MODEL OPTIMIZATION CONSTRUCTION OF THE CHOICE OF FINISHED GOODS EFFECTIVE DISTRIBUTION CHANNELS IN THE CONDITIONS OF UNCERTAINTY (ON THE EXAMPLE OF THE DAIRY INDUSTRY)

© 2010 N.V. Andrianova*

Keywords: a distribution channel, uncertainty, model of optimization of a choice, finished goods.

The article is devoted to the problem of finished goods distribution channels effective formation in the conditions of incompleteness and discrepancy of the information on enterprise environment. The article presents the steps in constructing a model of optimizing the choice of finished products effective channels distribution in the face of uncertainty on the example of dairy products.

The economic activities of any managing subject are implemented in the conditions of ambiguity (uncertainty) of real social and economic processes that considerably complicate the process of optimum decisions choice and can lead to unpredictable results. Uncertainty is an incomplete or inexact representation of values of various parameters in the future, generated by various reasons, such as: incompleteness or discrepancy of the information on conditions of the decisions implementation, including the expenses connected with them and results. For today in scientific literature there is not any formalized model of optimization of a choice of finished goods effective channels distribution in the conditions of uncertainty. Thus, definition of such combination is meant a choice of the effective channel of distribution at the decision of the given problem legal and the physical persons participating in the process of finishing of the goods from the manufacturer to the consumer who will meet mostly full requirements of the manufacturer.

$TO_{cp} = C \cdot Ц.$

The problem of a choice optimization of finished goods effective channels distribution presented here in the conditions of uncertainty is considered as a problem of profit maximization at the expense of increase in sales volume by the manufacturer at invariable total annual costs.

Construction of optimization model of a choice of finished goods effective channels distribution in the conditions of uncertainty will be carried out stage by stage.

1st stage. Factors or parameters that can affect a choice of distribution channels and that are necessary for considering construction of optimization model of this choice. Their symbols are defined.

C - annual consumption of production, units;

$З_г$ -general annual charges on production sale on the distribution channel, rbl.;

$З_{постм}$ - expenses constant on production sale on the distribution channel, rbl.;

$З_{пер}$ - expenses variables on production sale on the distribution channel, rbl.;

$Ц$ - the price of sale of a unit of production, rbl.;

$TO_{ср}$ - average annual sales volume of production (goods turnover) on the distribution channel, rbl.;

$П_г$ - the general annual profit to the taxation.

On production sale it is possible to present the general annual charges as follows:

$$З_г = З_{постм} + З_{пер}. \quad (1)$$

General annual profit is considered by a parity:

$$П_г = TO_{ср} - З_г. \quad (2)$$

The problem of maximization of the general annual profit can be presented as follows:

$$П_г = TO_{ср} - З_{пер} - З_{постм} \to \max, \quad (3)$$

$$TO_{ср} > 0.$$

Mid-annual sales volume of production on each channel of distribution is presented as follows:

(4)

Thus, within a year the manufacturer can change the production sale price. Not to do the model too bulk, let us assume, that in order to change these parameters it is possible to apply only to two scenarios (fig.).

Thus, it is necessary to consider the possible losses of profit caused, for example, by decrease in sale of production in connection with increase in sales volume of competitors,

* Natalya V. Andrianova, post-graduate at Kama State Engineering and Economy Academy. E-mail: v-yablochko@yandex.ru.

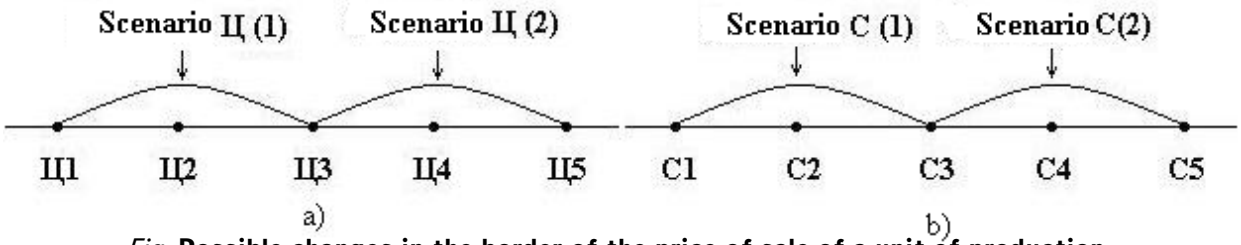

Fig. **Possible changes in the border of the price of sale of a unit of production and its annual consumption**

caused by short-term stimulating reductions of prices on their production. They are considered by introduction to the "lowering" factor α for value of an analyzed gain.

