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MODEL OF INVENTORY FOR A DISTRIBUTION COMPANY

Emilia CIUPAN
ciupi@mail.dntcj.ro

Abstract

The paper presents a model of inventory management which can be used by the distribution companies. The ordering size is determined taking in account the sales hstory, duration of deliveries, packing restriction, trend of consumption. The consumption is studied for each ordered product in a larger interval divided into smaller intervals. Considering the consumption in each subinterval will determinate the average balanced consumption and the trend. The ordering size and the command point will be determined in according to the average balanced consumption, trend and transport restrictions.

1. INTRODUCTION

This study proposes to create a model of inventory management specific for comercial societies which activity domain is selling.

This model will be incorporated in a inventory program which permits inventory tracking, the determination of goods ordering size and the starting-up moment of goods ordering.

The ordering size is determined considering the sales history, the amount of time required for supplying and the minimum quantity required by the supplier.

In general, the distribution companies (en gross selling) have more than one supplier, situated in different geografic areas considering the location of the company.

There is a certain time span in which the company receives its supplies because of the fact that the suppliers are situated at great distances from each other.This could disturb or decrease the company`s activities.

Also, ought to the costs of the transports only certain amounts are delivered depending on the type of packing required and transportation.

In general, distribution companies which handle a large amount of data use software which allow continuous tracking of inputs and outputs. As a result the stock level is permanently known.

The distribution companies have to work with inventories, the inventory rupture being unwanted.

Inventories imply supplying costs, maintainence costs, as well as costs caused by lack of stock [1].

Reference [1] presents a series of models for the optimization of the volume of one delivery for statistics systems for inventory management.

To determine the optimal batch and the starting-up moment of the order launching are the most crucial steps in an inventory management system.

2. Model description

Simplifying hypothesis.

Following are considered known:

a. the inventory level at any given moment;
b. the history of sales;
c. issued and unreceived orders;
d. duration of deliveries (d);
e. the inventory rupture is prohibitted;
f. issuing costs, maintainance costs aren`t considered.

We have to determine the stock command point (s) and the batch (Q) based on the history of sales.

A restriction about the determination of the batch is bound to the minimal batch accepted.

To determine the optimal batch, the average balanced consumption on a significant time span (trimester, semester, year etc.) as well as consumption trend will be taken into consideration.

We note T_s for time span and ? for trend.

To make a simple balance of the consumption of T_s we divide it in *n* equal intervals (days, weeks, months etc.): $t_1, t_2, ..., t_n$.

The average balanced consumption is determined as follows:

$$C_{smed} ? \frac{\sum_{i?1}^{n} c_i ?p_i}{\sum_{i?1}^{n} p_i} \qquad (1)$$

where:

c_i – the consumption in the interval t_i

p_i – consumption weight in interval t_i

The consumption trend shows increase or decrease of the demand in a fraction of the timespan T_s close to the start-up of a new order launching.

We consider the timespan t_1 as the first cronological timespan of T_s and t_n the most recent one.

For trend determination we consider k intervals:

$t_n, t_{n-1}, ..., t_{n-k+1}$

The trend ? is determined the following way:

$$? ? \frac{\frac{k}{p} ? \sum_{i?n}^{n?p?1} c_i}{\sum_{i?n}^{n?k?1} c_i} \qquad (2)$$

where 1<p<k.

The command point s is determined:

$$s ? ? ?? ?C_{smed} ?d \qquad (2)$$

The size of demand Q' is determined based on the average balanced consumption $C_{s\,med}$, the trend ?, depending on the inventory level S and unreceived orders C_d :

$$Q' = \mu \cdot C_{smed} \cdot (d + 1) + (S - Cd) \qquad (3)$$

where: μ - adjustement coefficient

d - duration of deliveries (in the same time unit as the t_i intervals)

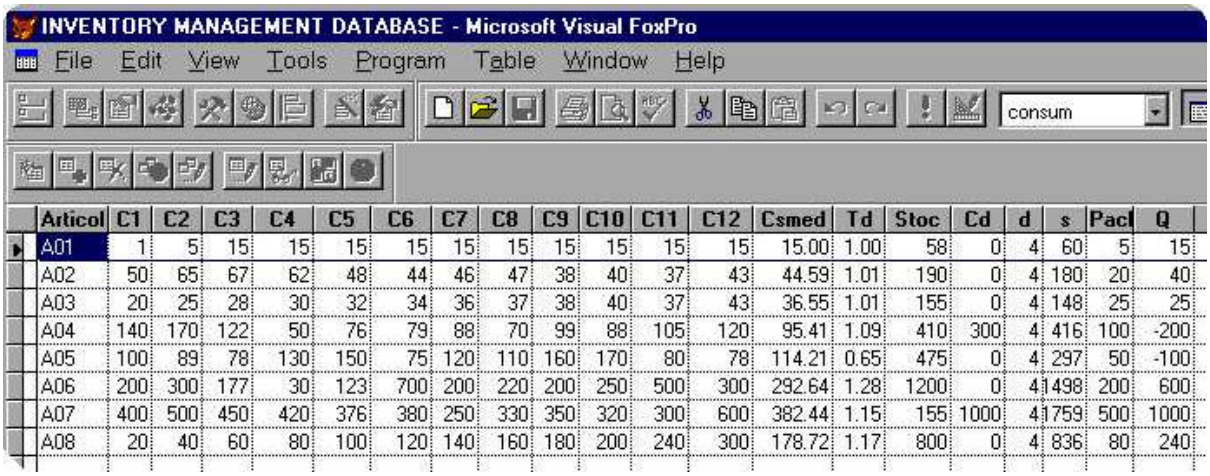
S - inventory level at the moment of issuing the order

C_d - level of unreceived orders

The size of demand Q' will be adjusted in according to the packing restriction Q_{min}:

$$Q = round\left(\frac{Q'}{Q_{min}}\right) \cdot Q_{min} \qquad (4)$$

This model was tested on a database of a distribution company (fig.1). The database contains data refering to volume, weight, packing, minimum delivered quantity and duration of delivery for each ordered product in addition to the main data for the inventory management.



