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Chapter 7
Inventory Policies with Development Cost for Imperfect Production and Price-Stock Reliability-Dependent Demand

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Abstract This article focuses on developing a model based on inventory dealing with the product's sell price-stock as well as reliability-dependent demand; also it undergoes a production process which is imperfect including manufacturing of perfect as well as imperfect quality products. As such, each production firm believes in the production of perfect quality goods but because of various uncontrollable barrier factors like machinery, labor, technology, and also due to the long-run process, the production, therefore, includes imperfect quality items along with perfect quality products. The products which are perfect are ready to sell out; on the other hand, the imperfect products undergo the reworking process owing a cost to become a perfect product. By inclusion of the cost of development also by modifying the raw material quality of production system, several considerations like product's reliability, the system's reliability parameter, and the reworking cost can be upgraded. The aim of this article is to calculate the firm's total profit along with the estimation of optimal values of production duration such that a manufacturer gets a maximum profit, manufacturing system's reliability parameter, and product's reliability. The classical optimization technique is utilized for calculating the optimal values. For the validation of developed models, numerical examples are demonstrated; then using the concept of eigenvalues of a Hessian matrix, we have proved the concave nature of the profit function of the system, and also the sensitivity analysis is done for each decision variables by fluctuating the inventory parameters for generating effective managerial insights.

Keywords Selling price-stock and reliability-dependent demand · Imperfect production process · Reworking process · Deteriorating items · Development cost

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