V. TURCULESCU

Practical Applications of Some Computation Formulae Dealing about Influences on Profit

In this paper the author's purpose is to show how some computation formulae dealing about influences on profit may be used, the computations being reduced to a minimum while ensuring concomitantly the elimination of any error by careful checking of the data.

The use and extension of scientific computation methods in economy is of considerable importance in view of improving documentation and developing the analysis in all branches of activity. The development of these methods is dependent on the building of new formulae, adequate to the object under investigation, but what is particularly important and confers efficiency to these formulae is their practical adaptation and transformation into methods for extensive use.

From the theoretical standpoint the influences on profit have been studied for a long time and they can be summarized as follows:

— influence of changes in production volume;
— influence of changes in production structure;
— influence of changes in cost price by commodities;
— influence of changes in wholesale prices.

Under the influence of technical progress and of the modern procedures applied in production, a continuous increase in labour productivity is recorded and this influences the increase in the production volume achieved, in comparison to the one planned.

Concomitantly, since these variations are not uniform and proportional to the plan, they entail changes in production structure which, in turn, influence the volume of profit, as the profitableness varies for every commodity.

However, the strongest influence is brought to bear by the cost price decrease per commodity unit. The entire ensemble of measures and actions unfolding on a constructive, technological and organisatory plan, or issuing from the activity of innovations are synthesized in this influence.

Influences may also appear in the case of changes in wholesale prices or when dealing with complex positions in the plan, expressing groups of commodities.

For all the above cases the common formulae are the ones shown hereafter

a. Influence of production volume achieved

$$\left[\sum q_0(p_0 - c_0) \times \frac{\Sigma q_1}{\Sigma q_0}\right] - \sum q_0(p_0 - c_0)$$

b. Influence of production structure achieved

$$\sum q_1 (p_0 - c_0) - \sum q_0 (p_0 - c_0) \frac{\Sigma q_1}{\Sigma q_0}$$

c. Influence of changes in cost price

$$-\left(\sum q_1 c_1 - \sum q_1 c_0\right)$$

d. Influence of changes in wholesale prices

$$\sum q_1 p_1 - \sum q_1 p_0$$

In all these formulae:

q = achieved quantity of each commodity
p = enterprise wholesale price (without goods circulation tax)
c = complete commercial cost price
0 = basic period or plan indicators
1 = indicators achieved in current period.

As an illustration we shall start from one of the documents used for the balance sheet and comprising all the data required by the above computations. This document is Chapter XI annexed to the balance sheet, bearing as a title "Computation of profitableness for main manufactured commodities".

Chapter XI. **Computation of Profitableness**

Commodity	Enterprise wholesale price per unit (lei)		Unit cost price (lei)		Quantity (pieces)	
	Planned	Effective	Planned	Achieved	Planned	Achieved
0	1	2	3	4	5	6
A	16,000	16,000	10,000	9,500	300	400
B	6,000	6,500	5,000	5,200	1,000	1,500
C	2,500	2,500	2,000	1,800	800	600
TOTAL	—	—	—	—	2,100	2,500
Symbols	p_0	p_1	c_0	c_1	q_0	q_1

As it may be noticed the commodities manufactured by the enterprise are here given with their cost and wholesale price, as well as the quantities planned and achieved. On basis of these data the production value was computed in enterprise wholesale price without the goods circulation tax (column 7) which corresponds to expression $q_0 p_0$ in the formula and the production value in planned cost price (column 10), corresponding to expression $q_0 c_0$ in the formula.

Concomitantly, the same elements have been recomputed for the effective quantities in the conditions of planned prices resulting from column 8, the manufactured production at computed wholesale price ($q_1 p_0$) and the recomputed cost price ($q_1 c_0$) in column 11.

For the effective production the computations correspond to the expression $q_1 p_1$, for the production at the effective wholesale price (column 9), and to the expression $q_1 c_1$ for the production at effective cost price (column 12).

These columns permit further to establish, by the difference between the columns of the plan elements (column 7—column 10), *the planned profit* corresponding to the expression in formula $q_0 p_0 — q_0 c_0$. One similarly establishes the difference of the recomputed elements (column 8—column 11) leading to the *recomputed profit*, i.e. to the profit that would have been obtained from the achieved quantities if the plan elements regarding the wholesale price and the cost price had been maintained unchanged. In accordance with the symbols adopted this profit corresponds to the expression $q_1 p_0 — q_1 c_0$. Finally, the last difference between the effective elements of manufactured production, given by column 9—column 12, indicates the *effective profit achieved in the reported period* ($q_1 p_1 — q_1 c_1$).