The problem of optimization with the account б will be presented as follows:

$$П_г = C \cdot Ц \cdot \alpha - З_{пер} - З_{постм} \to \max, \quad (5)$$

$$C \cdot Ц > 0.$$

2nd stage. Procedures of model formalization of a choice of the distribution channel in the conditions of uncertainty will be carried step by step.

Step 1. Full group of casual events (Q) for considered model of a choice of the distribution channel in the conditions of the uncertainty, influencing final economic result is formalized:

Q_1 - the event presented by a situation - $C \in [C1, C3)$, $Ц \in [Ц1, Ц3)$, $\alpha_{1+} = 1$; $\alpha_{2+} = 1$, when annual consumption of production is low at the low price of sale of a unit of production, and the losses of profit caused by not planned decrease of sale are absent for all channels. We mark this event as (н, н, +, +) and so on for all possible events (in our case their 16).

Step 2. The list of analyzed alternative decisions $\{X_1, X_2, X_3\}$ is formalized:

$X1$: the person receiving the decision assumes that deliveries are carried out only on the first channel; accordingly, the optimum size of goods turnover in such situation is defined by the formula:

$$TO_{ср2} = C_2 \cdot Ц_2 \quad (6)$$

$X2$: the person receiving the decision assumes that deliveries are carried out only on the second channel; according to the optimum size of delivery makes:

$$TO_{ср2} = C_2 \cdot Ц_2 \quad (7)$$

$X3$: the person receiving the decision assumes that deliveries are carried out by equal shares on Channel 1, and on Channel 2; according to the optimum sizes of corresponding deliveries make:

On Channel 1:

$$TO_{ср3}{}^{а} = \frac{C_1 \cdot Ц_1}{2} \quad (8)$$

On Channel 2:

$$TO_{ср3}{}^{б} = \frac{C_2 \cdot Ц_2}{2} \quad (9)$$

Step 3. We formalize an advantage matrix ($A = (П_{ij})$):

	X_1	X_2	X_3
Q_1	$П_{11}$	$П_{12}$	$П_{13}$
…	…	…	…
Q_i	$П_{i1}$	$П_{i2}$	$П_{i3}$
…	…	…	…
Q_{16}	$П_{16,1}$	$П_{16,2}$	$П_{16,3}$

For the definition of expected profit Пij we will use equality

$$П_г = TO_{ср} \cdot \alpha - З_{пер} - З_{постм} \quad (10)$$

Parameters of model of scenarios (+) and (-) losses implementation of profit for each channel

Model parameters	Designations	
	Channel 1	Channel 2
The price of sale of production	$Ц_1$	$Ц_2$
Expenses constant	$З_{постм1}$	$З_{постм2}$
Expenses variables	$З_{пер1}$	$З_{пер2}$
The lowering factor α for a gain at a favorable outcome of profit formation	Scenario 1 (+) $\alpha = \alpha_1 = 1$	Scenario 2 (+) $\alpha = \alpha_2 = 1$
The lowering factor α for a gain at a failure of profit formation	Scenario 1 (-) $\alpha = \alpha_1$ $0 < \alpha_1 < 1$	Scenario 2 (-) $\alpha = \alpha_2$ $0 < \alpha_2 < 1$

Sizes of expected annual profit ($П_{11}$ - $П_{13}$) for the first line of a matrix of advantage (event $Q1$ at decisions $X1$ - $X3$) are necessary for counting as follows:

$$П_{11} = С2 \cdot Ц2 \cdot (\alpha_{1+}) - З_{пер1} - З_{посм1} \quad (11)$$

$$П_{12} = С2 \cdot Ц2 \cdot (\alpha_{2+}) - З_{пер2} - З_{посм2} \quad (12)$$

$$П_{13} = П_{13}(1) + П_{13}(2) \quad (13)$$

$$П_{13}(1) = \frac{С2 \cdot Ц2}{2} \cdot (\alpha_{1+}) - \frac{З_{пер1}}{2} - З_{посм1} \quad (14)$$

$$П_{13}(1) = \frac{С2 \cdot Ц2}{2} \cdot (\alpha_{2+}) - \frac{З_{пер2}}{2} - З_{посм2} \quad (15)$$

There are values of profit for other events ($П_{21}$ - $П_{16,3}$).

Further, the constructed model of optimization of a choice of finished goods effective channels distribution in the conditions of uncertainty can be used for the final decision implementation, which is realized on the basis of concrete criterion. The criteria are divided into following groups: classical, derivative, compound [2, 3, 9]. In certain circumstances each of these criteria has the merits and demerits that can help with decision development. The criteria choice should be carried out taking into account concrete specificity of a solved problem and according to objects in view, and also leaning against last experience and own intuition of the manager. The constructed model will help the managers to work in the field of logistics, with finding the best decision, considering the features caused by absence of the information concerning a number of parameters.

Received for publication on 07.09.2010.