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持有成本和变质率时变的非立即变质品库存策略

李贵萍¹, 段永瑞², 霍佳震², 熊德平¹

1. 宁波大学商学院, 浙江 宁波 315211;
2. 同济大学经济与管理学院, 上海 200092

Inventory Policy for Non-instantaneously Deteriorating Items with Time-varying Holding Cost and Deterioration Rate

LI Gui-ping¹, DUAN Yong-rui², HUO Jia-zhen², XIONG De-ping¹

1. Business School, Ningbo University, Ningbo Zhengjiang 315211, China;
2. School of Economics and Management, Tongji University, Shanghai 200092, China

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摘要 本文主要研究非立即变质品的库存策略设计问题。以平均利润最大化为决策目标,构建了一个一般化的库存模型,假设需求受即时库存水平影响且在保鲜期和变质期内库存水平对需求的影响系数不同,持有成本和变质期内的变质率均随时间发生变化,系统允许缺货且短缺量部分延迟订购。进一步证明了当参数满足一定条件时,模型存在唯一的最优解。最后,采用牛顿法给出一些具体的数值算例,并对模型中主要参数的灵敏度进行了分析。结果显示:延长物品的保鲜期将有助于增加系统的平均利润;增加变质期内的需求比增加保鲜期内的需求更有利于增加系统的平均利润;对于变质率高的产品来说,其变质处理成本对最优策略和平均利润的影响不容忽视。此外,本文所构建的模型具有一般性,因此,其应用范围更加广泛。

关键词: 非立即变质品 需求依赖于库存水平 时变持有成本 部分延迟订购

Abstract: This paper aims to investigate the inventory policy for non-instantaneously deteriorating items. A generalized inventory replenishment model is formulated by maximizing the average profit of the system. In the model, it is assumed that the demand rate is influenced by the instantaneous inventory level with different influence coefficients in the deterioration period and non-deterioration period, the deterioration rate in the deterioration period and the holding cost are time-varying, shortage is allowed and the unmet demand is partially backlogged in the shortage period. The sufficient condition for the existence of the unique optimal solution to the model is presented. Finally, some numerical examples and the sensitivity analyses on the main parameters are given using the Newton's method. The results indicate that, to prolong the non-deterioration period of items will be helpful to the increase of the system's average profit. The increase of the demand in the deterioration period is more beneficial to the increase of the system's average profit than that in the non-deterioration period. For deteriorating items with high deterioration rate, the influence of the disposal cost of the deterioration items on the optimal policy and the average profit is significant. Besides, the model formulated in this paper is generalized, so it has a wide range of application.

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作者简介: 李贵萍(1988-),女(汉族),山西人,宁波大学商学院博士,讲师,研究方向:库存与供应链管理。

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