Articol	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	Csmed	Td	Stoc	Cd	d	s	Pacl	Q
A01	1	5	15	15	15	15	15	15	15	15	15	15	15.00	1.00	58	0	4	60	5	15
A02	50	65	67	62	48	44	46	47	38	40	37	43	44.59	1.01	190	0	4	180	20	40
A03	20	25	28	30	32	34	36	37	38	40	37	43	36.55	1.01	155	0	4	148	25	25
A04	140	170	122	50	76	79	88	70	99	88	105	120	95.41	1.09	410	300	4	416	100	-200
A05	100	89	78	130	150	75	120	110	160	170	80	78	114.21	0.65	475	0	4	297	50	-100
A06	200	300	177	30	123	700	200	220	200	250	500	300	292.64	1.28	1200	0	4	1498	200	600
A07	400	500	450	420	376	380	250	330	350	320	300	600	382.44	1.15	155	1000	4	1759	500	1000
A08	20	40	60	80	100	120	140	160	180	200	240	300	178.72	1.17	800	0	4	836	80	240

Figure 1.

Figure 2 and 3 shows the average balanced consumption and the trend of the demand.

The size of the demand must be adjusted according to the number of goods requested by a customer, the quantity of a package, the volume and the weight and the capacity of the transporting vehicle.

The exposed model is not influenced by the therms abowe mentioned. The adjustment of the size of the demand is made by the decision of the manager.

In a feature work the model will be developed with considering the transporting cost and the an optimization of the size of the demand taking in acount all the goods requested by a customer.

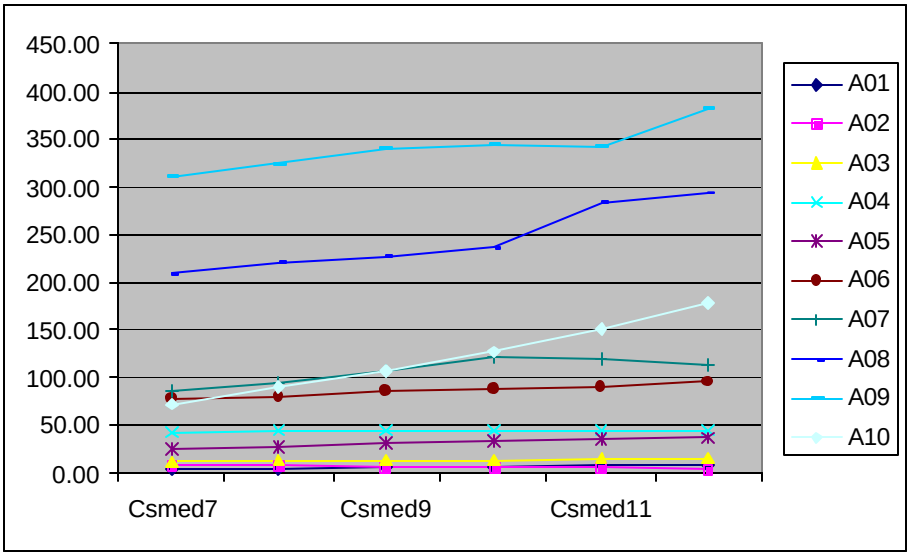


Fig. 2 Average balanced consumption

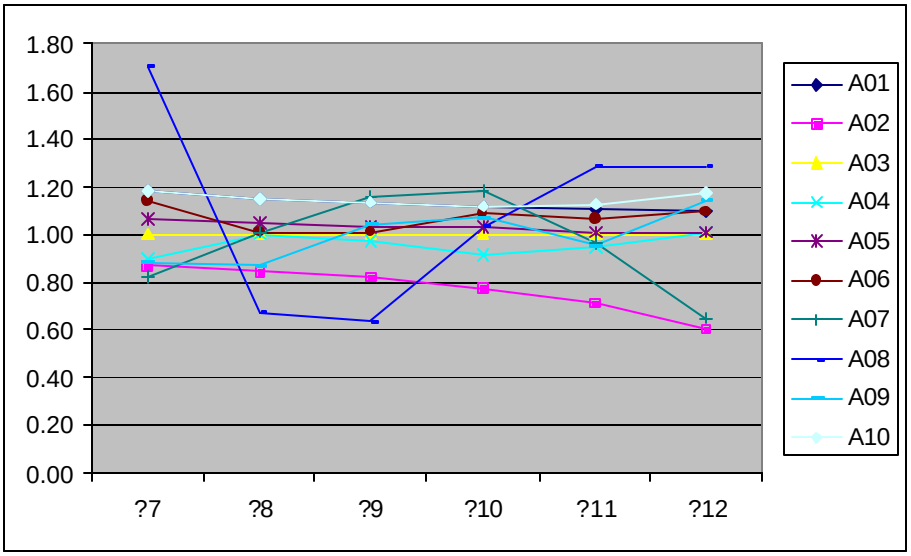


Fig. 3 The trend evolution

References

1. Abrudan I., Candea D. Ingineria si managentul sistemelor de productie. Ed. Dacia, Cluj-Napoca, 2002.
2. Hermanson R. H. Accounting principles. IRWIN INC. BOSTON, 1992.