GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 04, April (2023)

MATHEMATICAL MODELS OF INVENTORY MANAGEMENT OF MANY TYPES OF GOODS

Raximova Umida Ziyadullayevna
Assistant at the Department of Higher Mathematics
Samarkand Institute of Economics and Service
raximovaumida2018@gmail.com +998973945582

ANNOTATION

This work is devoted to the optimization of inventory management. It explores the problems of effective implementation of multi-holding decision-making and provides mathematical models of the problems.

Keywords: Stock, product, model, Lagrange function, optimum, control.

АННОТАЦИЯ

Данная работа посвящена оптимизации управления запасами. В ней исследуются проблемы эффективной реализации многохолдингового принятия решений и приводятся математические модели проблем.

Ключевые слова: Запас, товар, модель, функция Лагранжа, оптимум, управление.

INTRODUCTION

As a rule, each trading company has a large number of different inventories. If the goods are not interchangeable, then the determination of their optimal sizes for each product is carried out as a separate product in the work called mathematical models of inventory management of one type of product. If the goods cannot be interchangeable, then it is advisable to combine such goods into groups, and then optimize inventory for them as separate goods.

However, in practice there are other limitations, namely limitations of warehouse dimensions. At the same time, the batch of goods, the quantity of which is optimal, does not fit into the existing warehouse capacity. Aries let's see how to take into account the problem-limitations-as seen above.

Suppose total available warehouse capacity V (m^3) in the case of, one unit of i-th goods for storage ϑ_i (m^3) let the storage capacity be required. In this case, the restriction (limit) on the amount of all transported goods can be expressed as follows:

$$\sum_{i=1}^{m} v_i X_i \le V \qquad (1)$$

if

$$0 \le X_i \le Q_i \qquad (2)$$

if the condition is met. The resulting linear constraints on the sheep are (1), (2) and the non-linear target function

$$Z = \sum_{i=1}^{m} C_i \frac{X_i}{2} + \sum_{i=1}^{m} k_i \frac{Q_i}{X_i} \qquad (3)$$

we come to the matter.

It is also possible to solve this problem with general methods of non-linear programming, but it is much easier to solve using Lagrange's method of unknown manifolds. For our deafening issue, the LaGrange function will look as follows:

$$F=\sum_{i=1}^{m} C_i \frac{X_i}{2}+\sum_{i=1}^{m} k_i \frac{Q_i}{X_i}+\lambda\,(V-\sum_{i=1}^{m} v_i X_i) \qquad (4)$$

Function (4) corresponds to function (3) If (4)

$$V-\sum_{i=1}^{m} v_i X_i=0, \qquad \lambda<0 \qquad (5)$$

or

$$V-\sum_{i=1}^{m} v_i X_i>0, \qquad \lambda=0 \qquad (6)$$

if one of them is done. Now λ always with the choice of multiplier F=Z we see that it can be achieved. To do this, we take private derivatives from (4) and solve them by setting them to zero:

$$\left.\begin{array}{l}
\frac{\partial F_1}{\partial X_1}=\frac{c_1}{2}-\frac{k_1 Q_1}{X_1^2}-\lambda v_1=0 \\
\frac{\partial F_2}{\partial X_2}=\frac{c_2}{2}-\frac{k_2 Q_2}{X_2^2}-\lambda v_2=0 \\
\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
\frac{\partial F_n}{\partial X_n}=\frac{c_n}{2}-\frac{k_n Q_n}{X_n^2}-\lambda v_n=0
\end{array}\right\} \qquad (7)$$

or we define the corresponding values of (5) from each equation.

$$X_1=\sqrt{\frac{2k_1Q_1}{c_1-2\lambda v_1}}$$

$$X_2=\sqrt{\frac{2k_2Q_2}{c_2-2\lambda v_2}}$$

$$\ldots\ldots\ldots\ldots\ldots\ldots$$

$$X_m=\sqrt{\frac{2k_mQ_m}{c_m-2\lambda v_m}}$$

or in general

$$X_i=\sqrt{\frac{2k_iQ_i}{c_i-2\lambda v_i}} \qquad (8)$$

In this (8) Formula, all X_i only in the λ unknown. To find this option we put Xi in (1), i.e.:

$$\sum_{i=1}^{m} v_i \bullet \sqrt{\frac{2k_iQ_i}{c_i-2\lambda v_i}} \leq V \qquad (9)$$

In (9) λ all quantities other than are known and $\lambda \le 0$ it can be seen that. $\lambda=\lambda_0$ and the exact value can be found all the time, i.e.:

$$\lambda_0 = \frac{c_i}{2v_i} - \frac{k_i Q_i v_i}{V^2} \quad (10)$$

we will have.

