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A COMPARISON OF JOINT ORDERING RULE AND OTHER INVENTORY ORDER SYSTEMS

Hüseyin ÖZGEN*

The typical manufacturing corporation has about fourty, or fifty percent of its total assets invested in inventory items. Because of this reason, inventory control is considered to be one of the most important problems that deserves a special attention of top management. There are several different inventory control techniques that can be used in inventory management. The joint ordering rule discussed here, is sone of the most powerful techniques. This paper presents a comparison of joint ordering rule and other inventory order systems. A large number of articles or scientific papers has been written about this subject than any other in the field of production management. However, there are a lot of limitations and shortcomings about the applicability of those written papers. This paper tries to that the joint ordering rule is the most practical approach that can be used in inventory management.

I.INTRODUCTION

Inventory control is one of the most important problems that deserves a special attention of top management. For many manufacturing corporations inventories are one of the most important figures in the total assets. The efficiency in inventory control activities determines whether the business management is successful or not. The typical manufacturing organization has about fourty percent of its total assets invested in inventory items such as raw materials, semifinished products, supplies, finished products, and so forth.

There are several different inventory control techniques that can be used in inventory management. The joint ordering rule discussed here, is one of the most powerful inventory control techniques. The purpose of this paper is, to describe the joint ordering rule, compare it with other inventory order systems, and then show its potential uses in inventory management. This paper consists of three sections, the joint ordering rule is defined in section one, other inventory order systems are discussed in section two, and concluding remarks are mentioned in the last section.

II.THE JOINT ORDERING RULE

The joint ordering rule can be defined in terms of three parameters, S,B. and C, were S is the maximum inventory level, B is the reorder point, and C determines the items that should be included in the order. References dealing with this issue are (1), (2), (3), (4) and (5).

The term joint ordering means that a different number of inventory items are included in a single purchase order. The joint ordering rule is defined as follows: All inventory items which have inventory levels between the range C and B are ordered jointly. The order size for each inventory item is given by the inventory on hand plus on order.

The objective function of the joint ordering rule is to minimize the sum of the order costs, inventory holding costs, and backorder costs. The optimum solution can be obtained by minimizing the total inventory costs regarding to the joint ordering rule.

The time to order, and the quantity to order, are the two important decisions in an inventory control system where a single inventory item exists. On the other hand, in a case where a joint ordering rule is used, it is necessary to determine a third parameter, or decision, which items should be ordered jointly. It was believed that these basic decisions could be made if the joint ordering rules were applied. However, there is an important problem about grouping inventory items. In other words, what criteria should be used to group the items? The criteria about grouping may be stated as follows:

1. Natural grouping,
2. On the basis of demand
3. Nature of the source of supply, and
4. Nature of production process.

It is impossible to determine the best grouping method. However, the review of inventory control literature shows that the grouping of inventory items on the basis of demand is the best method for a joint ordering rule.

III.REVIEW OF THE LITERATURE

In the literature of inventory control there are many different joint ordering models that can be used in inventory control. Some of them are:

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* Associate Professor, Çukurova University, Faculty of Economics and Administrative Sciences, Department of Business, Adana/TURKEY.

(1) Adama, E.A. Jr. and Ebert, R.J., Production and Operations Management, Englewood Cliffs, New Jersey, Prentice Hall, 1982, Chaps. 15 and 16.

(2) Buchan, J. and koenigsberg, E., Scientific Inventory Management., Englewood Cliffs, New Jersey, Prentice Hall, 1966, Chap. 20.

(3) Hadley, G. and Whitin, T.M., Analysis of Inventory Systems, Englewood Cliffs, New Jersey, Prentice Hall, 1963, Chaps. 4,5, and 6.

(4) Magee, J.F. and Boodman, D.M., Production Planning and Inventory Control New York, McGraw Hill Book Co. 1967, Chap.6.

(5) Tersine, R.J., Production/Operations Management, New York, North Holland Inc. 1980, Chap. 20.