Hence, the document entitled "Computation of profitableness for main manufactured commodities" stops when the results in the basic activity in the final three columns have been established.

The data contained by the form can, however, be used for computing the influence of the various factors on the profit. Let us carry out these computations for the figures in the total column.

for Main Manufactured Commodities

Enterprise wholesale price (thousand lei)			Complete cost price (thousand lei)			Profits (thousand lei)		
Planned column 5× column 1	Recomputed column 6× column 1	Effective column 6× column 2	Planned column 5× column 3	Recomputed column 6× column 3	Effective column 6× column 4	Planned column 7– column 10	Recomputed column 8– column 11	Effective column 9– column 11
7	8	9	10	11	12	13	14	15
4,800	6,400	6,400	3,000	4,000	3,800	1,800	2,400	2,600
6,000	9,000	9,750	5,000	7,500	7,800	1,000	1,500	1,950
2,000	1,500	1,500	1,600	1,200	1,080	400	300	420
12,800	16,900	17,650	9,600	12,700	12,680	3,200	4,200	4,970
$q_0 p_0$	$q_1 p_0$	$q_1 p_1$	$q_0 c_0$	$q_1 c_0$	$q_1 c_1$	$q_0 p_0 - q_0 c_0$	$q_1 p_0 - q_1 c_0$	$q_1 p_1 - q_1 c_1$

We first notice that, in comparison with the planned profit of 3,200 thousand lei, an effective profit of 4,970 thousand lei was achieved, a profit of 1,770 thousand lei abvoe plan being obtained. What influences have determined this profit?

a) In view of determining the influence of the volume of production we apply the formula

$$\left[\Sigma q_0(p_0 - c_0) \times \frac{\Sigma q_1}{\Sigma q_0}\right] - \Sigma q_0(p_0 - c_0)$$

In this formula the expression $\Sigma q_0(p_0 - c_0)$ corresponds to the planned profit, and $\frac{\Sigma q_1}{\Sigma q_0}$ represents the index of the physical volume of production.

Replacing by numbers we obtain:

$$3{,}200 \times \frac{2{,}500}{2{,}100} - 3{,}200 = (3{,}200 \times 1.19) - 3{,}200 =$$

$$= 3{,}808 - 3{,}200 = + 608$$

Hence, the overfulfilment in the volume of planned production acted positively, influencing the profit increase by 608 thousand lei.

b) Let us further determine the influence exerted by the change in production structure, by means of the computation formula adopted

$$\Sigma q_1(p_0 - c_0) - \Sigma q_0(p_0 - c_0) \times \frac{\Sigma q_1}{\Sigma q_0}$$

where the expression $\Sigma q_1(p_0 - c_0)$ is equal to the recomputed profit and the expression $\Sigma q_0(p_0 - c_0)\frac{\Sigma q_1}{\Sigma q_0}$ is equal to the planned profit influenced by the index of the physical production volume; replacing by figures we obtain:

$$4{,}200 - (3{,}200 \times 1.19) = 4{,}200 - 3{,}808 = + 392$$

Hence, in the above example, the change in production structure bore a positive influence, increasing the profit by 392 thousand lei.

c) It was mentioned that the third influence, deriving from the *change in cost price* is computed by means of the formula:

$$-(\Sigma q_1 c_1 - \Sigma q_1 c_0)$$

The first term $\Sigma q_1 c_1$ corresponds to the production manufactured at the effective cost price (column 12), and the second term $\Sigma q_1 c_0$ corresponds to the production manufactured at the recomputed cost price (column 11).

Hence, replacing by the corresponding figures, we obtain:

$$-(12{,}680 - 12{,}700) = + 20$$

That is, the value of production at effective cost price being smaller than the value of production at recomputed cost price caused a profit increase of 20 thousand lei, likewise exerting a positive influence.

d) Finally, the fourth influence on profit, proceeding from *the change in the enterprise wholesale price of commodities* is computed by means of the formula:

$$\Sigma q_1 p_1 - \Sigma q_1 p_0$$

The total commodity production at effective selling price (column 9) corresponds to the expression $\Sigma q_1 p_1$, and the total commodity production at recomputed wholesale price (column 8) corresponds to the expression $\Sigma q_1 p_0$.

Replacing by figures, there results:

$$17{,}650 - 16{,}900 = + 750$$

The change in wholesale price has therefore determined a profit increase of 750 thousand lei.

