

## DETERMINATION OF OPTIMAL LEVEL OF INSURANCE INVENTORY ACCIDENTAL DEMAND BY QUEUING THEORY

During the management of stocks, trading companies often use the criterion of return on assets (ROA) during the settlement period (the ratio of return on sales to asset turnover).

The presence of excess, excessive stocks leads to an increase rate "assets" and, thus, reducing the "turnover". It is necessary to determine the optimal value of investments in stocks, which increases "asset turnover", did not cause decrease in ROA (by reducing turnover). That's why the problem of efficient inventory management is actual.

Let's consider the problem of determining the optimal level of reserves by criterion of minimum total cost for a random demand. Mathematical model of such inventory management system is built based on queuing theory [1]. Let a product characterized by a random variable  $S$  with the simplest flow intensity  $\lambda$ . There are specific costs  $C_1$  associated with excess supply over demand and costs  $C_2$  - demand over supply. You need to define this optimal level of inventory  $Q_{opt}$  in the planning period  $T$  in order to the total cost expenses were minimal:

$$U(Q) = U_1(Q) + U_2(Q) \rightarrow \min, \text{ where } U_1(Q) = C_1 \sum_{k=0}^Q (Q-k)P_k \quad - \text{ costs associated}$$

with excess supply over demand,  $U_2(Q) = C_2 \sum_{k=Q+1}^{\infty} (k-Q)P_k \quad - \text{ costs associated with}$

excess demand over supply,  $Q$  - value of goods supply,  $P_k$  - probabilities of demand. The function of the total cost reaches a minimum, provided:

$U(Q_{opt}-1) \leq U(Q_{opt}) \leq U(Q_{opt}+1)$ . We suppose that the system is in a state  $S_k$ , if during the time  $t$   $k$  units is sold. For a given Markov process with discrete states and continuous time, we obtain the infinite system of differential equations of Kolmogorov [1], the solution of which is the probability distribution of a discrete random variable demand for the planning period  $t=T$ .

In case when you cannot prevent the deficit on the goods with some

reliability  $P$ , insurance stock is created. The level of insurance stock  $r$  will be

matched with conditions:  $P_{k \leq Q-1} \leq P \leq P_{k \leq Q} = \sum_{k=0}^Q P_k$ , namely  $r = Q - Q^*$ , where  $P$  -

is the reliability coefficient,  $Q^*$  - mathematical expectation of demand for goods.

For the Poisson law of demand distribution this condition has the form:

$P \leq \sum_{k=0}^Q \frac{(\lambda T)^k}{k!} e^{-\lambda T}$ . The desired level of insurance reserves will be the first value  $Q$ , for which executed the above condition. It is also easy to identify the risk factor  $\alpha = 1 - P$ .

In order to effectively manage pricing policy on the basis of this model is solved the problem of determining the value of insurance stocks one category of goods for "Foxtrot" in view of accidental consumption.

Reference:

1. Zhernovyi Y. Markov models of queuing. - Lviv: Ivan Franko National University of Lviv, 2004.- p.154.