ABSTRACTS OF PAPERS

(Abstracts of papers presented at the Central Regional Meeting of the Institute, Urbana, Illinois, November 24–25, 1961. Additional abstracts will appear in the March, 1962 issue.)

1. **Admissibility of the Optimal Invariant Estimate for a Translation Parameter Under Absolute Error Loss Function.** MARTIN FOX AND HERMAN RUBIN, Michigan State University.

Let P satisfy the conditions given by Stein (*Ann. Math. Stat.*, Vol. 30, pp. 970–979) with the following changes: (i) replace Stein's condition (2.6) with the condition

$$\int d\nu(y) \int x^2 \, d_x P(x, y) < \infty$$

and (ii) add the condition that the unique median of $P(\cdot, y)$ be at 0 for each $y \varepsilon \mathcal{Y}$. Then, with absolute error loss function, x is an almost admissible estimate of the translation parameter θ where $(X - \theta, Y)$ has the joint distribution P. The proof is similar to Stein's but somewhat more intricate. Furthermore, under the assumption that $p(\cdot, y)$ is a density for each $y \varepsilon \mathcal{Y}$, Stein's proof of admissibility goes through. An example shows that almost admissibility is the best that can be obtained without a density. Farrell (Ithaca meeting, April 20–22, 1961) has shown that, if the median is nonunique, then there is no admissible estimate. The results stated above are still valid if the loss function is weighted by a if the estimate is to the left of θ and by b otherwise. The condition on the median is replaced by the same condition for the $(1 - \alpha)$th quantile where $\alpha = a/(a + b)$.

2. **Unbiased Estimation of Probability Densities** (Preliminary report). S. G. GHURYE, University of Minnesota.

Let $y = (y_1, \cdots, y_n)$ be a sample from a k-dimensional population P, which is an element of a family, $\mathcal{P}$, of distributions. Let $g(x)$ be a known numerical-valued function on R_k with finite expectation $\omega_P = \int_{R_k} g dP$, for all $P \varepsilon \mathcal{P}$. It is desired to find an unbiased estimate $\Phi(y)$ of ω_P. If $\mathcal{P}$ is a dominated family with respective probability densities $f_P(x)$ relative to a known measure μ on the k-dimensional Borel sets, then the problem is equivalent to that of finding $\varphi(x, y)$ satisfying $E_P^y \varphi(x, y) = f_P(x)$ for all $x \varepsilon R_k$, $P \varepsilon \mathcal{P}$. A number of special cases of the problem have been treated previously [Kolmogorov, *Izvest. Akad. Nauk SSSR, Ser. Mat.* (1950); Lieberman and Resnikoff, *J. Amer. Stat. Assoc.* (1955); Washio, Morimoto and Ikeda, *Bull. Math. Stat.* (1956); Schmetterer, *Ann. Math. Stat.* (1960)]. We give a detailed discussion for many families of densities, and also consider certain functions of densities.

3. **On the Resolution of Statistical Hypotheses.** ROBERT V. HOGG, University of Iowa.

Let ω_0 be the space of a parameter θ. Let ω_i be a subset of ω_{i-1}, $i = 1, 2, \cdots, k$. We test $\theta \varepsilon \omega_k$ against $\theta \varepsilon \omega_0 - \omega_k$ by testing iteratively the following hypotheses: $\theta \varepsilon \omega_i$ against $\theta \varepsilon \omega_{i-1} - \omega_i$, $i = 1, 2, \cdots, k$. The hypothesis $\theta \varepsilon \omega_k$ is accepted if and only if each intermediate hypothesis is accepted. If the test statistic for each intermediate hypothesis $\theta \varepsilon \omega_i$ is based on the corresponding likelihood ratio λ_i, we demonstrate why, under fairly general conditions, these test statistics are mutually stochastically independent. This argument is based on an independence theorem which deals with complete sufficient statistics.