DYNAMIC MODEL OF THE RESUPPLY OF COMPANY'S TRADE STOCK TAKING INTO ACCOUNT THE PRESCRIBED LIMITATIONS

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Keywords: optimum of total expenses, plan of incomings, limitations on productive capacity, functional cycle, minimum inventory, method of dynamic programming, state parameter, state function.

The article considers the method of dynamic programming for solving the problem of managing the company's trade stock. The described model takes into account the irregular character of the planned demand for production.

The method of dynamic programming for solving the problem of company's trade stock resupply is observed. The described model takes into account the irregular character of the planned demand for production, variable size of order and functional cycle.

With the help of mathematic modeling it's easy to describe the rules and principles of stock resupply control. Let's turn our attention to the mathematic model of stock resupply, taking into account the irregular character of the planned demand, reserve stocks, limitations of supplier on productive capacity. Let us introduce the following notation, where variables for the period *t*.

x_t - delivery lot; y_t - stock level; d_t - product demand; n_t - quantity of delivery lots; S_t - value of reserve stock; *m* - quantity of months, $w_t(x_t, y_t)$ - expenses on forming and maintaining of reserve stocks.

Quantity of delivery lots $n_t \in Z$ for the period *t* depends on the stock level and is defined by the formula: $y_t \geq S_t$,

$$n_t = \begin{cases} \frac{d_t}{x_t}, if\ y_t \geq S_t, \\ \frac{1}{x_t}(d_t + S_t - y_t), if, \\ y_t < S_t. \end{cases}$$

Let's write a material balance equation:

$$y_t = y_{t-1} + x_t n_t - d_t, (t = 1,..., m).$$

Now let's write formula of accession $X=(x_1,...,x_m)$ and storekeeping $Y(y_1,...,y_m)$, where total expenses of the enterprise *W* on forming and maintaining reserve stocks are minimum through the all balance year:

$$W = \sum_{t=1}^{m} w_t(x_t, y_t) =$$

$$= \sum_{t=1}^{m} (g_t n_t + c_t x_t n_t + h_t y_t),$$

where g_t - expenses on forming and maintaining one reserve stock, c_t - the price of production unit, h_t - expenses on the storage of production unit.

All expenses are estimated at monetary units.

Let's add the delimitations on variables x_t and y_t:

$$y_t \geq S_t,\ x_t \leq R.$$

where S_t - values of reserve stock, *R* - value of ultimate individual purchase order.

Let's use the formula of C. Bodenstab of reserve stock:

$$S_t = \lambda M_{t-1}(\alpha + \beta \frac{4}{n_t}).$$

where *ë, á, â* - coefficients, *M* - variance of prediction of observed sales.

The task of reserve stock optimization will be solved by dynamic programming. Let's take the capacity of state parameter as a delivery lot for the period t:

$$x_t = \{1,..., R\}.$$

Function of state $F_t(x_t)$ will be defined as minimum costs for intended period:

Let's write the equation of dynamic programming for stock control *t = 2, ..., m.*

$$F_t(x_t) = \min[w_t(x_t, y_t) + F_{t-1}(x_{t-1})].$$

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Finding the optimal order quantity according to deliminations x_t and y_t for the period $t = 3$

Dimension		January	February	March
Projection (items)	*d*	15	18	28
Insurance stock (items)	*S*	4	4	3
Quantity of delivers (items)	*n*	2	3	4
Economic order quantity (items)	*x*	5	6	7
Total expenses (monetary unit)	*f*	6268	11 118	17 126
Total expenses for a quarter (monetary unit)	*f*	34 512		
Stock level for the end of the period (items)	y_t	4	4	3
The top lot for production (items)	*R*	7	7	7

The solution of this problem for the company selling aluminum is suggested with the help of EXCEL program. The results are shown in the table.

Finally it's necessary to notice that this very approach makes possible to reduce total expenses on maintaining stock up to 15 %. Moreover it makes possible to vary the size of order and functional cycle (time period between the order and delivery of goods to storehouse) depending on the situation.

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