

Hannah Yee

Dual sourcing under non-stationary demand with a partially observable demand process

We study dual sourcing under stochastic and non-stationary demand. The non-stationarity is modeled through changes in the underlying demand distribution. The actual demand distribution is not observed directly, yet demand observations reveal partial information about it. We propose a replenishment policy where a pre-committed base order from the slow source is complemented with flexible short-term orders from both the fast and slow source. The pre-committed order is available at a lower cost, while flexible orders can be adjusted to the actual inventory needs and the non-stationary demand. By formulating the problem as a partially observable Markov decision process, we show that the optimal flexible orders follow an adaptive dual base-stock policy when the lead time difference between both sources is one period. The base order is optimized in combination with the flexible orders in a two-stage solution algorithm. We implement our policy in a representative dual transport mode case study. Our findings show that our policy increases the use of slow sourcing, resulting in a positive environmental impact without increasing costs.