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USE OF THE COST/VOLUME/PROFIT ANALYSIS TO ESTIMATE EARNINGS

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Abstract

Given the existing risks and competition conditions, company management needs management accounting, which is a component of the company's accounting system and is designed solely to help managers in the decision-making process.

Due to the diversification of the production and sale activities, there has become imperative, from the viewpoint of company organization, operation, equipment and even earnings and costs, an alternative to the full costing method. This is the direct costing method employed to calculate costs, which is based on those costs that are closely and directly connected to the operation volume. This method is actually more than a cost calculation method; it is a short-term earnings calculation method, which makes these costs a useful company management tool.

This paper is designed to explain, by means of concrete examples, the way in which operation conditions changes influence the earnings estimated by means of the cost-volume-profit analysis, as well as the implications of these changes on the decisions to make.

Key words: cost, profit, method, decision, process
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1. Introduction

The COST–VOLUME–PROFIT (C–V–P) analysis is the analysis of the cost evolution models, which points out the relations between cost, production volume and profit. The C–V–P analysis is a useful forecasting as well as managerial control tool. The method includes a set of problem solving techniques and procedures, based on understanding the characteristics of company costs evolution models. The techniques express the relations between income, sales structure, costs, production volume and profits and include breakeven point analysis and profit forecasting procedures. These relations provide a general economic activity model, which may be used by managers to make short-term forecasts, to assess company performance and to analyze decision-making alternatives.

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Differentiating, within the production costs, between variable („operation") and fixed („structure") costs, is the ground for cost analysis of partial methods. Considering costs variability allows a different profit structuring, as well as the calculation of the breakeven point, which is a vital tool for forecast-based management.

This variability criterion enables one to study both the consequences of such an approach and the incidence of profitability and structure changes on costs behavior. Therefore, the goal is a simplified representation of costs behavior, designed to allow the study of real and complex situations. Thus it is developed a cost behavior model that allows a simplification of reality. Fixed costs are difficult to split between production costs, if analysis centers and „allocation keys" are used. A way to avoid random allocation is to fully appropriate them, possible a part determined in a different manner, as the case may be. Only variable costs will be considered for cost calculation, as these are generally direct and usually cause no appropriation (allocation) problem.

For a fixed management period, all the fixed costs are borne by the company, regardless of its business level, which means that sales volume should reach a certain level, to enable the company to bear these fixed costs. Moreover, all companies want to be profitable, meaning to have profit from their sales. This is equal to the sales value minus the variable and fixed costs. When sales volume, variable or fixed costs change, profit changes as well.

2. Earnings determination after changes of the operation conditions

Economic entities may use the COST-VOLUME-PROFIT ratio to estimate the business environment of the future management period (200N+1) and to control their operations. These estimates, including changes of the sale price, the amount of manufactured and sold goods, the variable production costs, the variable sale costs, the fixed production costs and the fixed sale and administration costs, as well as their implications, will be analyzed by the company manager bearing in mind the data for the current year 200N (shown in table no. 1) and they refer to the following possible situations (estimates) [Needles Jr., B.E., Anderson, H.R.,Caldwell, J.C., 2000, pp. 917-920] :

Table no. 1 – Calculation process constituents

No.	Explanations	Amount (pieces)	Price/unit cost (lei/piece)	TOTAL (lei)
0	1	2	3	4
1.	Turnover	33 000	5.50	181 500
2.	Variable production costs	33 000	2.20	72 600
3.	Variable sale costs	33 000	1.40	46 200
4.	Total variable costs	-	-	118 800
5	Variable cost margin (rd.1-rd.4)	-	-	62 700
6	Fixed production costs	-	-	32 625
7	Fixed sale and administration costs	-	-	12 050
8	Total fixed costs	-	-	44 675
9	Earnings (profit/loss) before tax (rd.5-rd.8)	-	-	18 025

1. ***Changes only to the production costs***, by the 10% increase of the variable production costs and by the 5% increase of the fixed production costs. The data shown in table no. 2 were obtained after calculation.

Table no. 2 Changes only to the production costs

No.	Explanations	Amount (pieces)	Price/unit cost (lei/piece)	TOTAL (lei)
0	1	2	3	4
1.	Turnover	33 000	5.50	181 500
2.	Variable production costs	33 000	2.42	79 860
3.	Variable sale costs	33 000	1.40	46 200
4.	Total variable costs	-	-	126 060
5	Variable cost margin (rd.1-rd.4)	-	-	55 440
6	Fixed production costs	-	-	34 256.25
7	Fixed sale and administration costs	-	-	12 050
8	Total fixed costs	-	-	46 306.25
9	Earnings (profit/loss) before tax (rd.5-rd.8)	-	-	9 133.75

The implications of these estimates, namely only the increase of the variable and fixed production costs, without alteration of the sale price or the amount of manufactured and sold good, are the profit that is lower by 8 891.25 lei (18 025 lei – 9 133.75 lei). Thus, in order to fight production costs increase, the company manager may wish to increase the sale price or to request other estimates from other specialists.

