

# PERFORMANCE MANAGEMENT BY CVP ANALYSIS

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## Abstract

The paper presents the stage of knowledge the cost-volume-profit analysis (CVP analysis), namely the principles, objectives and its usefulness for the performance management. The main objective of the paper is to implement the CVP analysis by calculating activity indicators on a Romanian company. To achieve the main goal of the research, we approached concepts such as costs, revenues, production volume, profit, decision making, *what if* analysis needed by the management to develop different scenarios on production volume, cost, sales price that lead to conclusive decisions in the near future. The research methodology corresponds to the research objective and is circumscribed to an archival research regarding literature review and the exploratory case study to highlight the effects of CVP analysis on the outcome by modifying the various factors. The basis of the research is the company Boromir, in which we studied the impact of CVP analysis on bakery activity. In order to apply the presented concepts, we highlighted the usefulness of CVP analysis in the decision making process. The main result of the research is that the CVP analysis applied to Boromir can give it various opportunities to maximize profits for the upcoming period. The projected scenarios at the company level have led to the possibility of adopting strategic decisions such as investing in promotion, reducing the sales price and changing the structure of fixed and variable costs in total costs.

**Keywords:** CVP analysis, Decision making, Profit, Production volume, Forecasting, What if.

## 1. INTRODUCTION

Cost-Volume-Profit analysis (CVP) or breakeven point analysis studies the relationship between total revenue, total cost and total profit at different production levels, and is often used by executives to determine the sales volume required by the company at the breakeven point or to determine profit / loss

in terms of multiple levels of manufactured and sold quantities. Knowing how costs change as a result of volume change is useful in making business decisions. For example, if most of the costs of a product are fixed, then a company's total costs will grow to a small extent when multiple units are produced and sold. Understanding this cost behavior could lead to special promotions that will increase profits and sales.

This study aims to examine the effect of CVP analysis on the decision making process in the bakery industry and on the outcome of the scenarios determined based on forecasts.

Knowing the cost-volume-profit relationship helps management find the right solution for various issues such as: What should be the sales volume to obtain the profit you want? How will the change in the sales price affect the company's profit level? How will profit changes affect your costs? What should be the optimal mix of the enterprise?

For a complex and clear illustration, we have proposed to present a study at Boromir SA to achieve the proposed objective, respectively to present the effects of the CVP analysis on the result by modifying the various factors.

The structure of the paper is designed to achieve the proposed objective. After the introduction, it follows the conceptual context of the CVP analysis - a tool used by managerial accounting, then the principles and utility of this management tool are presented, followed by the section dedicated to the case study developed by Boromir SA. The end of the paper contains conclusions on CVP analysis in performance management, as well as recommendations for the application of this analysis in the activity of any company.

## **2. COST-VOLUME-PROFIT ANALYSIS (CVP ANALYSIS)**

Profit represents the figure that balances sales in relation to costs and is a major concern for a company's management. Sales volume never remains constant. It fluctuates positively or negatively, and revenue also increases or decreases with volume fluctuations. Profit is the result of interaction between different factors - cost volume and sales price. The effectiveness of a manager depends on his ability to make accurate predictions about future profits. This can be exposed when the correct relationship between cost, volume and profit is practically known. For this reason, knowing the relationship between cost, volume and profit should be seen as a huge asset to management (Okoye et al., 2006).

CVP analysis according to Glautieret et al. (2001) is a systematic review of the relationship between sales prices, sales and production volume, production costs, expenses and profits. The above definition explains CVP analysis as a commonly used tool, providing management with useful information for decision-making. CVP analysis will also be used to make vital and reasonable decisions when a firm faces managerial problems involving cost and profit. Such problems relate to profit planning, production planning, the decision to produce or buy, to expand or limit the product line, to use the production capacity in a period of economic growth or decline (Glautieret et al., 2001, quoted by Ihemeje et al. 2015).

Moreover, CVP analysis is used by managers to plan and control more effectively an entity's business, and also leads them to focus on the relationship between revenue, costs, changes in the quantities produced and sold, taxes and profit. This is also known as equilibrium analysis (Ihemeje et al., 2015).

