

An (s, k, S) fluid inventory model with exponential leadtimes and order cancellations

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We consider a stochastic fluid inventory model for a single-item infinite horizon, based on an (s, k, S) policy. The content level I increases or decreases according to a fluid-flow rate modulated by an n -state continuous-time Markov Chain. I starts at $I(0) = S$ but is not bounded from above; whenever $I(t)$ drops to level s , an order is placed, which the supplier will carry out after an exponential leadtime. However, if during the leadtime the content level reaches k the order is suppressed and a penalty cost is paid.

Four types of costs are considered: the set-up cost, the variable delivery cost, the holding cost for the stock and the penalty cost for the backlogged demand. We obtain explicit formulas for the expected discounted costs. The derivations are based on optional sampling of a multi-dimensional martingale and on fluid flow techniques.