Optimal ordering policy for an economic order quantity model with inspection errors and inspection improvement investment

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ABSTRACT

The rise of consumer rights has caused businesses to focus increasingly on product quality. The inability of businesses to identify defective items before selling them results in higher return costs, decreased sales revenue, damaged reputations, and decreased competitiveness. This study examines the economic order quantity (EOQ) model in which the retailer discovers defective goods among received products. Although retailers conduct quality inspections, the inspection process is imperfect. We assume that Type I and Type II inspection errors occur during product quality inspection and that the market demand rate is sensitive to Type II inspection errors. To improve inspection, the retailer invests capital to decrease Type II inspection errors. This study investigates the optimal order quantity and the power of the test to maximize total profit per unit time. Mathematical analysis is used to show the optimal solution exists. An algorithm is then developed to calculate the optimal solution. Finally, numerical examples demonstrate the solution process and sensitivity analysis with respect to major parameters is carried out.

Keywords: inventory; defective products; inspection error; power of the test; capital investment