The major problem encountered in manufacturing industries considering that CVP analysis is the basis for decision-making process is managerial inefficiency, including the ignorance of this concept, i.e. the inability of management to adopt this analysis in their decision-making system, and not recognizing the importance of CVP analysis (Ihemeje et al., 2015).

Managers generally want to know what the impact will be on profit as the amount of products sold or the services sold are changing. At a managerial level, there are issues that raise a number of questions, such as how many units in a new product should be sold to reach the profit margin or profit. Another uncertainty is how the expansion of a business on a foreign market would affect costs, sales and profits. These questions have a common technique, respectively *what if technique*. Examining the outcomes of these opportunities and the related alternatives contributes to making better managerial decisions (Horngren et al., 2012).

According to ACCA (2017) CVP analysis presents first the effects of different levels of activity on a company's financial results. If you could find out how many customers would buy the company's product, then management would be able to make ideal business decisions and maximize profits. Information provided by managerial accounting can be useful in providing answers to questions about the different action paths. One of the most important decisions that must be taken before starting any business is about the amount needed to be sold to reach the breakeven point. *The breakeven point* is covering all costs without gaining profit.

From the perspective of Gonzalez (2001), the CVP analysis studies the relationship between costs, revenue (depending on production volume and sales price) and profit. The analysis usually focuses on

the calculation of two specific exit values: the one needed to achieve a given target profit and the one for which the business obtains the zero result, so the revenue is equal to the expenditure. In both cases, CVP analysis acts as a tool to achieve management goals. The CVP model is based on three hypotheses:

- a. Application to either mono-production or multi-production activity;
- b. The total cost and revenue functions are linear and
- c. Fixed costs, variable cost per unit and sales price are known for certain.

## 2.1. Principles of CVP analysis

Ihemeje et al (2015) argue that the basis for the CVP analysis is based on the following principle: "at the lowest level of activity, the cost exceeds revenue, but as activity increases, revenue rises faster than cost, and eventually the two values become equal, after which the revenue exceeds the cost until the yield cuts bring again the cost over the income". This principle describes the CVP analysis from the perspective of a graph with curved lines. The cost and revenue curves seen only theoretically appear to be inapplicable. The professional accountant offers pragmatism through additional information on cost behavior and sales policy.

Ihemeje et al. (2015) presents the following fundamental assumptions of the CVP assay according to Horngen et al. (2006):

- a. Cost behavior and revenues are linear;
- b. The sales price is constant;
- c. Total cost can be divided into fixed and variable elements;
- d. The fixed total cost remains constant;
- e. The total variable cost is proportional to the volume of activity;
- f. The volume of activity is the only unit of cost;
- g. The purchase prices of the materials required for production are constant.

According to Budugan et al. (2008) CVP analysis is the cost evolution analysis that highlights the relationship between cost - production volume and profit. CVP analysis is a useful forecasting tool and managerial control. The methods used include a set of problem-solving techniques and procedures based on the understanding of the characteristics of the company's cost-development models. The techniques express the relationship between revenue, sales structure, costs, production volume and profits, and include the profitability analysis and profit forecasting procedures. These relationships

provide a general model of economic activity that can be used by managers to make short-term forecasts to assess the company's performance and to analyze the decision-making alternatives.

CVP analysis is useful because it provides an overview of company management. For the purpose of forecasting, management can use the CVP to calculate the profitability with a certain amount of goods sold or determine the level of sales needed to obtain the desired profit. Moreover, CVP analysis is increasingly being used in the budgeting process.

Differentiation in production costs between variables and fixes is the basis for cost analysis of partial methods. Given the variability of costs, it is possible to structure different profits and calculate the breakeven point that is a vital tool in the forecasting process. This variability criterion allows to study the consequences of both this variability approach and structural changes on cost behaviors. Therefore, the objective of the analysis is to simplify the representation of cost behavior, designed to allow the study of real and complex situations. Thus, a cost-based model is developed that allows a simplification of reality (Budugan et al., 2008).

