ANALYSIS AND PROGNOSIS OF COSTS - SUPPORT IN MAKING DECISIONS*

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Abstract: Estimating the production costs constitutes one of the main problems in making decisions for a company, the information regarding the costs being the first to be considered in the decision making process.
An estimation of the costs is necessary both for short and long term company strategies. Therefore, on a short term basis, cost estimations are necessary for the decisions regarding the growth of the offer volume towards the maximum production capacity. On a long term basis, decisions based on cost estimation are the ones regarding the extension and restriction of the company's size, taking into account the corresponding optimal production.
The model presented in this study is based on the method of the littlest squares, a method used in the prognosis of economic processes. It was implemented in three companies which unfold their activity within the framework of three different industries, thus verifying its functionality.

JEL classification: M41, M40

Key words: costs, managerial process, management of cost, analysis and prognosis of costs

1. INTRODUCTION

Understanding the production costs, in their theoretical and practical complexity, represents basic instruments that serve the management activity and implicitly the goal to increase the economic activity's efficiency.

To this regard, a structure of the of the costs' informational system according to the classic calculates principles- which presently rules in our country's enterprises- is no longer in accordance with the latest demands and strategies of the economical development. A modern management must also take into account the changes appeared in the costs' structure, the internal and external agents that influences the costs' height

* This work was supported by CNCSIS –UEFISCSU, project number PNII – IDEI code 378/2008

under the conditions imposed by the new production technologies and not in the least by the new informational technologies.

The role of information regarding the costs in the decisional process is underlined by the costs' functions such as:

- support for establishing the selling price;
- settling the inferior accepted limit of the prices' reduction;
- determination of the products' profitability;
- reserves' evaluation;
- analysing the production process' efficiency;
- analysing the performances reached by some of the subunits;
- revealing potential lost or inefficient activities;
- determination and elimination of the non-economical costs.

In this context, the information regarding the costs is useful for the enterprises' managers for the following reasons:

- certain decisions such as: acquisition or production of a product can be taken based on the costs' information;
- the costs may represent a base for prices' substantiate and , at the same time, for the periodical revise of them;
- based on the costs' analysis one can estimate the profitability and viability of a production line or can estimate the replacing of the equipments and installations;
- costs represent an important element in planning the budget;
- costs hold an important role in optimal usage of the lacking of resources;
- analysing the relations with the clients and the distributors;
- eliminating non-quality through hidden costs' analysis; it's known that, presently, the quality is like a key competition trump. Starting from here it goes the whole theory of the quality's costs;
- monitoring the costs is vital so that functions of the delegate responsibilities can be efficiently realized;
- costs' determination and the in-time providing of relevant information represents the grounds of the financial control; one of the management foremost functions is planning, implementation and operating some organizational control systems, as premises of a financial control.

Because the cost represent different significations for each technological faze or operation, for each costs generating place and for each product a detailed understanding is compulsory, at every management level. To this aim it has to be taken in account the fact that information provided by the costs' calculation ensures, among others, premises necessary for the following:

- costs' analysis and control for each costs generating place;
- operative management of each costs generating place, production and envisaged costs 'estimation and their fulfilment's control;
- the fair estimation of the products' stocks;
- determination of the taken decisions' efficiency.

The cost is a universal accepted economical category and it appears in all the economical and social activities. It's study has been centred on two aspects: a theoretical approach, according to it's essence, and a practical approach, as an appreciation revealing for the undertaken efforts-therefore ,integrated in the used resources' indicators category.

ISSN 1223-365X

In the theoretical point of view, cost can be defined as being the valuable expression of all the production agents used for producing and distributing the materials goods, for the works' fulfilment or the carried out services.

The production the cost represents the money expression of the production's agents (materials and human) usage that an enterprise makes for producing and selling it's services and goods.

In the accountable point of view the cost is a sum of spending made for obtaining and/or selling a certain utility (product or service) ; the cost of an utility is equal to the resources usage's value.