Ballintfy's Random Joint Order Model (6), Magee and Boodman's Multi-Item Model (7), Maynard's Group Ordering Rules (8), Silver's Two Item Rule (9) and Starr's Constrained Control of Multiple Items (10).

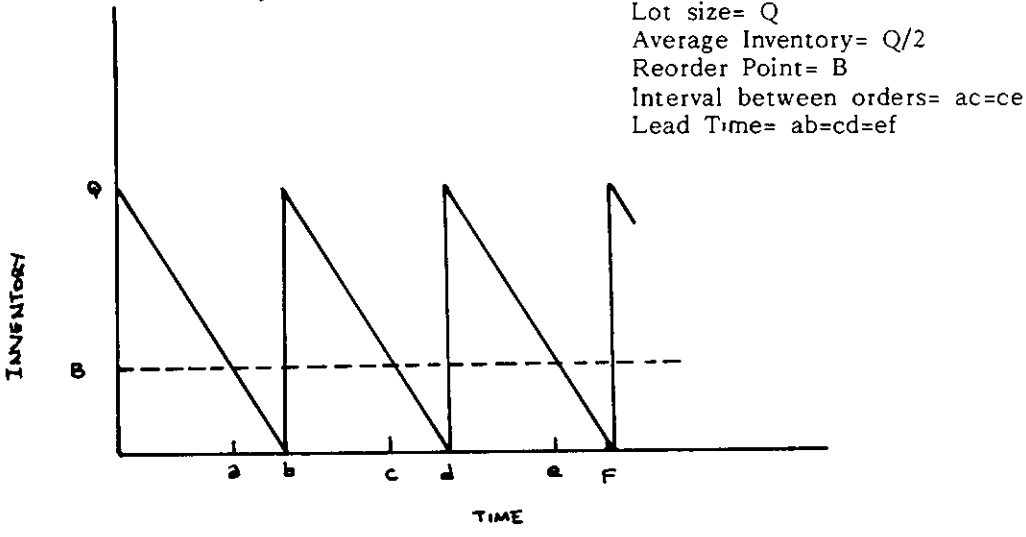
IV.OTHER INVENTORY ORDER SYSTEMS

A.The Fixed Order System

The fixed order system is the most commonly used inventory control system. There are a fixed order quantity, and a variable order interval in this system. With this system, an important reduction is obtained in clerical work. The fixed order system can be used to control those inventory items which have low value, fairly consistent use, and short lead time, such as office supplies, nuts, bolts, and so forth.

The reorder quantity can be determined when the stock is drawn down to the expected demand during the lead time period, plus the safety stock. Figure 1 exhibits a typical fixed order sytem.

FIGURE 1
The Fixed Order System



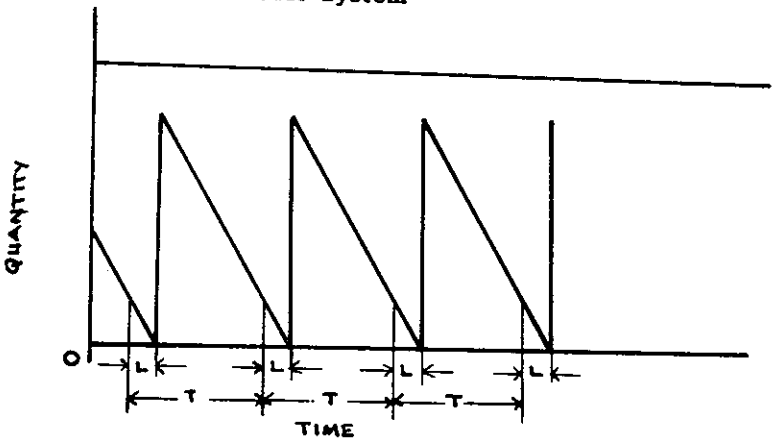
SOURCE: Tersine, R.J., Production/Operations Management, New York, North Holland Inc., 1980, p.529.