Costs and expenses that do not change with a change in the volume of activity are known as fixed costs. Examples of fixed costs are administrators' wages, property tax and depreciation. Costs and expenditures that grow entirely on the basis of increased activity volume are variable costs. Materials directly attributable to a product, direct labor and some general costs are variable costs. Two examples of variable general costs could be the electricity for powering the equipment in the manufacturing process and the supplies at the factory. Analysis of the breakeven point uses the concept of contribution margin. Contribution margin represents sales revenue minus variable costs (Bashir et al., 2011).

Fixed costs are difficult to divide between production costs if analysis centers and allocation keys are used. Only variable costs will be taken into account for the calculation of costs because they are direct and usually do not cause any allocation problem. For a fixed management period, all fixed costs are borne by the company, irrespective of its level of activity, which means that the level of sales should reach a certain level to allow the company to bear these fixed costs. In addition, all companies want profitability, i.e. profit from their sales (the profit being the difference between the sales value minus the variable and fixed costs). In the case of changing the volume of sales, variable and fixed costs, the profit is also changed.

Economic entities can use the cost-volume-profit relationship to estimate the business environment of the future management period and to control operations. These estimates, including changes in the sales price, the value of the manufactured and sold products, the variable costs of production, the

variable costs related to the quantity sold, the fixed production costs and the fixed costs related to the sold production, as well as their implications, will be analyzed by the company's manager considering the dates for the current year.

In order to make relevant decisions, CVP analysis is recommended when the company meets the following requirements (Budugan et al., 2008):

- a. Estimates of business professionals from the following year should not exceed the relevant timeframe;
- b. The physical volume of the products sold should be equal to the volume of manufactured products to prevent the impact of stock changes;
- c. The production capacity must be known and unchanged during the analyzed management period;
- d. The product sales structure should be known and unchanged during the analyzed management period;
- e. Costs should be split into fixed and variable costs and their evolution should be set with a high degree of accuracy for that period;
- f. The three indicators, i.e. turnover, variable costs and variable cost margins, should be subject to an evolution proportional to the physical volume of manufactured and sold goods.

If one or more of the above requirements are not met or if one of these presumptions is missing, CVP analysis may be incorrect.

## 2.2. Objectives of CVP analysis

CVP analysis is primarily concerned with studying the effects of different levels of activity on an enterprise's financial results. The reason for concentrating especially on sales volume is due to the fact that, in the short term, the selling price and the cost of materials and labor are usually known with a degree of precision. However, sales volume is usually not so predictable and, therefore, in the short term, profitability often depends on it (ACCA, 2017).

According to Tulvinschi et al., (2012) CVP analysis is a powerful analysis tool based on the variable cost method, a tool that managers have at their disposal. This analysis presents a contradiction of the correlations between costs, revenues, sales prices, production volume and profit. These correlations provide a general pattern of economic activity that management can use for short-term forecasts to assess company performance and analyze decisional alternatives.

### 2.3. Using CVP analysis

CVP analysis is one of the most widely used tools in managerial accounting that serves multiple internal purposes (such as the evaluation of alternative sales scenarios, budgeting and performance appraisal) as well as external (investor and analyst forecasts on Sales earnings). CVP's relationship is based on the standard model of fixed and variable costs, which implies a linear relationship between sales and costs and therefore between sales and earnings (Banker et al., 2013).

Besides providing management with general information on the cost-volume-profit relationship of firms, the professional accountant can use CVP analysis and provide management with useful information needed in the sales process, certain planning, control, and various issues regarding more specific decisions. The areas of decision to include this analysis are: (1) profit planning, (2) control decisions, (3) product replacement, (4) pricing decision, (5) selection of distribution channels, (6) determining the production and sales volume, (7) maintaining the target investment sensitively, (8) measuring performance when entering a new market (Ihemeje et al., 2015).

Considering the profit planning, knowing CVP analysis allows management to predict profits under a varied volume of activity. This knowledge is very useful in preparing a flexible budget (Okoye et al., 2006).