As mentioned above, the costs' study has also a practical side, the production cost being analysed as quality-economical indicator used for measuring and appreciating the economical development; the cost holds a central position in the indicators' system at the micro economical level.

Generally, the efficiency can be evaluated according to the correspondence between the economic activities' results and the social needs, the assigned resources being spent according to the market standards.

Although efficiency is given by many elements, an important one is the amount of spending necessary for acquiring the results.

The production cost's level illustrates the absolute amount of spending that forms it. Being an effort indicator, the analysis of its dynamics enables the representation of its economic efficiency (or inefficiency) which is appreciated according to the effort/effect unity balance.

The production cost represents basic element in elaborating an enterprise's strategy. In this regard it has certain functions such as:

- Knowing the real materials, financial and human consumption used for producing each good in the whole production;
- The account and control due to the fact that it measures the materials and human consumption;
- Reckoning some important indicators based on which the activity's efficiency is expressed;
- Influencing the profitability's level, because it expresses on the money form the level of occasional expenditures for acquire each product unity or the whole production.

The above mentioned functions indicate the role and importance of the production cost as a stimulation key factor for carrying on an efficient activity.

In order to substantiate the decisions, four related to costs problems become important and they are:

- the costs reached through a taken decision?
- if a certain decision is chosen despite another one what is that is given up to? (In other words, to decide means to give up?).
- how do the costs react to the made choice? What laws and logics do the costs follow?
- how can the costs been operated upon?

2. MODEL OF COST'S ANALYSIS AND PROGNOSIS

In order to realize a model of production costs' prognosis in an enterprise which we can consider as a cybernetic-economic system we must specify the costs' structure (production expenses) in a form which allows us the modeling of the phenomenon in order to give a better prognosis by using the adequate mathematical device.

Thus, we will note with E the matrix of entries in the production process:

$$E=(E_1(t), E_2(t),..., E_I(t))$$

where $E_i(t)$ represents the production means and the workforce, grouped according to their nature such as follows :

- raw materials and basis materials;
- auxiliary materials;
- fuel and energy;
- fixed means;
- workforce and so on.

We will note as well with S the matrix of exits from the production process:

$$S=(S1(t), S2(t),..., Sj(t))$$

where $S_j(t)$ is characterized by:

- finite products;
- services;
- semi-finished products.

If:

- $C_i(t)$ represents the total of costs afferent to quantities $E_i(t)$ on a well defined period of time t;
- $X_{ij}(t)$ represents the consumption from $E_i(t)$ for the realization of a unit of product from the exit $S_j(t)$ during the period t;
- $C_{ij}(t)$ represents the consumption cost $X_{ij}(t)$;
- $p_i(t)$ represents the price of an unit from the entry $E_i(t)$,

we will have:

$$\textbf{1)}\ C_{ij}(t)=p_i(t)X_{ij}(t) \quad i=\overline{1,I}\ ,\ j=\overline{1,J}$$

In order to write the relation (1) matriceally we consider the matrices:

$$X(t)=\begin{pmatrix} X_{11} & X_{12} & \cdots & X_{1J} \\ X_{21} & X_{22} & \cdots & X_{2J} \\ \vdots & \vdots & \vdots & \vdots \\ X_{I1} & X_{I1} & \cdots & X_{IJ} \end{pmatrix}=(\ X_{ij}(t)\ ) \quad i=\overline{1,I}\ ,\ j=\overline{1,J}$$

the matrix of primary unitary consumptions on products during the period t;

$$C(t)=\begin{pmatrix} C_{11} & C_{12} & \cdots & C_{1J} \\ C_{21} & C_{22} & \cdots & C_{2J} \\ \vdots & \vdots & \vdots & \vdots \\ C_{I1} & C_{I1} & \cdots & C_{IJ} \end{pmatrix}=(\ C_{ij}(t)\ ) \quad i=\overline{1,I}\ ,\ j=\overline{1,J}$$

the matrix of primary unitary costs on products during the period t;

$$P(t)=\begin{pmatrix} p_1(t) & 0 & \dots & 0 \\ 0 & p_2(t) & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & p_I(t) \end{pmatrix}$$

the matrix of unitary entry prices.

