations be ordered and define $Z_\alpha^{(i)} = 1$, if the αth ordered observation is from the ith population and 0, otherwise. To test the hypothesis $H: F_1 = F_2 = \cdots = F_k$ against the alternative that they are all different we propose the statistic $B = \{12N^3(N-1)/r(r+1)[2N(2r+1) - 3r(r+1)]\} \cdot \sum_{i=1}^k n_i^{-1}(S_i + r(r+1)n_i/2N^2)^2$ based only on the first r ordered observations from the combined sample, where $S_i = \sum_{\alpha=1}^r[(\alpha - r - 1)/N]Z_\alpha^{(i)}$. For $r = N$, the above statistic reduces to the Kruskal statistic H (*Ann. Math. Statist.* **23** (1952) 525–540), and for $k = 2$ it is equivalent to the Sobel statistic $V_r^{m,n}$ (Technical Report No. 69, University of Minnesota, (1965)). The mean and variance of B under the null hypothesis have been derived. The asymptotic distribution of B in the non-null case is shown to be the noncentral χ^2-distribution with $(k-1)$ df. A second k-sample life test statistic, generalizing the Jonckheere statistic S (*Biometrika* **41** (1954) 133–145), has also been proposed. (Received 28 February 1966.)

9. Method of maximum empirical likelihood for the two-sample location parameter problem. P. K. Bhattacharya, University of Arizona.

$X_1, \cdots, X_m, Y_1, \cdots, Y_n$ are independent random variables, X's having common cdf F and Y's having common cdf G. $G(x) = F(x - \theta)$, but F and θ are unknown. Choose $a_1 < \cdots < a_k$. Let $\chi_1, \cdots, \chi_{k+1}$ be the indicator functions of $(-\infty, a_1]$, $(a_{j-1}, a_j]$, $j = 2, \cdots, k$, and (a_k, ∞) respectively, $\nu_{jm} = \sum_{i=1}^m \chi_j(X_i)$, $q_{jn}(t) = \sum_{i=1}^n \chi_j(Y_i - t)/n$, $j = 1, \cdots, k+1$, $Z_{m,n}(t) = \sum_{j=1}^{k+1} \nu_{jm} \log q_{jn}(t)$. Choose $d > 0$ and a real number t_0. Consider the inequality $Z_{m,n}[t_0 + rd/(m+n)^{\frac{1}{2}}] > \max\{Z_{m,n}[t_0 + (r-1)d/(m+n)^{\frac{1}{2}}], Z_{m,n}[t_0 + (r+1)d/(m+n)^{\frac{1}{2}}]\}$. If $N = m + n \to \infty$ such that $m/N \to u$ in $(0, 1)$, then under some conditions on F, (i) the probability that the above inequality is satisfied at more than one point of the form $t_0 + rd/N^{\frac{1}{2}}$ (r integer) in the interval $(\theta - A/N^{\frac{1}{2}}, \theta + A/N^{\frac{1}{2}})$ tends to 0 for arbitrary A, (ii) the above inequality has a sequence of solutions T_N such that $N^{\frac{1}{2}}(T_N - \theta)$