A company decides first how much wants to sell, the cost and activity before generating the profit that will occur, but it plans the profit, which means that the company first decides what profit wants and then considers the sales, cost and activity needed to obtain that profit. Elements taken into account for profit planning are variables of CVP analysis. In this case, we can study how to apply CVP analysis (graphically or algebraically) using a company's predicted or planned economic data as a data source and then examine how the planned profit will change if fixed costs, variable cost and sales volume are varied (Ihemeje et al., 2015). This analysis will allow management to know about the company's inherent economic structure and what changes are needed on the future of the firm. CVP analysis for profit planning involves the use of the equation that determines the minimum amount that industries must achieve to achieve their cash dividend payout target for that year (Ihemeje et al., 2015).

With regard to the decision on product selection, the selection of products to be manufactured, abandoned, or postponed is one of the most critical decisions faced by a company's management. The products selected from the product mix decision determine the company's revenue, profit and operating cash flow. Perhaps equally important is the fact that selected products will determine on the one hand the competitive position of the firm versus its competitive position given by the products currently

selected and providing the necessary funds for the development and future production of products (Ihemeje et al., 2015). Based on the accounting data, CVP analysis is used to determine the amount of sales required for the breakeven point and the amount of sales needed to obtain the desired profit margin. The manager then compares the forecast sales of the product with the amount of sales needed to reach the breakeven point and obtain a target profit margin thus determining whether a product deserves to be manufactured.

Budget control is the establishment of a budget that involves management responsibility and company policy requirements and refers to the ongoing comparison of actual results with budgeted ones. Budgetary control ceases when budget planning stops and budget aspirations are reached. Budget control aims at using the budget to control the firm's business activity either with the aim of securing through individual actions the business objective or to provide a basis for business valuation (Ihemeje et al., 2015). CVP analysis can be used in budget control to compare the budgeted sales, volume, cost, and profit values to actual values. Variance analysis is only processed for cost-volume-profit. The process of comparing actual results with planned outcomes and reporting of budgeted control helps maintain spending within the agreed limits.

The pricing decision determines the management to make a series of decisions about the price of manufactured products in view of the effect of this price on revenue and, implicitly, on profit. The cost-volume-profit analysis presents the behavior and relationship of the elements of revenue, total costs, and profit, taking into account a number of changes in the sales volume, sales price, unit costs, or fixed costs of a product (Horngren et Al., 2012). The pricing decision is a strategic decision that affects the quality produced and sold, so costs and revenues. In order to make these decisions, managers need to understand cost behavior models and cost drivers, then evaluate the value chain and throughout the life cycle of products to achieve profitability (Horngren et al., 2006, quoted by Ihemeje et al. 2015).

With a decline in business, the company sets very carefully the price of its products. It has sometimes become necessary to reduce the price to stimulate the sale of a product. For decisions of this kind, management must determine by CVP analysis what impact the price reduction will have on the level of the enterprise's profit (Okoye et al., 2006).

#### **2.4. The limits of CVP analysis**

- a. CVP analysis is essential in demonstrating the effect on an organization selling different quantities of products, with changes in sales price and costs. However, its use is limited because it is based on

the following assumptions: either a single product is sold or there are several products sold in a constant mix. If the assumption of this constant mix changes, so will the breakeven point.

- b. All other variables, except volume, remain constant, i.e. the volume of production is the only factor that causes changes in revenue and costs. In reality, this hypothesis may not prove to be true because, for example, economies of scale can be achieved as the volume increases. Similarly, if there is a change in the sales mix, the revenue will change. In addition, it is often found that in the case of sales volume growth, the sales price should decrease, which is only a few of the reasons why the hypothesis may not be true.
- c. The total cost and total revenue functions are linear. This is likely to have a limited, short-term activity level.
- d. Costs can be divided into a component that is fixed and a component that is variable. In practice, some costs may be semi-fixed, such as telephony, where there may be a fixed monthly rental charge and a variable charge for calls made.
- e. Fixed costs remain constant over the range considered relevant - the levels at which the activity has experience and can therefore perform a certain degree of accurate analysis.
- f. Profit is calculated on a variable cost basis or, if the absorption costing is assumed, the volume of production is assumed to be equal to the sales volume.