Then, the relation (1) is represented under the form:

$$\textbf{(1')}\ C(t)=P(t)\cdot X(t)$$

It is evident that for the fixed period t the values $X_{ij}(t)$ represent an aleatory discrete variable having at most a number of values equal to the number of products from the entry $S_j(t)$, so that in practice we work with the average of this aleatory variable given by the relation: $\overline{X}_{ij}(t) = \dfrac{\sum_{r=1}^{N_j} X_{ij}(r)}{N_j}$

where N_j represents the number of products from the exit S_j.

Corresponding to the average value $\overline{X}_{ij}(t)$, we will have average expenses $\overline{C}_{ij}(t)$ given by the relation:

$$\textbf{(3)}\ \overline{C}_{ij}(t) = p_i(t)\,.\,\overline{X}_{ij}(t)\,.$$

or under the matriceal form:

$$\textbf{(3')}\ \overline{C}(t) = P(t)\overline{X}(t)$$

where:

$$\overline{X}(t) = \left(\overline{X}_{ij}(t)\right)\ i=1,...,I\ ;\ j=1,...,J$$
$$\overline{C}(t) = \left(\overline{C}_{ij}(t)\right)\ i=1,...,I\ ;\ j=1,...,J$$

and P(t) is the matrix previously defined.

The elements of the matrix $\overline{C}(t)$ which give the relationship between the $E_i(t)$ and the exits $S_j(t)$ during the fixed period t characterize the structure of production costs on primary elements. Knowing the elements of the matrix $\overline{C}(t)$ for a future period is important with a view to the regulation of the conducted process, so that a prognosis of the costs' structure is necessary, that is a prognosis of the elements of $\overline{C}(t)$.

If we note with $\overline{X}_i(t)$ the average consumptions from the entry $E_i(t)$ that is

$$\overline{X}_i(t) = \sum_{j=1}^{J} \overline{X}_{ij}(t)$$

Then the relation (3') will take the form:

$$\textbf{(4)}\begin{pmatrix} \overline{C}_1(t) \\ \overline{C}_2(t) \\ \vdots \\ \overline{C}_I(t) \end{pmatrix} = \begin{pmatrix} p_1(t) & 0 & \dots & 0 \\ 0 & p_2(t) & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & p_I(t) \end{pmatrix} \begin{pmatrix} \overline{X}_1(t) \\ \overline{X}_2(t) \\ \vdots \\ \overline{X}_I(t) \end{pmatrix}$$

The problem of costs' prognosis for a horizon θ, that is on the period (t,t+θ) is then raised.

We can say that the prognosis for unitary prices is given by the prognosis of unitary prices $p_i(t+\theta)$ and of primary consumptions $\overline{X}_i(t+\theta)$. The prognosis of the two components determines the costs' prognosis.

An enterprise can also start from the expenses prognosis, raising the problem of the prognosis of other two elements so that the relation (4) be verified. In order to make such prognoses it is necessary to study the variation in the past either of costs or of consumptions and prices. By past, we understand the entire period t for which we know the three elements from the relation (4) or an interval of time shorter than t, which characterizes the evolution of the three components in the best way.

Thus, if we consider that the past taken into account in the prognosis is the period $t_1<t$, divided into intervals equal in length as an unity the same as in t, knowing the past means knowing the elements:

$$\begin{cases} \overline{C}_1(t-n), \overline{C}_1(t-n-1), \dots, \overline{C}_1(t) \\ \overline{C}_2(t-n), \overline{C}_2(t-n-1), \dots, \overline{C}_2(t) \\ \dots\dots\dots\dots \\ \overline{C}_I(t-n), \overline{C}_I(t-n-1), \dots, \overline{C}_I(t) \end{cases}$$

for the matrix $\overline{C}(t)$, or for the other two components that is:

$$\begin{cases} p_1(t-n), p_1(t-n-1), \dots, p_1(t) \\ p_2(t-n), p_2(t-n-1), \dots, p_2(t) \\ \dots\dots\dots\dots \\ p_I(t-n), p_I(t-n-1), \dots, p_I(t) \end{cases}$$

and respectively,

$$\begin{cases} \overline{X}_1(t-n), \overline{X}_1(t-n-1), \dots, \overline{X}_1(t) \\ \overline{X}_2(t-n), \overline{X}_2(t-n-1), \dots, \overline{X}_2(t) \\ \dots\dots\dots\dots \\ \overline{X}_I(t-n), \overline{X}_I(t-n-1), \dots, \overline{X}_I(t) \end{cases}$$

for which we have:

$$\begin{pmatrix} \overline{C}_1(t-k) \\ \overline{C}_2(t-k) \\ \vdots \\ \overline{C}_I(t-k) \end{pmatrix} = \begin{pmatrix} p_1(t-k) & 0 & \dots & 0 \\ 0 & p_2(t-k) & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & p_I(t-k) \end{pmatrix} \begin{pmatrix} \overline{X}_1(t-k) \\ \overline{X}_2(t-k) \\ \vdots \\ \overline{X}_I(t-k) \end{pmatrix}$$

The prognosis of the structure of production expenses (costs) for a horizon θ supposes determining $\overline{C}_i(t+\theta)$;$p_i(t+\theta)$ şi $\overline{X}_i(t+\theta)$ so that the matriceal relation be verified:

$$\begin{pmatrix} \overline{C}_1(t+\theta) \\ \overline{C}_2(t+\theta) \\ \vdots \\ \overline{C}_I(t+\theta) \end{pmatrix} = \begin{pmatrix} p_1(t+\theta) & 0 & \dots & 0 \\ 0 & p_2(t+\theta) & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & p_I(t+\theta) \end{pmatrix} \begin{pmatrix} \overline{X}_1(t+\theta) \\ \overline{X}_2(t+\theta) \\ \vdots \\ \overline{X}_I(t+\theta) \end{pmatrix}$$

This prognosis represents a peculiar problem because the three components cannot be separately forecasted, depending on the relationship between them given by the relation above.

So the expenses forecast (costs forecast) without taking into account the consumptions prognosis $\overline{X}_i$ or that of prices p_i or vice versa is wrong and does not allow the regulation of the process by the managers of the enterprise in question. Costs forecast must be realized in relationship with the previous costs evolution as well as of other elements. For the short-term prognosis, we start from the hypothesis that future appears as an extension of the present taking into account the fact that we usually keep a conservation of quantities, which have lead to a certain dynamics of the economic phenomenon in question.

We will consider that the costs' elements $\overline{C}_i(t)$ can be independent. The case in which they are dependent implies a prognosis that regards the cost elements. In economic practice, there are cases in which the expenses elements are independent, as well as cases in which costs' elements are in a tight interdependence.

We will consider that the cost elements $\overline{C}_i(t)$ are independent. Using extrapolation that is starting from the hypothesis that future is an extension of the present and of the past, we will try to find a function it follows with certain exceptions of cost element evolution. The method is known as the prognosis method by extrapolation. We will briefly present this method by exemplifying several cases used in economic practice.

Generally, the extrapolation method consists of finding for $\overline{C}_i(t)$ a system of continuous functions functionally independent

$f_{i0}(t), f_{i1}(t), f_{i2}(t), \dots, f_{im_i}(t)$ and is written $\overline{C}_i(t)$ under the form

$$\textbf{(5)}\ \overline{C}_i(t) = \sum_{l=0}^{m_i} a_{il} f_{il}(t) + \varepsilon_i(t)$$

