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无统计信息假设下的多阶段报童决策

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Decision-making for Multi-period Newsvendor Problem Without Statistical Information Assumption

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摘要

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摘要 在不对需求做任何统计假设的情形下,该文用理论计算科学兴起的集成专家意见的弱集成算法研究多阶段报童决策。弱集成算法是一种指数加权平均集成方法,在一定的初始权重下,根据损失函数在线调整专家意见的权重。基于收益损失函数和固定订购量的专家意见,得到了与从累积收益角度研究相一致的决策方法;并扩展研究了带有回收价值的情形。理论上证明了决策方法的累积收益损失几乎不超过最优专家意见的累积收益损失。通过数值算例验证了决策方法的可行性和合理性,探讨了卖出价和成本价等因素对竞争性能的影响,说明了回收价值的引入大大提高了决策方法的竞争性能,具有重要的现实意义。

关键词: 多阶段报童问题 回收价值 无统计假设 弱集成算法 收益损失函数

Abstract: The Weak Aggregating Algorithm (WAA) of prediction with expert advices, which advanced in computer science, is applied to study the multi-period newsvendor problem without making statistical assumption. WAA is an exponentially weighted average algorithm that updates the expert advice's weight according to loss function with initial weights distribution. Based on the return loss function and the expert advice of fixed stock level strategy, the decision-making method is used in this paper, which is in accord with the conclusions obtained using return function; and the case with salvage value is extended. Theoretically, it is proved that the cumulative loss the proposed decision-making method achieved does exceed that of the best expert advice. Numerical examples are presented to further illustrate the feasibility and rationality of the proposed decision-making method and explore the effect of selling and cost price on competitive performance; the results show that the introduction of salvage value greatly improves the competitive performance of the proposed decision-making method and thus presents important practical significance.

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