

Revenue Management of Perishable Products Considering Freshness and Price Sensitive Customers

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Abstract : Global grocery and supermarket sales are among the largest markets in the world and perishable products such as fresh produce, dairy and meat constitute the biggest section of these markets. Due to their deterioration over time, the demand for these products depends highly on their freshness. They become totally obsolete after a certain amount of time causing a high amount of wastage and decreases in grocery profits. In addition, customers are asking for higher product variety in perishable product categories, leading to less predictable demand per product and to more out-dating. Effective management of these perishable products is an important issue since it is observed that billions of dollars' worth of food is expired and wasted every month. We consider coordinated inventory and pricing decisions for perishable products with a time and price dependent random demand function. We use stochastic dynamic programming to model this system for both periodically-reviewed and continuously-reviewed inventory systems and prove certain structural characteristics of the optimal solution. We prove that the optimal ordering decision scenario has a monotone structure and the optimal price value decreases by time. However, the optimal price changes in a non-monotonic structure with respect to inventory size. We also analyze the effect of 1 different parameters on the optimal solution through numerical experiments. In addition, we analyze simple-to-implement heuristics, investigate their effectiveness and extract managerial insights. This study gives valuable insights about the management of perishable products in order to decrease wastage and increase profits.

Keywords : age-dependent demand, dynamic programming, perishable inventory, pricing

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