In practice, negative influences may also occur, and in this case the sign of the four kinds of influences will show the sense in which they acted. Let us, on basis of the above computations, sum up the influence of the various factors on the profit:

a) Production volume achieved	+	608
b) Production structure change	+	392
c) Cost price change	+	20
d) Wholesale price change	+	750
Total	+	1,770

We notice that we have answered the question we had set, that of determining the influence of each factor on the achievement of the profit above plan, in the example we have chosen.

The document of computation of profitableness yielded all the necessary elements, and in some cases it also yielded control figures. Thus, the difference between the recomputed profit (column 14) and the planned profit (column 13) gives us the sum of the influences resulting from the production volume change and from the structure change:

$$4{,}200 - 3{,}200 = 1{,}000$$
$$608 + 392 = 1{,}000$$

With regard to the influences resulting from the change in cost price and in wholesale price, these stood out from the differences between the columns mentioned, without any additional computation.

The above finding leads us to the idea that this document can very easily be improved upon in view of showing all the influences acting on the profit, with a minimum number of computations and this is the very scope of the present proposal by which the analysis of the influences brought to bear by the various factors on the profit is made accesible to the largest number of accountants and economists.

Chapter XI, annex to the balance sheet, in its present form, does not sufficiently turn to account the data it contains because it stops at the establishment of the profit, without also explaining the influences that have been brought to bear on it.

If, however, 5 columns are further added to this form, its value for an economic analysis is noticeably increased since, besides the structure of the profit achieved, one also obtains the source of the profit, i.e. the qualitative element that points to the factors due to which the profit above plan was achieved.

Concomitantly, the computations are, mostly, reduced to differences between columns, all the formulae we have mentioned being eliminated, although they stand at the basis of all these data.

In accordance with our proposal the document "Computation of profitableness for main manufactured commodities", completed with columns 16—20, would be of the form:

Influences on profit, from:

Production volume change $\Sigma q_1(s_0)b_0 - \Sigma q_0(s_0)b_0$	Production structure change $q_1 : q_0 = i_q - I_Q q_0 b_0$	Cost price change col. 11—col. 12 = + increase col. 12 — col. 11 = — decrease	Enterprise wholesale price change col. 9 — col. 8 = + increase col. 8—col. 9 = — decrease	Total influences on profit col. 15—col. 13 = + increase col. 13 — col. 15 = — decrease
16	17	18	19	20
+342	+258	+200	—	+800
+190	+310	−300	+750	+950
+ 76	−176	+120	—	+ 20
+608	+392	+ 20	+750	+1770

As it results from the above table, given the sum of influences in production volume change and production structure change, it is sufficient to determine only one of the other two influences since the second will result by subtraction. Nevertheless, in view of checking scientifically the computations, we will establish each influence in part hereafter.

To compute the influence resulting from volume change, using one of the formulae shown (1), viz.:

$$\Sigma q_1(s_0)b_0 - \Sigma q_0(s_0)b_0$$

we obtain the following table:

Product	Quantity achieved (q_1) in pieces	Planned structure (s_0) in %	Quantity achieved influenced by planned structure $q_1(s_0)$ in pieces	Planned profit per unit (b_0) in lei	Total profit planned influenced by structure $q_1(s_0)b_0$ in thousand lei	Planned profit $q_1(p_0 - c_0)$ in thousand lei	Influence of volume change in thousand lei
A	400	14.29	357	6,000	2,142	1,800	+342
B	1,500	47.61	1,190	1,000	1,190	1,000	+190
B	600	38.10	953	500	476	400	+ 76
	2,500	100.00	2,500	7,500	3,808	3,200	+608

Based on the above data we can find and influence the change in structure by product in a simplified manner, as follows:

Product	Recomputed profit	Planned profit influenced by structure	Influence of structure change
A	2,400	2,142	+258
B	1,500	1,190	+310
C	300	476	−176
	4,200	3,808	+392

The influence of structure change on the profit can also be determined by direct computation, by means of the formula:

$$\Sigma q_0 b_0 i_q - \Sigma q_0 b_0 I_Q = \Sigma q_0 b_0 (i_q - I_Q)$$

Introducing the data of the example we obtain:

Product	Effective quantity (q_1) in pieces	Planned quantity (q_0) in pieces	Physical volume index per product (i_q)	Physical volume index for entire production (I_Q)	Difference $i_q - I_Q$	Planned profit $q_0 b_0$	Influence of structure change
A	400	300	1.333	1.19	+0.143	1,800	+258
B	1,500	1,000	1.500	1.19	+0.310	1,000	+310
C	600	800	0.750	1.19	−0.440	400	−176
	2,500	2,100		1.19		3.200	+392

In the case of the complex positions in the plan, expressing groups of commodities, the planned quantity and the effective ones are taken for the whole group such as it in the situation of the computation of profitableness.