1. Changes to all the categories of costs, namely the 10% increase of all the variable costs and the 5% increase of the fixed costs. No other changes are foreseen. Table no. 3 shows the calculation results.

Table no. 3 Changes to all the categories of costs

No.	Explanations	Amount (pieces)	Price/unit cost (lei/piece)	TOTAL (lei)
0	1	2	3	4
1.	Turnover	33 000	5.50	181 500
2.	Variable production costs	33 000	2.42(2.20*1.10)	79 860
3.	Variable sale costs	33 000	1.54(1.40*1.10)	50 820
4.	Total variable costs	-	-	130 680
5	Variable cost margin (rd.1-rd.4)	-	-	50 820
6	Fixed production costs	-	-	34 256.25 (32 625*1.05)
7	Fixed sale and administration costs	-	-	12 652.50 (12 050*1.05)
8	Total fixed costs	-	-	46 908.75
9	Earnings (profit/loss) before tax (rd.5-rd.8)	-	-	3 911.25

These estimates, consisting of the change (increase) of all the categories of variable and fixed costs, show an even lower profit, of only 3 911.25 lei, that is a decrease by 14 113.75 lei (18 025 lei – 3 911.25 lei) as compared to the original situation. Thus, the company manager may wish to adjust the estimates by changing both the amount of manufactured and sold goods and the sale price.

Changes to the amount of manufactured and sold goods and to all the categories of costs, namely, on the one hand, by the 8% increase of the amount of manufactured and sold goods expressed in physical units and by the 20% increase of all the types of variable costs,

and, on the other hand, by the 10% decrease of all the categories of fixed costs (see table no. 4).

Table no. 4 Changes to the amount of manufactured and sold goods and to all the categories of costs

No.	Explanations	Amount (pieces)	Price/unit cost (lei/piece)	TOTAL (lei)
0	1	2	3	4
1.	Turnover	35 640	5.50	196 020
2.	Variable production costs	35 640	2.64	94 089.60
3.	Variable sale costs	35 640	1.68	59 875.20
4.	Total variable costs	-	-	153 964.80
5	Variable cost margin (rd.1-rd.4)	-	-	42 055.20
6	Fixed production costs	-	-	29 362.50
7	Fixed sale and administration costs	-	-	10 845
8	Total fixed costs	-	-	40 207.50
9	Earnings (profit/loss) before tax (rd.5-rd.8)	-	-	1 847.70

This prognosis is the most pessimistic of all, since despite the increase of the amount of manufactured and sold goods (and hence of the total variable costs) there is a variable cost margin decrease of 20 644.80 lei (62 700 lei – 42 055.20 lei). This variable cost margin decrease has a considerably higher negative effect than the positive effect of fixed costs split among a larger number of manufactured items. Therefore, the profit suffers the most, as it decreases to 1 847.70 lei, which means a decrease by 16 177.30 lei (18 025 lei – 1 857.70 lei).

If all these prognoses are considered correct, a set of actions have to be taken to increase the sale price.

Changes to the sale price, the amount of manufactured and sold goods and the sale costs, namely by a 10% increase of the sale price, which would lead to a demand decrease of 8%. Also, the amount of manufactured goods will decrease by 8%, the variable sale costs by 5%, and the fixed sale and administration costs will increase by 10% (see table no. 5).

Table no. 5 Changes to the sale price, the amount of manufactured and sold goods and the sale costs

No.	Explanations	Amount (pieces)	Price/unit cost (lei/piece)	TOTAL (lei)
0	1	2	3	4
1.	Turnover	30 360	6.05	183 678
2.	Variable production costs	30 360	2.20	66 792
3.	Variable sale costs	30 360	1.33	40 378.80
4.	Total variable costs	-	-	107 170.80
5	Variable cost margin (rd.1-rd.4)	-	-	76 507.20
6	Fixed production costs	-	-	32 625
7	Fixed sale and administration costs	-	-	13 255
8	Total fixed costs	-	-	45 880
9	Earnings (profit/loss) before tax (rd.5-rd.8)	-	-	30 627.20

The calculations in this table (table no. 5) show that our estimations led to the most optimistic prognosis, namely:

- the profit increases by 12 602.20 lei (30 627.20 lei – 18 025 lei);

- the total income increases by 2 178 lei (183 678 lei – 181 500 lei), although the increase of the sale price diminished the market demand from 33 000 pieces to 30 360 pieces;
- the increase of the fixed sale and administration costs from 12 050 lei to 13 625 lei is offset by a much larger reduction of the variable sale costs (40 378.80 lei < 46 200 lei).