We determine that a_{il} ($l=\overline{1,m_i}$) with the method of the littlest squares, enouncing the condition that

$$\sum_{k=1}^{n} [\varepsilon_i(t_k)]^2 \text{ be minimum.}$$

With a_{il} determined with the method of the littlest squares, we do the costs forecast for the period $[t,t+\theta]$ extrapolating such as follows:

$$\textbf{(6)}\ \overline{C}_i(t+\theta) = \sum_{l=0}^{m_i} a_{il} f_{il}(t+\theta)$$

As for the economists finding the system of functions $f_{ij}(t)$ used above is difficult, being rather a problem dealt with by mathematicians, we will consider the case in which these functions are:

$$f_{i0}(t) = 1,\ f_{i1}(t) = t,\ f_{i2}(t) =$$
$$= t^2, \ldots, f_{im_i}(t) = t^{m_i}$$

In this case we have the adjustment after a polynomial of degree m_i .

In order to render it easier we will consider that $m_1= m_2=...= m_I=m$ that is polynomials by which we do the estimation of $\overline{C}_i(t)$ have all a degree equal to m and we will have:

$$\overline{C}_i(t) = a_{i0}+a_{i1}t+a_{i2}t^2+\ldots+a_{im}t^m+\varepsilon_I(t)$$

or

$$\overline{C}_i(t) = \sum_{l=0}^{m} a_{il} t^l + \varepsilon_i(t)$$

As we have previously mentioned, a_{il} is determined with the method of the littlest squares that is on condition that

$\sum_{k=1}^{n}\left[\overline{C}_i(t_k) - \left(a_{i0} + a_{i1}t_k + ... + a_{im}t_k^m\right)\right]^2$ be minimum, where t_k are the sub-periods t (from the past) for which we know $\overline{C}_i(t_k)$.

If we note $U(a_{i0}, a_{i1},..., a_{im}) = \sum_{k=1}^{n}\left[\overline{C}_i(t_k) - \sum_{l=0}^{m} a_{il} t_k^l\right]^2$ we notice that this is a function of several variables (m+1 variables), that is $a_{i0}, a_{i1},..., a_{im}$. The minimum of the function is obtained in the points for which:

$$\textbf{(7)}\ \frac{\partial U(a_{i0}, a_{i1}, ..., a_{im})}{\partial a_{il}} = 0 \qquad l=0,1,\ldots,m.$$

Obtaining partial differentials of the function U and equaling them to 0 we obtain the following system:

$$
\textbf{(8)}\begin{cases}
na_{i0} + a_{i1}\sum\limits_{k=1}^{n} t_k + a_{i2}\sum\limits_{k=1}^{n} t_k^2 + \ldots + a_{im}\sum\limits_{k=1}^{n} t_k^m \\
= \sum\limits_{i=1}^{n} \overline{C}i(t_k) \\
a_{i0}\sum\limits_{k=1}^{n} t_k + a_{i1}\sum\limits_{k=1}^{n} t_k^{\;2} + a_{i2}\sum\limits_{k=1}^{n} t_k^3 + \ldots + a_{im}\sum\limits_{k=1}^{n} t_k^{m+1} \\
= \sum\limits_{i=1}^{n} t_k \overline{C}i(t_k) \\
\ldots\ldots\ldots\ldots\ldots \\
a_{i0}\sum\limits_{k=1}^{n} t_k^{m,} + a_{i1}\sum\limits_{k=1}^{n} t_k^{m+1} + a_{i2}\sum\limits_{k=1}^{n} t_k^{m+2} + \ldots + a_{im}\sum\limits_{k=1}^{n} t_k^{2m} \\
= \sum\limits_{i=1}^{n} t_k^m \overline{C}i(t_k)
\end{cases}
$$

i=1,2, …,I.

The system (8) is known in the adjustment theory as the system of normal equations of Gauss. As t_k are different (k=$\overline{1,n}$) the determinant of the system (8) is different from zero so the system has a unique solution.

As from the economic practice we know that the costs' variation either continuously increases, or has increases and decreases, we can consider that for a not too long period of time t, the costs have a linear variation or a parabolic variation, that is we consider that the adjustment function is either a linear function or a parabolic function linked to a linear extrapolation, respectively to a parabolic function. We specify that the system (9) is valid for any i=1,2,...,I that is we have in fact I such systems.

