Chapter 17
Two-Way Substitutable Inventory System with N-Policy

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ABSTRACT

This article presents a two commodity stochastic inventory system under continuous review. The maximum storage capacity for the i-th item is fixed as $S_i$ $(i = 1, 2)$. It is assumed that demand for the i-th commodity is of unit size and demand time points form Poisson distribution with parameter $\lambda_i$, $i = 1, 2$. The reorder level is fixed as $s_i$ for the i-th commodity $(i = 1, 2)$ and the ordering policy is to place order for $Q_i (= S_i - s_i)$ items for the i-th commodity $(i = 1, 2)$ when both the inventory levels are less than or equal to their respective reorder levels. The lead time is assumed to be exponential. The two commodities are assumed to be substitutable. That is, if the inventory level of one commodity reaches zero, then any demand for this commodity will be satisfied by the item of the other commodity. If no substitute is available, then this demand is backlogged up to a certain level $N_i$ $(i = 1, 2)$ for the i-th commodity. Whenever the inventory level reaches $N_i$ $(i = 1, 2)$, an order for $N_i$ items is replenished instantaneously. For this model, the limiting probability distribution for the joint inventory levels is computed. Various operational characteristics and expression for long run total expected cost rate are derived.

INTRODUCTION

In many practical multi-item inventory systems concentrated the coordination of replenishment orders for group of items. Now a days it is very much applicable to run a successful Business and Industries. These systems unlike those dealing with single commodity involve more complexities in the reordering procedures. The modelling of multi-item inventory system under joint replenishment has been receiving considerable attention for the past three decades.

In continuous review inventory systems, (Ball-Intfy, 1964) and (Silver, 1974) have considered a coordinated reordering policy which is represented by the triplet $(S, c, s)$, where the three parameters $S_i$, $c_i$ and $s_i$ are specified for each item i with $s_i \leq c_i \leq S_i$, under the unit sized Poisson demand and constant lead time. In this policy, if the level of i-th com-
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Consider a two commodity stochastic inventory system with the maximum capacity $S_i$ units for $i$-th commodity ($i = 1, 2$). The demand for $i$-th commodity is of unit size and the time points of demand occurrences form independent Poisson