Table no. 6 is a synthetic comparison between the four estimates. This synthetic approach will enable the company management to have a sold ground for the future talks with the other specialists in the company, related to the prognoses for the following year, thus preventing them from making wrong decision when setting the budget for the year 200N+1. When there are several data for the same economic category (sale price, variable production costs, fixed costs, etc.), one may use an average figure of all these values. This reviewed budget project will also be analyzed at another meeting of the company specialists.

Table no. 6 Synthetic comparison between the four prognoses

No.	**Explanations**	**200N**	**Prognosis I**	**Prognosis II**	**Prognosis III**	**Prognosis IV**
0	1	2	3	4	5	6
1.	Turnover	181 500	181 500	181 500	196 020	183 678
2.	Variable production costs	72 600	79 860	79 860	94 089.60	66 792
3.	Variable sale costs	46 200	46 200	50 820	59 875.20	40 378.80
4.	Total variable costs	118 800	126 060	130 680	153 964.80	107 170.80
5.	Variable cost margin (rd.1-rd.4)	62 700	55 440	50 820	42 055.20	76 507.20
6.	Fixed production costs	32 625	34 256.25	34 256.25	29 362.50	32 625
7.	Fixed sale and administration costs	12 050	12 050	12 625.50	10 845	13 255
8.	Total fixed costs	44 675	46 306.25	46 908.75	40 207.50	45 880
9.	Earnings (profit/loss) before tax (rd.5-rd.8)	18 025	9 133.75	3 911.25	1 847.70	30 627.20

In order for the decisions made to be relevant, the COST-VOLUME-PROFIT analysis should be used only if the company meets the following requirements:

- the specialists' estimates on the business environment of the following year should not exceed the relevant time interval;
- the physical volume of sold goods should be equal to that of the manufactured goods, in order to prevent stock variation impact;
- the production capacity should be known and unchanging during the analyzed management period;
- the goods sale structure (mix) should remain unchanged throughout the analyzed period;
- the costs should be divided into fixed and variable costs, and their evolution should be established with great accuracy for that period;
- the three ratios: turnover, variable costs and variable cost margin, should undergo a proportional evolution with the physical volume of manufactured and sold goods. If the sale price remains uncharged throughout the reference period, one may consider proportional the variable cost margin and variable costs.

If one or more of these requirements are not met, or if any of these assumptions is missing, the C–V–P analysis may be inaccurate.

Conclusion

To conclude with, separating fixed and variable costs helps gathering relevant cost-related information useful in short-term decision-making, such as, for instance, profit estimate for the following time interval. We could therefore say that prognoses of the production, sale and administration costs and of the future income of the various business units of a company, as well as the use of decision-making techniques based on relevant costs are possible only by a variable costs system approach, since profit is often inaccurately shown in a full costing system.

All these profit estimates were performed considering a safe business environment: the decision maker was familiar with the environment affecting his/her decision. However, the sales level does not depend on the decision maker's will, but on the market. Therefore, the breakeven point analysis is increasingly required in an uncertain, risky environment.

The limitations of the C-V-P analysis in estimating profit would be the following:

- the information provided by this analysis are accurate from the mathematical viewpoint, however there are many instances proving that costs are never absolutely fixed or proportional to the turnover;
- this analysis provides very simple solutions, however, this simple model and information processing procedures are mostly due to our simplification of reality. Thus, the problem of the reliability of these measures arises: is this information useful for a minimum level of profitability?

The case-by-case use of the C-V-P analysis will enable the users to find pertinent answers to the questions addressed to those in charge of decision making.

Profit forecasting is thus a simple tool, from the viewpoint of the C–V–P ratio approach, it is a model coming from financial accounting, playing a modest role, which allows however, in the absence of other more detailed analyses [Oger, B., 1994, p.75]:

- „a posteriori" to control business operation (the landmark being the company „control board");
- „a priori" to offer answers to questions such as: „from what turnover level or from what time of the year on will the variable cost margin fully generate profit?"

This may be translated for the company manager by: „from what operation level (or point in time) on will I be able to cover the structure costs in my own departments and to start developing a general company costs absorption capacity?"

An answer to these questions is already an attempt to solve the efficiency problem in a particular sector or group of people, by achieving the minimum revenue-expenditure balance objective. Other analyses will undoubtedly allow a more thorough follow-up of this efficiency.

Finally, the C–V–P is useful since it offer an overall image of the company management. For forecasting purposes, management may use C–V–P analysis to calculate the profit yield by a given amount of sold goods. Or, based on the C–V–P analysis, the management may set the necessary sales level to earn the desired profit. Moreover, C–V–P analysis is increasingly used in the budgeting process.

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