Bayesian Sample Sizes in an $M/M/1$ Queueing System

R. C. Quinino & F. R. B. Cruz

Departamento de Estatística
Universidade Federal de Minas Gerais
31270-901 - Belo Horizonte - MG, Brazil
roberto@est.ufmg.br, fcruz@est.ufmg.br

Abstract

Although the broad field of applications amply justifies an intensive study of queueing models, it turned out that these models are also of great use outside the field of queueing theory, e.g. in inventory and maintenance theory very important for production systems. In these applications the queue model $M/M/1$ has several works that illustrate its importance, but usually they adopt the parameters are known. The literature presents estimation methods such as maximum likelihood and Bayesian that could be directly applied. However there is no discussion about planning the sample size to guarantee the precision of the parameters that are estimated. An accurate estimate of the model parameters can avoid wrong decisions on inventory control and maintenance. The focus here is on sample size determination for estimates in single server Markovian infinity queues, considered the simplest and yet most useful queueing model for its accuracy to model many problems of practical interest. In this article, a Bayesian method is described for sample size determination for traffic intensity estimation, one of the most important parameters for performance evaluation of queueing systems. Numerical results are presented to attest to the efficiency and efficacy of the approach.

Keywords: Markovian queues, single-server, inference, sample size, inventory, maintenance.

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