Economic order quantity for perishables with decreasing willingness to purchase during their life cycle

Ronald David Suárez Díaz, Carlos D. Paternina-Arboleda, José Luis Martínez-Flores, Miguel A. Jimenez-Barros

Abstract

In an inventory management model for perishables, depletion due to interacting with the demand is of importance, but also, damage to products is a relevant variable. This article considers that demand and sales phenomena do not always gohand-in-hand. The demand process relates tothe willingnessto acquireproducts in goodcondition, givingthecustomerthepowertoevaluatethequalityoftheproductbeforeaneffectivepurchase takes place. We also considered the cost of disposing of unsold units, besides the conventional costs for storage and procurement. We then proposed a mathematical model to derive the Economic Order Quantity (EOQ) under specific conditions, in order to minimize the expected management cost of perishables, assuming constant demand and linearly decreasing purchase probability during the product life cycle. We proposed several random instances and validate the mathematical model using simulation. We then found the optimal parameters for the inventory policy using a third-order numerical approximation. Last, we developed a sensitivity analysis over the product life cycle to prove that the proposed model approximates to a traditional EOQ model for perishables when life cycle is sufficiently large.

Keywords