

A Study of the Impacts of Uncertainty on EPQ Model

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ABSTRACT

Many supply chain management models, ignoring the uncertainty of demand, have dealt with the delivery under the assumption of steady demand. Recently the issue of disruption management of supply chain is drawing to more attention. Basically disruption can be classified into two types: demand disruption and supplies disruption. Demand disruptions have impacts on consumers, retailers, wholesalers, manufacturers and suppliers in the entire supply chain. Even minor fluctuations can propagate through large portions of a supply chain causing major management problems, raising costs and reducing customer service. For some cases, either demand or supply disruption occurs in only one direction. However, sometimes it occurs simultaneously in both directions. This research is focused on the uncertainty occurring at the manufacturer where economic production quantity (EPQ) is implemented to control its inventory. Traditional EPQ model assumes that the machine is failure-free, namely no machine shut-down. However, machine breakdowns are inevitable and the machine may breakdown randomly. This study extends the traditional economic production quantity by taking account of the uncertain supply. Machine breakdown is key cause for the uncertain supply where production process up-time duration is exponentially distributed. This research production of period in view of economic production quantity carries on the analysis discussion machine of damage pattern with the non-production period. This research discusses the EPQ model to include machine breakdown occurrence: (1) during the production period machine breakdown; (2) during the non-production period machine breakdown. The extended model is equivalent to EPQ at the extreme cases. This model facilitates to conduct a better delivery quantity control. More numerical examples and sensitivity analysis are also conducted to demonstrate its application for the real-world situation.

Keywords : economic production quantity ; uncertainty ; supply disruption ; machine breakdown

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