An Integrated Vendor: Buyer Model with Uncertain Lead Time, Life Time Under Inflation and Variable Holding Cost

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ABSTRACT

This paper considers the problem of a vendor which supplies an item to the buyer with imprecise partial backlogging rate of unsatisfied demand and non instantaneous deterioration rate considering variable holding cost, the effect of inflation and time value of money. Supplier’s lead time is a stochastic function of his managing cost. The extra costs incurred on the retailer due to the uncertain lead time in terms of shortages costs or lost sales costs should be owed by the supplier. A numerical example is cited to illustrate the results and its significant features. Finally, to study the effect of changes of demand parameters, deterioration, inflation and managing cost on supplier and the retailer’s profit, a sensitivity analysis is presented numerically.

Keywords: Inflation, Lifetime, Partial Backlogging, Supply Chain, Uncertain Lead Time, Variable Holding Cost

INTRODUCTION

Besides, in almost every business, supplier suffers from the problem of uncertain lead time at his end as well as the lead time is inversely proportional to the managing cost of the supplier. More the supplier is ready to spend as the managing expenses; smaller will be the lead time and vice-versa. However, there is a constraint upon the cost; the supplier can afford to spend. Due to his goodwill supplier is also willing to owe the extra cost incurred on retailer in terms of shortages cost and lost sales cost due to uncertain lead time. Due to the uncertainty of the arrival of replenishment unsatisfied demand is fulfilled at an imprecisely partially backlogging rate.

Liao and Shyu (1991) showed that lead time can be controlled through crashing. Later on, Ouyang et al. (1999) investigated uncertain lead time and studied the effect of cost reduction in a continuous review inventory model. Even then, this is a realm which has not been sufficiently explored by researchers.

Another area which is comparatively untouched is the concept of capital constraint for the supplier. However, as is very much evident from the face of facts, this constraint is very common. Khouja and Mehraz (1996) explored

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a constrained multi product newsboy problem with progressive multi discount. Lau and Lau (1996) in the same year studied the newsstand problem for a capacitated multi product single period inventory system. Other researchers related to this area such as Khouja (1999) and Pasternack (2001) etc.

The supply chain models in inventory are a comparatively new foray for researchers. The series of firms that eventually make products and services available to consumers, including all the functions enabling the production, delivery and recycling of the materials, components, end products and services, is a supply chain. The term supply chain refers to the complex sequence of activities, information and material flow involved in producing and distributing a firm’s outputs. It consume vast amount of capital in the form of plant, equipment and inventories and are responsible for most of a firm’s cost-of-goods and operating expenses. It creates significant value and ultimately determines a firm’s ability to satisfy the demands of its customers. As a result, effective supply chain management is a major strategic challenge for most firms. But formulating effective strategy requires a good understanding of what drives cost and service in a supply chain. Supply chain management is the systematic, strategic coordination of the traditional business functions and the tactics across these functions within a particular company and across businesses within the supply chain for the purposes of improving the long-term performances of the individual companies and the supply chain as a whole.

Nowadays, companies can no longer compete solely as individual entities in the constantly changing business world. Globalization of market and increased competition forces organizations to rely on effective supply chains to improve their overall performance. Supply chain has become a vital topic in management science and industry. When individual firms in the supply chain make business decisions that ignore the interests of other chain members, then this sub-optimization only transfers costs and additional waiting time along the supply chain. This ultimately leads to higher end product prices, lower supply chain service levels and consequently lowers end-customer demand. For this reason, supply chain management definitely needs some extra concern on the part of the managers. If supply chain inventory information is not shared or exchanged among different parties in the supply chain it can lead to weakly connected activities and decisions across the supply chain. Today, timely sharing and coordination of information across the supply chains in addition to the emerging capabilities have changed the way supply chains operate. The global visibility of inventory profiles across the supply chain leads to reduced costs and improved customer service.

In supply chain many problems still need a careful consideration regarding solution procedure to support respective systems. Furthermore, collaborative relationships that focus on reducing the uncertainty in operating environments by employing improved information systems and business processes will result in more efficient allocation of key resources, faster response times to market forces and more reliable supply chain performance. However, these collaborative arrangements by themselves cannot compensate for fundamentally flawed and operationally ineffective manufacturing and distribution environments. Supply chain management deals with total process excellence and represents a new way of managing the business and relationships with other members of the supply chain.

There has been especially very limited research for a supply chain. The idea of joint total cost of the supplier and the customer was first introduced by Goyal (1976). Later, Cohen and Lee (1988) determined material requirement for all materials at every stage in a supply chain. Subsequent contributions in this direction came from researchers like Pake and Cohen (1993), Gyana and Bhabha (1999), Sarker et al. (2000), Chein and Lin (2004) and Ahmed et al. (2007) etc.
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