(6) Ballintfy, J.L., "On a Basic Class of Multi-Item Inventory Problems" Management Science, Vol.10, No:2, January 1964, pp.287-297.
(7) Magee, J.F. and Boodman, D.M., op.cit. pp.152-157.
(8) Maynard, H.B., Industrial Engineering Handbook, New York McGraw-Hill Book Co., 1956, pp.7-64.
(9) Silver, E.A., "Some Characteristics of A Special Joint Order Inventory Model", Operations Research, Vol.13, No:2, March-April 1965, pp.319-322.
(10) Starr, M.K., Production Management, Englewood Cliffs, New Jersey, Prentice Hall Inc., 1980, p.321.

B.The Fixed Interval System

The fixed interval system is an inventory system in which the reorder cycle is fixed while the order quantity varies depending on demand. In this system, orders are placed at equally predetermined points in time, and the demand rate is constant. The reorder quantity varies according to the fluctuations in use between orders. Orders may be placed weekly, monthly, or on some other cycles. A typical interval order system is shown in Figure 2.

FIGURE 2
A Fixed Interval Order System



SOURCE: Tersine, R.J., Op. cit. p.536.

C.The (s,S) System

The (s,S) system is a composition of the perpetual and periodic review systems. Stock levels are reviewed at regular intervals, but orders are not placed until the inventory position has fallen to a predetermined reorder point (11). In this system, s is the maximum inventory level. Figure 3 exhibits the basic characteristics of the (s,S) system.

If inventory on hand plus the inventory on order is above the reorder point, s, no order is placed. If the inventory position is at or below the reorder point, s, an order is placed. According to this system, the order quantity is the maximum inventory level minus the inventory level at the review period. On the other hand, Magee and Boodman (12). defines (s,S) system as follows:

1.Choose two inventory levels S and s, S larger than s.

2.At each review period, compare the available inventory I with S and s.

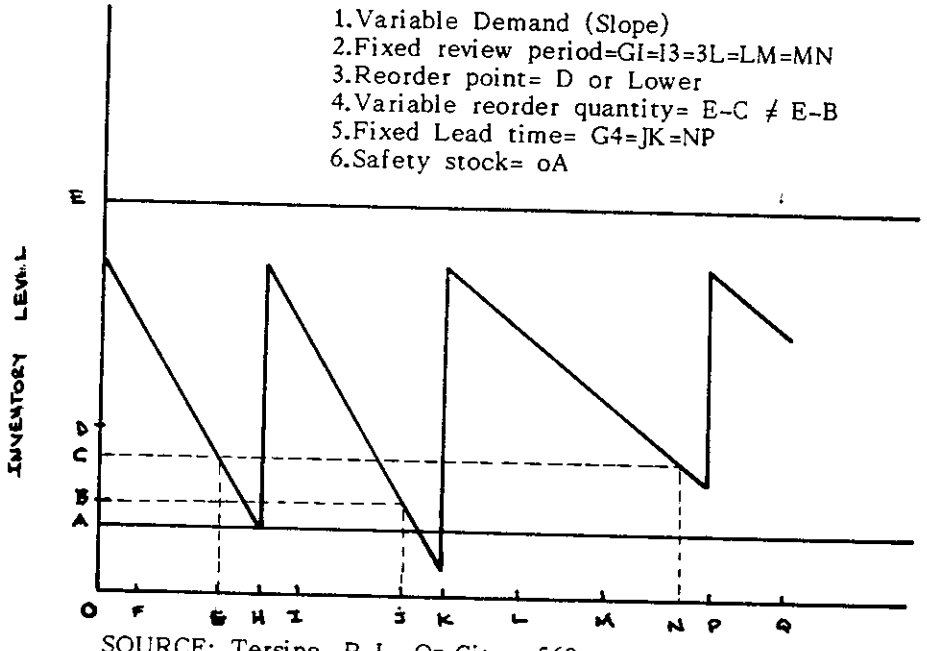
3.If I lies between S and s, place no order. If I is at or below the level s, place an order for amount equal to S - I.

(11) Tersine, R.J., op. cit. p. 568.

