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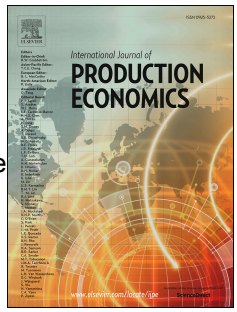

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Optimal order quantity and selling price over a product life cycle with deterioration rate linked to expiration date

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Abstract

It is evident that the lower the price, the higher the demand. Therefore, price is an important factor in a consumer's purchasing decision. Additionally, for today's health-conscious consumers, product freshness is another important factor in purchasing decisions. Since product freshness declines over time, today's health-conscious consumers prefer a perishable product with a longer "sell-by" date to a shorter one. Moreover, a product's demand rate moving through its life cycle can be approximately represented by a trapezoid-type pattern which includes constant demand, increasing demand, and decreasing demand as special cases. In existing literature, several researchers have developed inventory models for trapezoidal demand. However, they failed to consider pricing strategy, product freshness linked to expiration date, and purchasing cost. In this study, we enhance previous models by (1) taking pricing into consideration, (2) exploring deterioration rate linked to expiration date, and (3) adding an appropriate non-constant purchasing cost. We then derive theoretical results, and run numerical examples to obtain managerial insights. For instance, the total profit without purchasing cost is significantly lower than that with purchasing cost included. Also, if the cost of lost sales is improperly low, then the total profit may become negative due to a large amount of lost sales.

Keywords: Inventory control; Pricing; Trapezoid-type demand; Deteriorating items; Expiration date.

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