If we consider the case of linear extrapolation

$$\overline{C_i}(t) = a_{i0} + a_{i1}t + \varepsilon_i(t)$$

and the appropriate system is :

$$
\textbf{(8')}\begin{cases}
na_{i0} + a_{i1}\sum\limits_{k=1}^{n} t_k = \sum\limits_{k=1}^{n} \overline{C}_i(t) \\
a_{i0}\sum\limits_{k=1}^{n} t_k + a_{i1}\sum\limits_{k=1}^{n} t_k^2 = \sum\limits_{k=1}^{n} t_k \overline{C}_i(t)
\end{cases} \qquad \text{i=1,2,…,I.}
$$

for which we have the solution:

$$\textbf{(9)}\quad a_{i0} = \frac{\begin{vmatrix} \sum_{k=1}^{n} \overline{C}_i(t_k) & \sum_{k=1}^{n} t_k \\ \sum_{k=1}^{n} t_k \overline{C}_i(t_k) & \sum_{k=1}^{n} t_k^2 \end{vmatrix}}{\begin{vmatrix} n & \sum_{k=1}^{n} t_k \\ \sum_{k=1}^{n} t_k & \sum_{k=1}^{n} t_k^2 \end{vmatrix}}$$

$$a_{i1} = \frac{\begin{vmatrix} n & \sum_{k=1}^{n} \overline{C}_i(t_k) \\ \sum_{k=1}^{n} t_k & \sum_{k=1}^{n} t_k \overline{C}_i(t_k) \end{vmatrix}}{\begin{vmatrix} n & \sum_{k=1}^{n} t_k \\ \sum_{k=1}^{n} t_k & \sum_{k=1}^{n} t_k^2 \end{vmatrix}}$$

In the case of parabolic extrapolation

$$\overline{C_i}(t) = a_{i0} + a_{i1}t + a_{i2}t^2 + \varepsilon_i(t)$$

And the system (8) becomes

$$\textbf{(8'')}\quad \begin{cases} na_{i0} + a_{i1}\sum_{k=1}^{n} t_k + a_{i2}\sum_{k=1}^{n} t_k^2 = \sum_{k=1}^{n} \overline{C}_i(t) \\ a_{i0}\sum_{k=1}^{n} t_k + a_{i1}\sum_{k=1}^{n} t_k^2 + a_{i2}\sum_{k=1}^{n} t_k^3 = \sum_{k=1}^{n} t_k \overline{C}_i(t) \\ a_{i0}\sum_{k=1}^{n} t_k^2 + a_{i1}\sum_{k=1}^{n} t_k^3 + a_{i2}\sum_{k=1}^{n} t_k^4 = \sum_{k=1}^{n} t_k^2 \overline{C}_i(t) \end{cases}$$

This last system is solved with Crammer's rule. In order to choose the adequate extrapolation, we graphically represent the values of $\overline{C}_i(t_k)$ and we notice that we have a linear or parabolic variation.

In obtaining the systems, we can consider that the furthest past 1 and the closest which is the present n so that $t_k=k$ and

$$\sum_{k=1}^{n} t_k = \sum_{k=1}^{n} k = \frac{n(n+1)}{2} \quad \text{and}$$

$$\sum_{k=1}^{n} t_k^2 = \sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$

In this case:

ISSN 1223-365X

$$\begin{vmatrix} n & \sum_{k=1}^{n} t_k \\ \sum_{k=1}^{n} t_k & \sum_{k=1}^{n} t_k^2 \end{vmatrix} =$$

$$= \begin{vmatrix} n & \dfrac{n(n+1)}{2} \\ \dfrac{n(n+1)}{2} & \dfrac{n(n+1)(2n+1)}{6} \end{vmatrix} =$$

$$= \frac{n^2(n^2-1)}{12}$$

and

$$\textbf{(9')} \quad \begin{cases} a_{i0} = \dfrac{2}{n(n-1)} \begin{vmatrix} \sum_{k=1}^{n} \overline{C}_i(k) & 1 \\ 3\sum_{k=1}^{n} k\overline{C}_i(k) & 2n+1 \end{vmatrix} \\ a_{i1} = \dfrac{6}{n(n^2-1)} \begin{vmatrix} 1 & \sum_{k=1}^{n} \overline{C}_i(k) \\ n+1 & 2\sum_{k=1}^{n} k\overline{C}_i(k) \end{vmatrix} \end{cases}$$

As long as the future is realized we raise the problem of the reactualization of the coefficients a_{il}, l = 0,1,...,m and i = 1, 2, ...I depending on new obtained data.

If we note A_{il} the actualized coefficients for the past previously taken into account plus a period [t, t + p] which has elapsed from the moment t and for which we have new observations for t+1, t+2,..., t+p we obtain the coefficients A_{il} (l=0, 1, 2, ...,m; i =1, 2, ...,I) reactualized from the system (8) in which n is replaced by n+p.

Thus, if from the moment t to t + p the costs' variation is as well linear from the system (9´) we obtain the reactualized coefficients for the linear adjustment function for which:

$$\overline{C}_i(t) = A_{i0} + A_{i1}t + \varepsilon$$

so:

$$\textbf{(9'')} \quad \begin{cases} A_{i0} = \dfrac{2}{(n+p)(n+p-1)} \begin{vmatrix} \sum_{k=1}^{n+p} \overline{C}i(k) & 1 \\ 3\sum_{k=1}^{n+p} k\overline{C}i(k) & 2(n+p)+1 \end{vmatrix} \\ A_{i1} = \dfrac{6}{(n+p)[(n+p)^2-1]} \begin{vmatrix} 1 & \sum_{k=1}^{n+p} \overline{C}i(k) \\ n+p+1 & 2\sum_{k=1}^{n+p} k\overline{C}i(k) \end{vmatrix} \end{cases}$$

We took into account that $\overline{C}_{n+1}(k),....,\overline{C}_{n+p}(k)$ are already known (at the moment t + p) on the basis of new certain findings in the period from to t+p.

If $t_k \neq k$ than for the linear adjustment the reactualized coefficients A_{il} (l=0, 1, 2, ...,m; i =1, 2, ...,I) are obtained from the relations (9) by replacing n with n+p.

Starting from the properties of determinants and doing the adequate mathematical calculations we can find the relations between A_{i0} and a_{i0} respectively between A_{i1} and a_{i1}.

In a similar way, we can forecast the consumptions $\overline{X}_i(t+\theta)$ and respectively the prices $p_i(t+\theta)$ using the systems of functions
$g_{i1}(t), g_{i2}(t),\ldots, g_{im}(t)$ respectively,
$h_{i1}(t), h_{i2}(t),\ldots, h_{im}(t)$ for which:

$$\overline{X}_i(t) = \sum_{l=1}^{m} b_{il} g_{il}(t) + \varepsilon_i \quad \text{respectively,}$$

$$\overline{P}_i(t) = \sum_{l=1}^{m} c_{il} h_{il}(t) + \varepsilon_i$$

where b_{il} and c_{il} are determined in the same way.
After determining the coefficients b_{il} and respectively c_{il} the forecast of consumptions and prices can be done by extrapolation after the formulas:

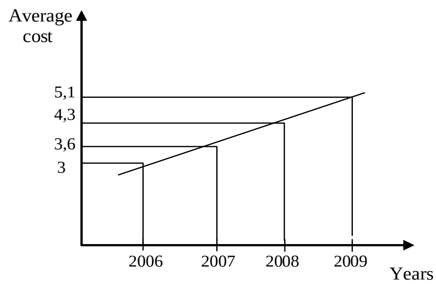

Figure no. 1

$$\textbf{(10)}\ \overline{X}_i(t+\theta) \approx \sum_{l=1}^{m} b_{il} g_{il}(t+\theta)$$

respectively

$$\textbf{(11)}\ \overline{P}_i(t+\theta) \approx \sum_{l=1}^{m} c_{il} h_{il}(t+\theta)$$

In economic practice, we usually forecast the expenses $\overline{C}_i(t)$, and these are decomposed in party quotas which devolve to $p_i(t)$ and respectively $\overline{X}_i(t)$.