Obviously, when one deals with an extended list of commodities the accurate computations to be carried out in a very short time interval become involved and one can therefore not rely on the possibility of wide applications. We have, for this reason, endeavoured to reduce these computations to a minimum, by adopting the present form for the computation of profitableness, annexed to the balance sheet, which already includes ready processed, almost all the data necessary to determine the influences brought to bear by the various factors on the profit.

In the supplementary columns we have suggested, the computation for only a single influence remains to be effected, viz. for the one resulting from the change in production volume. All the other influences result from differences between the columns.

This simplifying offers a decisive influence in view of also extending the use of economic computation to the progress of the analysis of the economic

activity of enterprises. Both in enterprises and at higher levels, it will be possible to study better the source of profits above the plan, a fact which will lead to corresponding appreciations and findings regarding this branch of economic activity which concretizes financial results.

If one renounces to delimit the influences in the change of production volume and in structure change for each commodity taken singly, an ever simpler form of computation may be adopted.

In this case the suggested columns to be added to the profitableness form would be reduced to four, with the following headings and control keys:

Column	Title	Mode of computation
16	*Influences from volume change and from production structure change*	*column 14—column 13*
17	*Influences from cost price change*	*column 11—column 12*
18	*Influences from wholesale price change*	*column 9—column 8*
19	*Total influences*	*column 16+column 17+column 18 or column 15—column 13*

As it can be noticed, there is no supplementary computation here, all the data resulting from the present profitableness form.

We have also given this last variant since it shows how rather involved computations can be reduced to elementary operations which can easily be carried out in any enterprise.

In this variant the delimitation of the influences due to the change in the volume and structure of production can be done most easily by means of the formulae shown at points a) and b), that were also illustrated.

We are convinced that the improvement of the form "Computation of profitableness for main manufactured commodities", annexed to the balance sheet, by means of the supplementary columns suggested, ensures a unitary computation method of the influences exerted by various factors on the profit, thus strengthening the economic analysis and giving more weight to the information yielded by the economic and financial data.

REFERENCES

1. GHEORGHIU, A., *Analiza rentabilităţii întreprinderilor industriale*, Editura Ştiinţifică Bucureşti, 1964.
2. CICICOPOL, C. and CRĂCIUN, S., *Despre stabilirea factorilor care au influenţat asupra îndeplinirii beneficiului*, "Evidenţa Contabilă", No. 4, 1965.
3. GHEMEŞ, V., *Calculul influenţelor asupra beneficiului întreprinderii*, "Evidenţa Contabilă" No. 10, 1965
4. TURCULESCU V., *Analiza beneficiului peste plan şi efortul propriu al întreprinderii*, "Economia Românească" No. 1, 1958.
5. TURCULESCU, V., *Calculul rentabilităţii la principalele produse şi influenţele asupra beneficiului*, "Evidenţa Contabilă", No. 6, 1964.

APPLICATIONS PRATIQUES DE CERTAINES FORMULES DE CALCUL DES INFLUENCES SUR LES BENEFICES

L'auteur présente les possibilités d'adapter aux formes courantes qui expriment la rentabilité, certains éléments permettant de déterminer facilement les influences qui résultent de la modification du volume de la production et du pourcentage d'assortiment des marchandises, resultat d'une réduction du coût de revient ou d'une modification du prix de vente en gros, sur le bénéfice.

Les formules et les solutions proposées contribuent à l'application et à la généralisation de certaines méthodes de calcul accesibles au personnel travaillant dans l'économie, ceci étant d'une grande importance en vue d'améliorer l'analyse économique et de stimuler les processus de production.

ПРАКТИЧЕСКИЕ ПРИМЕНЕНИЯ НЕКОТОРЫХ ФОРМУЛ РАСЧЕТА ВЛИЯНИЙ НА ПРИБЫЛЬ

Указываются возможности применения к обычным формам отражения рентабельности некоторых элементов, которые позволяют легко определять на прибыли, исходящие из изменения объёма производства, удельного веса ассортимента, снижения себестоимости или изменения продажной оптовой цены.

Предложенные формулы и решения способствуют применению и обобщению некоторых методов расчета, доступного экономистам, что имеет большое значение для улучшения экономического анализа и стимулирования процесса производства.