Proceedings of the 1983
Winter Simulation Conference
S. Roberts, J. Banks, B. Schmeiser (eds.)

ON USING SELECTION PROCEDURES WITH BINOMIAL MODELS

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RESEARCH SUMMARY

ABSTRACT

An important aspect of quality assurance receiving increased attention recently is that of vendor (supplier) selection. Such selection involves consideration of quality, price, delivery terms, and other critical aspects. In this article, we formulate and address a selection procedure based on the quality assessment of a sample of n items from each vendor. It is assumed that an appropriate test for quality is available and so the relevant test statistic for the ith vendor is X_i, the number of conforming items from the sample of n items. If p_i denotes the probability that an item supplied by the ith vendor is a conforming item, then X_i has the binomial distribution with parameters p_i and n. In selecting a preferred subset of k vendors, we consider a decision rule of the form: Select the ith vendor if and only if $X_i \geq \max_{1 \leq j \leq k} X_j - d$, where d is a nonnegative integer chosen to insure that the probability of a correct selection is at the least a user given (usually large) value. In this context, a correct selection means the inclusion of the vendor characterized by the largest (population) proportion of conforming items. The number of vendors selected with this decision rule is an integer-valued random variable.

The operating characteristics (i.e. selection probabilities and expected size of the selected subset) of this selection procedure are related to the underlying p_i's, the common sample size n, and d. We present formulae, tables, and figures relating these quantities as a guide to sample size requirements. Both exact and asymptotic formulae are given to facilitate calculations applicable to general parametric configurations.

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