(12) Magee, J.F. and Boodman, D.M., op.cit. pp.152-157.

As can be seen from the above definitions, the (s,S) system is controlled by three variables, the maximum available inventory S, the reorder point s, and the length of review period or interval between reviews.

FIGURE 3
The (s,S) System



SOURCE: Tersine, R.J., Op.Cit. p.569.

D.Choice of System

Each of the inventory order systems described above has certain advantages and disadvantages. The advantages of the fixed order system are mentioned by Magee (13) as follows:

1. Where some type of continous monitoring of the inventory is possible, either because of the physical stock is seen and readily checked when an item is used or because a perpetual inventory record of some type is maintained.
2. Where inventory consists of items of low unit value purchased infrequently in large quantities with usage rates; or where otherwise there is less need for tight control.
3. Where the stock is purchased from an outside supplier and represents a minor part of the supplier's total output, or is source whose schedule is not linked to the particular item or inventory in question; and where irregular orders for the item from the supplier will not cause production difficulties.

(13) Magee, J.F., "Guides to Inventory Policy: Functions and Lot Sizes", Harvard Business Review, January-February 1956, pp.49-60.

One the other hand, the (s,S) system has the advantages of close control associated with the perpetual system and fever item orders associated with the periodic system.

Tersine (14) lists the advantages of joint ordering systems as follows:

1. A reduction in ordering cost may be possible because items are processed under a single order.
2. Suppliers may offer discounts for purchases exceeding a given monetary volume. The lumping of several items into a single order can make the discount more attainable.
3. Shipping cost may be significantly decreased if an order is of a convenient size such as a boxcar. This can often be accomplished by the simultanous ordering of several items.

V.CONCLUSION

The joint ordering rule and its relationships with other inventory order systems were discussed and analyzed in the above sections of this paper. In a case where a single or a few inventory items are involved, it is very easy to calculate those parameters such as reorder point, economic order size, reorder interval period, safety stock level, and so forth. However, it is seldom possible to come face to face with an inventory problem which consists of a single or a few items in the real business life. In general, several thousands of different inventory items are carried in stock. Thus, it becomes practically impossible to use the ebove mentioned parameters in inventory management which consists of several thousands different items. Because of this reason, it is compulsory to use the joint ordering rules so as to solve the inventory control problems. Additionally, the joint ordering rules have some advantages over other inventory order systems (15) , such as reductions in ordering costs and shipping costs, and quantity discount opportunities.

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(14) Tersine, R.J., op. cit. p.568.

(15) Richard, J.W.and Eagle, R.H., Modern Management, New York, John Wileys and Sons. Inc., 1965, p.360.

Operations Research, Vol.13, No:2, March-April 1965, pp.319-322.
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ÖZET

İmalat sanayi işletmelerinde toplam varlıkların yaklaşık yüzde kırk ya da ellisi farklı kalemlerden oluşan stoklara ait bulunmaktadır. Bu nedenle, stok kontrolü sorunu, üst düzey yönetiminin özel önem verdiği sorunlar arasında yer almaktadır. Bilindiği gibi, sanayi işletmelerinde çoğu kez yüzlerce ya da daha fazla çeşit stok kalemi mevcuttur. Bu çalışmada sözü edilen "Birleşik Sipariş Verme Kuralı", en etkili stok kontrol tekniklerinden birisidir. Bu teknik ile diğer stok sipariş verme sistemlerinin karşılaştırmalı analizinin yapıldığı bu çalışmada stok kontrolü ile ilgili literatürün pratik stok sorunlarının çözümünde yetersiz kaldığı vurgulanmaktadır. Çünkü stok kontrolüne ilişkin teorik çalışmaların çoğunluğu firmada tek kalem stok bulunduğu varsayımından hareket etmektedir. "Birleşik Sipariş Verme Kuralı", özellikle stok çeşit sayısının fazla olduğu stok sistemlerinde daha yararlı ve pratik değer taşıdığından, bu tekniğin uygulama alanlarının yaygınlaştırılması gerekmektedir.