Input uncertainty quantification on supply chain simulation optimization using Bayesian view

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Abstract

Accounting for uncertainties has been a profound feature for a robust simulation study. Various attempts have been dedicated to incorporate such uncertainties by means of quantification, reduction, and risk mitigation and assess the effectiveness of such attempts in various types of queueing systems representing generic models with wide applications. In contrast, this study will focus on exploiting the potential uses of input uncertainty quantification in updating the credible confidence interval resulting from the Bayesian approach on treating the input uncertainties. More specifically, this study deals with problems emerging in supply chain settings where the decisions are highly inter-related representing systems with complex interaction in its decision variables. The initial findings suggest that the traditional approach which relies either on a naive point estimate or even a conventional frequentist confidence interval that assumes perfect input modeling may lead to biased decisions, and hence yielding a sub-optimal result. Furthermore, when the data available for input modeling is very limited, therefore constitutes high risks and dominant input uncertainties, the frequentist view will likely depart further from the optimality when one conducts a simulation optimization. Thus, mechanisms accounting for input uncertainty using Bayesian models should be favored as they account well for the associated risk inherited from input uncertainty.

Keywords
Input uncertainty, simulation optimization, Bayesian model, supply chain modeling

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Biography
Mansur M. Arief is a Master's student in Industrial & Operations Engineering (IOE) at the University of Michigan (UM). He completed his bachelor degree in Industrial Engineering Department at Sepuluh Nopember Institute of Technology (ITS) in Surabaya, Indonesia. His primary research interests lie in the area of stochastic optimization, simulation modeling, and the applications in supply chains and intelligent transportation systems. Currently, he is assisting a research related to intelligent transportation systems affiliated with UM Transportation Research Institute (UMTRI) while pursuing his Master's from UM-IOE and SCM MicroMaster's from MITx. In addition to serving as the lead technical operations for Operations and Supply Chain Management (OSCM) Forum and Operations and Supply Chain Management: An International Journal, Mansur also actively engages with the Institute for Operations Research and the Management Sciences (INFORMS) Student Chapter at the University of Michigan and the Indonesian Supply Chain and Logistics Institute (ISLI).