Traffic Intensity Estimation in Finite Markovian Queueing Systems *

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Abstract

In many everyday situations in which a queue is formed, queueing models may play a key role. By using such models, which are idealizations of reality, accurate performance measures can be determined, such as traffic intensity (ρ), which is defined as the ratio between the arrival rate and the service rate. An intermediate step in the process includes the statistical estimation of the parameters of the proper model. In this study, we are interested in investigating the finite-sample behavior of some well-known methods for the estimation of ρ for single-server finite Markovian queues or, in Kendall notation, $M/M/1/K$ queues, namely, the maximum likelihood estimator, Bayesian methods, and bootstrap corrections. We performed extensive simulations to verify the quality of the estimators for samples up to 200. The computational results show that accurate estimates in terms of the lowest mean squared errors can be obtained for a broad range of values in the parametric space by using the Jeffreys' prior. A numerical example is analyzed in detail, the limitations of the results are discussed, and notable topics to be further developed in this research area are presented.

Keywords: Estimation; Markovian queues; finite queues; bias; bootstrap.

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