ROBUSTNESS OF CONFIDENCE INTERVALS FOR TRANSIENT SIMULATIONS*

Averill M. Law
Department of Industrial Engineering
University of Wisconsin-Madison

Most of the statistical simulation literature is concerned with steady-state simulations. That is, a simulation where the quantity to be estimated is defined as a limit as time (or the number of customers) goes to infinity. For example, the regenerative method is for this case. However, we have discovered by talking to a large number of simulation practitioners that, for the majority of real-world simulations, the length of the simulation is specified by the problem context. (The proportion may be 75 percent or higher.) For example, a simulation to determine the mean wait in a bank during the noon rush hour or a simulation to determine the time to failure of a system of electronic components. We call this type of simulation a transient simulation.

Since the length of a transient simulation is fixed, suppose we make k independent runs. If $Y_i (i=1,2,\ldots,k)$ is the estimate from the ith run, then the Y_i's are independent and identically distributed, and classical statistical analysis may be applied to construct a c.i. for $E(Y)$.

In this paper we will carefully define transient simulations and then contrast them to the steady-state case. (Although the transient case is simpler, it has never received a careful treatment in the literature. This may be a carry-over from queueing theory where only steady-state analysis is generally possible.) We will also consider fixed sample size, two-stage, and sequential procedures for constructing a c.i. for $E(Y)$. In the fixed sample size case (which is the one most commonly used), we show that significant degradation in coverage can result from the nonnormality of the Y_i's. In the other cases, we consider both relative and absolute criteria for stopping.

Details of this paper may be found in Law [1].

REFERENCE

1. Law, A.M., "Stopping Rules for Replicated Simulation Experiments," Technical Report No. 77-32, Department of Industrial Engineering, University of Wisconsin-Madison, (1977).

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*This research was supported by the Office of Naval Research under contract N00014-76-C-0403(NR 047-145).