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ANALYSIS OF PROFITABLENESS UNDER THE INFLUENCE OF BOTH COST DYNAMICS AND VOLUME OF PRODUCTION

1. Introduction

The synthetic indicators, the benefit, and the profitableness rate have a special relevance when estimating the level of the economic and financial activity of an industrial unit. One of the criteria ensuring an objective evaluation of the results in the activity of every enterprise is represented precisely by the profitableness indicators. By their means both the enterprise and the society can control the efficiency in using material, financial, and labour resources as well as discover new internal uncapitalized reserves for every sector of economic activity. The greatest part of an enterprise's balance benefit is given by the benefit that comes from selling the commodity output. This benefit may be influenced by various factors among which a decisive role is played by the changes in the level of the working expenses per unit of product; the changes in the volume of production and production costs; the changes in the structure and the quality of the goods to be sold [1].

Profitableness imposes as an elementary condition the fact of obtaining incomes (V) bigger than expenses (C), therefore V>C. Consequently, an industrial unit may be profitable or not whether its gross income is bigger or smaller than the general expenses. The formula for profitableness would be the following:

$$R = \frac{B}{C} \cdot 100 \qquad (1)$$

where B stands for benefit and C, for general expenses.

The profitableness of an enterprise, especially the one depending on the type of goods may have quite extended limits: $0 < R < \alpha$ in case of profit

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and $-1 < R < 0$ in case of loss. The value of α depends on the level of costs per unit of product, the nature and the quality of products, the price policy with regard to certain products, etc.

2. Variation of Profitableness Depending on the Precentage of Cost Variation.

In order to determine this functional dependence we shall start from formula (1). We do not intend to demonstrate the way of getting the final formula, but only to insist on the elements comprised in the economic analysis. The following formula is considered:

$$r = \frac{100.C}{100+c}.A \qquad (2)$$

where: r – percentage variation of the profitableness rate

c – percentage variation of the product cost

$A = 1 + \frac{C}{B}$ where C stands for the general working expenses and B is the overall profit.

Whenever there is benefit, $\frac{C}{B} < 0$ and $A > 1$

Whenever there is loss, $\frac{C}{B} < 0$ and $A < 1$

For example, $A = 0$ when $B = -C$, that is the working expenses have not been recovered.

So, whenever $B = -C$, $A = 1 + \frac{C}{-C} = 0$ and, therefore, $r = 0$ as one can infer from formula (2). In this case whatever percentage variation may occur in the cost of products, it does not alter the profitableness rate.

- If $A > 1$, with values close to 1, the profitableness rate is very big, for example, if $A = 1.5$, $R = 200\%$. When A gets very big values the profitableness rate tends to 0: if $A = 401$, $R = 0.25\%$.
- If $A < 1$, there are two possibilities:

-the situation in which 0<A<1, meaning that the loss would exceed the expenses, which is practically impossible.

- the situation in which A <0, meaning that a quota of expenses has been recovered and the loss rate is P = -33.3%. If the absolute value of A is big and increasing, the loss rate tends to 0:if A = - 399, P = -0.25%.

Table 1 displays a quite large scale of significant cases in the economic activity of an enterprise.

Table 1

Loss and Profitableness Rates

A>1		Profitableness rate	A<1		Loss rate
1,5	B= 2C	R= 200%	1.5	B= -2/5C	P= -40%
2	B= C	R= 100%	2	B= -1/3C	P= -33%
3	B= 1/2C	R= 50%	3	B= -1/4C	P= -25%
4	B= 1/3C	R= 33%	4	B= -1/5C	P= -20%
5	B= 1/4C	R= 25%	5	B= -1/6C	P= -16.6%
...					
8	B= 1/7	R= 14.3%	8	B= -1/9C	P= 11.1%
...	B=	R=		B=	P=
21	B= 1/20C	R= 5%	21	B= -1/22C	P= 4,5%
...	B=	R=		B=	P=
101	B= 1/100C	R= 1%	99	B= 1/100C	P= -1%
134	B= 1/133C	R= 0.75%	132	B= 1/133C	P= -0.75%
201	B= 1/200C	R= 0.50%	199	B= 1/200C	P= -0.50%
401	B= 1/400C	R= 0.25%	399	B= 1/400C	P= -0.25%

The variation of profitableness depending on the percentage alteration of the product cost has been determined in a large number of cases so that it may include the scale of the real cases in the economic activity of enterprises.

The results in the case of formula (2) were included into double entry tables of the following variation limits for C and A (for space reasons the tables are missing from the paper).

$$C \in \{-50,\ 49, \ldots, -2, -1, 0, +1, +2, \ldots, +49, +50\}$$

$$A \in \{2, 3, 4, 5, \ldots 100\}$$

The results brought together this way play the role of an instrument panel for an immediate and easy estimation of the level of the profitableness percentage variation as related to various products or groups of products.

An important observation with economic activity is derived from the comparative analysis of this particular kind of data. In case of the same percentage decrease or, respectively, increase of costs (c) for a given A, the effects on profitableness (r) are not symmetrical. The effects of the percentage decrease of the cost upon profitableness are bigger as compared to those of its increase by the same percent and for A >2. For instance, if A =6, in case of a decrease of c by - 50%, r = 600%, while for an increase of c by +50%, r=-200%, which is in fact the percentage dimension of the loss. When A < 0, formula (2) should be regarded as the rate of loss. In order to decrease it c must be negative, so c <0. For example, if c = -15%, the loss rate decreases by –70.6% and if c= -20%, it decreases by –100%, meaning that the entire working expenses have been recovered. Therefore B = -C, when C<-20, the loss rate is changing into the rate of profitableness.