We can ascertain that the period t is shorter (t being the past period) the prices can be considered constant case in which the functions g_{il} (t) (l=0, 1, 2, ...,m; i =1, 2, ...,I) are identical to functions $f_{il}(t)$ (l=0, 1, 2, ...,m; i =1, 2, ...,I), because the costs are

ISSN 1223-365X

proportional with the consumptions (that is $\overline{C}_i(t)$ are proportional with $\overline{X}_i(t)$ i=1,2,…,n).

Given the same hypotheses (that is for a not too long period t), we can consider the consumptions $\overline{X}_i(t)$ as being constant in the past.

In order to emphasize the utility and the way in which the previously mentioned aspects can be turned to the best account, we will use the data existent at S.C. METAL-LEMN S.A. CRAIOVA for the product Craiova type II during the period 2006-2009, forecasting the cost for 2010 which we will compare with the effective price of the same year.

The average costs of the product during 2006-2009 are presented in the table below:

Table no. 1

- mii lei -

Year	2006	2007	2008	2009
Average cost	3	3,6	4,3	5,1

In order to establish which type of extrapolation we use we will graphically represent the values in the table above:

We notice that cost evolution imposes the use of linear extrapolation and replacing the data in the system (8') we will obtain:

$$\begin{cases} 4a_0 + 10a_1 = 16 \\ 10a_0 + 30a_1 = 43{,}5 \end{cases}$$

Solving the system and replacing in

$$C_{(t)} = a_0 + a_1 t \Rightarrow$$

$$\left.\begin{array}{l} \Rightarrow C_{(t)} = 2{,}25 + 0{,}7t \\ \text{As for } 2010, t = 5 \end{array}\right\} \Rightarrow C_{(t)} = 5{,}75$$

So, the average forecast price, using the presented model, is of 5,75 mii lei. The effective average cost of the product Craiova type II for the year 2010 was of 5,9 mii lei.

We conclude that the forecast we have done is close to the real situation, which recommends the use of the model in forecasting prices.

The difference between the forecast price and the real price can be due to the fact that the analysis was done on a short period of time (a small number of years).

3. Conclusions

Before assuming a certain solution the involved costs' behaviour must be tested. therefore, it's important to know what will happen if, for instance, the sells grow up more than predicted; if the enterprise has to invoice extremely various orders; if there are partial deliveries or which will be the consequence of the products' computerizing; which is the critical volume of that must be commercialized in order to reach a certain net annual result.

These are only a few examples that indicate the fact that for these men of decision knowing the costs' dynamics and their rules is important. It would be idealistic that these laws to be well enough known for allowing the flexibility and for the managers to be able to feign the decisions, to make some estimation for establishing the potential results of different choices.

Technique speaking, the managers can act upon the costs relying on the laws the costs respect, laws imposed by their behaviour.

It's important to know for those who decide to release that specific law.

At the same time, there is the problem of the necessary terms for acting upon the costs, which is a crucial moment in this domain.

The passing time is strictly related to accounting, in general; for instance , writing the synthesis documentation (the balance sheet, the profit and lost accounts etc.) presents the past actions' consequences and at the same time are supposed to be of great help for the future activities' orientation.

In the management accounting specific domain this problem represents a real coercion because the released information, for being justified, must be delivered in time.

In other words, it is necessary to connect the speed and viability of this information.

In conclusion, we consider of utmost importance for the costs reached through a decision' analysis to know their dynamics , that of the phenomenon or actions which modifies their evolution, as well as knowing the generating causes; the aim is to adapt the costs and their laws.

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