

This is a review text file submitted electronically to MR.

Reviewer: Konstantopoulos, Takis

Reviewer number: 68397

Address:

Department of Mathematics
Uppsala University
PO Box 480
SE-75106 Uppsala
SWEDEN
takiskonst@gmail.com,takis@math.uu.se

Author: Ghosh, Arka; Ryan, Sarah M.; Wang, Lizhi; Weerasinghe, Ananda

Short title: Heavy traffic analysis of a simple closed-loop supply chain.

MR Number: 2739336

Primary classification: 60K25

Secondary classification(s): 60K20, 93E20, 60K10, 60K30

Review text:

In reviewing this paper, it occurred to me that I would like to remind the reader that we should often judge a paper's value not only as a function of its mathematical content, but also in terms of its ability to transform a practical problem into a (tractable!) mathematical model. Mathematically, the paper under review is a rather simple 2-dimensional stochastic process and an associated control problem. The process is a discrete-event system, driven by Poisson processes. It is shown that it possesses a natural diffusion approximation by a 2-dimensional Brownian-driven system. A control problem is formulated and solved (under several assumptions), both in the time-average and the long-term discounted cases. The time-average case is easier as it reduces to a 1-dimensional problem. The approach is not via dynamic programming but a direct one, owing to the representation of reflectors via Skorokhod reflection maps. The optimal controls are shown to be approximately optimal for the original system. This is verified by numerical experiments. The story of how the model arises is rather interesting in its own sake, describing a supply chain where customers demand expensive new or cheaper refurbished products (the latter made available, e.g., via product returns).