ABSTRACT

The present research work proposes inventory models for value deteriorating items, such as electronic gadgets, domestic appliances, vehicles and fashion goods, which have random shelf life and which are typically demanded only one at a time by the customers. We have developed models for continuous review inventory system and assume zero lead time in all the models proposed by us. The work presented here differs from the available literature in several aspects viz. type of items, demand pattern, and calculation of holding cost.

We start by developing an inventory model specifically for discrete items and compared it with classical EOQ model.

Next, we develop stochastic inventory models, assuming that the demand is generated according to a Poisson process in terms of customer inter arrival process being Poisson with every customer having a unit demand. Due to our assumptions, the actual holding cost is random and depends on the time points at which actual demands occur. The replenishment is assumed to be instantaneous and hence the new order is placed only when (and as soon as) inventory level reaches zero. This also results into the random cycle length.

We give comparison of the models developed in chapters 2 and 3 and also compare them with classical EOQ model. We also indicate a scenario in which the models proposed by us provide better results.

Most of the inventory models for deteriorating items available in the literature assume that deterioration rate is exponential or Weibull or gamma distribution.

All of these distributions are suitable for operational life of an item, rather than the shelf life which is more relevant for modeling inventory systems. Most of the classical literature on inventory models for deteriorating items assumes that the items are fully useful up to some stage and totally useless thereafter. Deterioration of this type of item is similar to failure of an item. However, in practice deterioration also takes place continuously for many items. Modeling of inventory for such items (value deteriorating items) is also very important. We further observe that, our assumptions result into random cycle lengths for our models.

A product whose shelf life is uncertain is referred to as a product with random life time. For example, fashion/style goods, mobiles, electronic items etc. In the present research work we focus on developing models for such items.

Items which lose their value through time because of new technology or the introduction of new product or low stock can also be considered as value deteriorating items. For example, Price of the style goods must be reduced after some time. It is necessary develop and investigate suitable models for such items. The present work proposes models for value deteriorating items. These are the items which must be sold at reduced price.

We develop models for inventory systems in which sellers reduce the price for any of the following objectives/ circumstances

- To maintain the demand rates when inventory levels go down.
- After a specified duration T_0, if there are any unsold items

- In response to some event such as new technology or the introduction of alternative products in market.

In items such as fashion goods, it is generally seen that the demand is influenced by inventory levels. As inventory level decrease, demand of the item also decreases. Normally sellers reduce the price in order to maintain the demand rates which may otherwise reduce.

In Chapter 4, we present an inventory model for the system in which the items are initially sold at price p_1 per unit, and later at a reduced price p_2 per unit when stock level drop below a specified level. The demand is assumed to be Poisson and holding cost is incurred only for the period during which the inventory items are in the stock. Formula for the optimal order quantity is derived.

We also present an inventory model, in chapter 5, for the systems in which the items are initially sold at a regular price p_1 per unit, and after a specified duration T_0, the unsold items, if any, are sold at a reduced price p_2. It is assumed that this price reduction helps in maintaining the demand rates for the items. The demand is assumed to be Poisson and holding cost calculation is same as in the previous model. As the closed form expression for optimal order quantity is not obtainable, we present a program in C++ to obtain optimal order quantity and the associated minimum cost.

We also propose an inventory model, in chapter 6, for the system in which the items are initially sold at a regular price p_1 per unit and later at a reduced price p_2 in response to some event like new technology or the introduction of alternative product, which may occur at a random time point T. It is assumed

that this price reduction helps in maintaining the demand rate which may otherwise reduce. Here, the event occurrence time T is assumed to be a random variable having exponential distribution. The demand is assumed to be Poisson and assumption for holding cost is same as for the previous models. As the closed form expression for optimal order quantity is not obtainable, we present a program in C++ to obtain optimal order quantity and the associated minimum cost.