

CHAPTER 3

DISCRETE-EVENT SIMULATION

Sections

3.1. Discrete-Event Simulation (programs <code>ssq2</code> and <code>sis2</code>)	101
3.2. Multi-Stream Lehmer Random Number Generation (library <code>rngs</code>) . .	111
3.3. Discrete-Event Simulation Models (program <code>ssms</code>)	120

The *trace-driven* single-server service node model and simple inventory system formulated in Chapter 1 were limited by their dependence on an external data source for generating their stochastic elements. This chapter links the models presented in Chapter 1 and the random number generation algorithms in Chapter 2 to create discrete-event simulation models that are free of any reliance on external data sources.

We return to the single-server service node and the simple inventory system models from Sections 1.2 and 1.3. The single-server service node required arrival times and the associated service times. The simple inventory system required demands.

This chapter uses the Lehmer random number generators developed in Chapter 2 to free discrete-event simulation models from their dependence on the trace-driven approach. Section 3.1 introduces exponential and geometric variates and uses them in the single-server service node and (s, S) simple inventory system models. Section 3.2 tackles the problem of *multi-stream generators* that are used to effectively provide a separate random number generator for each stochastic element in a discrete-event simulation model. Section 3.3 extends the two elementary models in Section 3.1 to three slightly more complicated models: (i) a single-server service node *with immediate feedback*, (ii) a simple inventory system *with delivery lag*, and (iii) a single-server machine shop.