In turn, it is possible to find the optimal measure-quantity of one carriage for each of the goods.

$$X_{i0} = \sqrt{\frac{2k_i Q_i}{c_i - 2\lambda_0 v_i}} \quad (11)$$

average current optimal reserve amount-measurement

$$\frac{X_{i0}}{2} = \sqrt{\frac{2k_i Q_i}{c_i - 2\lambda_0 v_i}} \quad (12)$$

The optimal number of batches of transportation of goods in the planned period

$$n_{io} = \frac{Q}{X_{io}} = \sqrt{\frac{Q_i(c_i - 2\lambda_0 v_i)}{2k_i}} \quad (13)$$

Optimal inverval-time between the parties for transporting goods

$$t_{io} = \frac{T}{n_{io}} = T \cdot \sqrt{\frac{2k_i}{Q_i(c_i - 2\lambda_0 v_i)}} \quad (14)$$

Here T is the duration of the planned period.

In turn, if we put all the values (3) of X_{i0}, then under these conditions we will have the formula for determining the amount of the minimum costs of managing reserves, namely:

$$Z_0 = \sum_{i=1}^{m} c_i \frac{X_{io}}{2} + \sum_{i=1}^{m} k_i \frac{Q_i}{X_{io}} = \sum_{i=1}^{m} c_i \sqrt{\frac{k_i Q_i}{2(c_i - 2\lambda_0 v_i)}} + \sum_{i=1}^{m} k_i \sqrt{\frac{Q_i(c_i - 2\lambda_0 v_i)}{2k_i}} =$$

$$= \sum_{i=1}^{m} c_i \sqrt{\frac{k_i Q_i}{2(c_i - 2\lambda_0 v_i)}} + \sum_{i=1}^{m} \sqrt{\frac{k_i Q_i(c_i - 2\lambda_0 v_i)}{2}} =$$

$$\sum_{i=1}^{m} \sqrt{\frac{2k_i Q_i}{c_i - 2\lambda_0 v_i}} \left(\frac{c_i}{2} + \sqrt{\frac{(c_i - 2\lambda_0 v_i)^2}{4}} \right) = \sum_{i=1}^{m} X_{i0} \left(\frac{c_i}{2} + \frac{c_i - 2\lambda_0 v_i}{2} \right) = \sum_{i=1}^{m} X_{io}(c_i - \lambda_0 v_i) = \sum_{i=1}^{m} (c_i - \lambda_0 v_i) X_{io}$$

Thus, the formula for determining the optimal (minimum) cost amount of multi-product commodity stock management:

$$Z = \sum_{i=1}^{m} (c_i - \lambda_0 v_i) X_{io} \quad (15)$$

we have.

REFERENCES

1. Raximova, U. Z. (2023). Bir turdagi tovar zaxiralarini boshqarishni optimallashtirish. Academic Research in Educational Sciences, 4(4), 58–62.
2. Sh.R.Muminov, Iqtisodiy matematik usullar va modellar. Oliy o'quv yurtlari talabalari uchun o'quv qo'llanma. T.:"IQTISODIYOT-MOLIYA". 2007. 384b.
3. Nasritdinov G'. "Iqtisodiy-matematik usullar va modellar". Darslik.-T.: 2011.
4. Shodmonova G. "Iqtisodiy-matematik usullar va modellar". O'quv qo'llanma. T.: 2007.

GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 04, April (2023)

5. Фомин Г.П. Математические методи и модели в коммерческой деятелности. Учебник. –М.: ИНФРА-М, 2009.
6. Федосеев В.В. Экономико-математические методи и прикладние модели. Учебное пособие. –М.: ЮНИТИ, 2007. – 395 с.