Another important observation regarding the economic activity is that any percentage decrease of costs (c) leads compulsorily to a decrease of loss and a similar percentage increase of costs (c) will generate comparatively a smaller increase of loss.

3. Variation of Profitableness Depending on the Percentage Changing of Production.

In order to determine the interrelationship between the variation of profitableness and percentage changing of production one should use the next formula:

$$r = \frac{100 \cdot q \cdot g}{100 + q(1-g)} \cdot A \qquad (3)$$

The above takes into account the influence of three parameters upon profitableness:

q – percent of production variation (in natural or natural-conventional units)

g – weight of the conventionally constant expenses as compared to the general working expenses;

A = 1+ C/B.

In this case we have tried as well to find out a more accessible way to fructify the use of formula (3). Setting the variation limits to:

$$q \in \{+50, +49, \ldots +2, +1, 0, -1, -2, \ldots -49, -50\};$$

$$A \in \{2,3,4, \ldots 100\},$$

$$\text{and } g \in \{0, 0{,}50, 0{,}10, 0{,}15, 0{,}20, 0{,}25\}$$

the values of profitableness (r) have been established and displayed under the form of double entry tables. Also the comparative analysis of the data emphasizes a phenomenon of asymmetry in the profitableness variation. For any value of A, A >2, the effects of the production increase upon profitableness are smaller than those of its decrease by the same percent. Such effects become ever more powerful as g is increasing until g < l. So, for an increase of production (q) by + 50% the profitableness (r) raises to + 60%. If the production (q) decreases by –50%, the profitableness r = -100%, so it turns into loss.

When A<0, formula 3 should be also taken as loss rate. In order to reduce the loss it is necessary for the percentage increase of production to be ensured. For instance, an increase by 25% (q=+25) brings about a – 32.6% loss decrease. It is to be noticed that with any decrease of production the effects on loss are considerably greater than with a similar increase of production. In order to ensure the passing from loss to benefit, one should obtain a percentage increase of production (q). Hence the next condition is fulfilled:

$$1 + \frac{g \cdot q \cdot A}{100 + (1-g)q} < 0. \qquad (4)$$

4. Applications of the Analysis on the Percentage Influence of Costs and Production Volume Upon Making Profitable the Products Made at a Loss.

From the above it arises that under the condition imposed by production, the variations of the production volume by a quantity q% may cause a variation of profitableness. Denoting the rate of profitableness by R_0, the ratio is this:

$$\frac{r}{100} = -\frac{q \cdot g \cdot A}{1 + q(1-g)}.$$

It follows that the new profitableness rate R is $R = R_0\left(1+\frac{r}{100}\right)$. If initially R_0 is smaller than 0 so the product is fabricated at a loss, in order to make it profitable it is necessary for the mathematical expression $1+\frac{r}{100}$ to become smaller than 0, hence

$$1+\frac{r}{100}=1+\frac{q\cdot g\cdot A}{100+(1-q)g}=\frac{100+q(1-g+g\cdot A)}{100+(1-g)q}.$$

If 1-g+g.A < 0, the product may yield profit by giving q a positive value, that is the value of production increases. We should emphasize that if g is very small, the production volume must be substantially increased for the economic effect to become a notable one. On the contrary, if 1-g+g.A > 0, the production decrease alone will allow the products to become profitable.

Economically dealing with the effect of increasing the production volume upon profitableness, it follows that it is this effect that is expected as in this way the fixed expenses per unit of product can be reduced.

Table 2

Cost Variation and Product Profitableness

Products	Unprofitable Products			
	Rate of loss %	A	g%	Percentage of cost decrease that renders products profitable
a_1	-0.19	-525	3.6	-0.2
a_2	-6.74	- 14	3.0	-6.75
a_3	-3.40	- 28	3.1	-3.42
a_4	-4.02	-24	2.7	-4.04
a_5	-3.92	-25	2.9	-3.94
a_6	-0.25	-399	2.6	-0.27
a_7	-3.54	-27	2.2	-3.56
a_8	-4.53	-21	4.4	-4.53
a_9	-3.55	-27	3.3	-3.57
a_{10}	-1.05	-94	1.9	-1.07

The weight of fixed expenses as compared to the overall expenses being small, the effect of increasing the production volume is rather insignificant. In such cases, when the weight of fixed expenses (g) is very small and A·g is close to 1(A·g<1), hence the product is made at a loss, the increase of production even by a very large percent could hardly call forth the product profitableness.

The a_2, a_3, a_4, a_5, a_7, a_8, a_{10} products (see Table 2) belong to the same made-at-a-loss type. Only if the increase of the production volume is achieved simultaneously with the reduction of costs, the cumulated effect of both ways of improving the rentability may lead to a better situation. In the other cases, when A.g >1 the increase of the production volume may render profitable the products made at a loss. For example product a_1 has a loss rate of –0.19%, g= 3.6%, A =-525, and A.g>1, so an increase by only 5.6 % of the volume of its production is quite enough to make it profitable. On the contrary, for product a_6 with –0.25% loss rate, A=- 399, g= 2.6%, and A.g >1, the increase of the production volume should be particularly big, which is practically impossible. (For example, for product a_{10} the increase should exceed 200%). Also in these cases the only way of making the products profitable is to reduce the costs for every unit of product.

The study of the interrelationships between the three types of variation: variation in rentability, cost, and volume of production, has an obvious importance from both methodological and practical points of view. They are instruments needful in analysing the rentability dynamics and foreseeing its evolution, which may lead to a better substantiation of the economic decisions [2].

References

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2. Tacu Al.P.,ş.a., *Inteligenţa artificială. Teorie şi aplicaţii în economie*, Editura Economică, Bucureşti, 1998, p. 362–363, 396.