### **3. CVP ANALYSIS - CASE STUDY AT BOROMIR SA**

#### **3.1. Research methodology**

According to Lopes (2014) academic and scientific research highlights how to assimilate new knowledge through diverse methods and methodologies. Accounting research tends to increase the positivist approach.

The present research is based on the literature review and the case study, in order to apply the presented concepts and methods. According to Smith (2014), managerial accounting research is substantially enriched by case studies involving limitation to a single base of analysis in order to demonstrate the application of concepts, techniques, and methods that can prove good practice for the area under investigation. The contribution to the literature is given by the results highlighted by the case study. If these can be generalized or replicated in other work areas than the one exemplified in a particular work, then the validity of the method is validated and generally accepted.

Our research provides a descriptive and illustrative case study. As Smith (2014) describes the descriptive case study, it applies procedures in a specific field of work - the Boromir bakery department - to give them the status of good practices or to identify them as "successful recipes" for the field investigated. Our study is also illustrative, proposing to illustrate the effects of changing the various factors on the company's profit.

### 3.2. CVP Analysis at Boromir SA

Boromir is a group based in Ramnicu Valcea, having as main activity the activity of milling and bakery, established in 1994. The group includes the companies Boromir Prod, Boromir Ind., Moara Cibin, Sibiu Extrasib, Comcereal Sibiu, Amylon Sibiu, Panmed Mediaș, Boromir gas stations and a timber mill in Valcea County.

During the 16-year period, Boromir has developed, so now it is able to control 10% of the milling activity on the Romanian market with a grinding capacity of 1,500 tonnes/day. This was possible both through the acquisition of new milling and bakery plants located in areas of the country with development potential in Sibiu, Buzău, Deva, Slobozia, as well as by the re-technologization and re-equipment of all production facilities.

During 2016 the production obtained by department was 32,441 tonnes, being valued at 58,654,637 RON (at the registration price). Thus, the milling has a weight of 58.44% in the total quantity and 32.09% in the total production income. The average price during 2016 was in this sector of 0.99 RON / kg. The bakery and mustard department represent 41.56% of the total quantity and 67.91% of the total revenues obtained in the production area.

TABLE 1. THE PRODUCTION PRESENTED BY DEPARTMENTS

Department	2016 year		Medium cost <sup>*)</sup>	Percentage of the total quantity (%)	Percentage of the total value (%)
	Weight (kg)	Value (RON)			
Milling activity	18,595,654	18,819,910.42	0.9926	58.44	32.09
Bakery, confectionary, sweets, mustard	13,481,435.84	39,834,727.16	2.9547	41.56	67.91
<b>Total</b>	<b>32,441,089.84</b>	<b>58,654,637.58</b>	<b>1.8080</b>	<b>100</b>	<b>100</b>

Source: financial statements of Boromir

\*)Note: The average costs are at the product record level

Given the fact that for our study case we needed certain information presented below and in the financial statements of Boromir we could not obtain all the information we needed, we presented the information needed below as an example in order to present the effect of CVP analysis.

We focused our study case on the bakery segment, which accounts for about 26% of the total quantity and 46% of the total production revenue. Based on this data, we can determine the quantity of bread produced and sold (kg) and its cost in 2016.

Manufactured and sold quantity	26% x 32,441,089.84 RON	<b>8,434,683.36 kg</b>
Total production cost	46 % x 58,654,637.58 RON	26,981,133.28
Production cost per unit		3.20 RON
Variable cost per unit		2.183 RON/kg
Fixed costs		8,570,000 RON
Total variable costs		18,411,133.28 RON

Considering that the bakery segment contributed 43.4% of the turnover in 2016, i.e. 40,203,613 RON (Table 2), the average selling price for this segment could be approximated to 4.76 Ron/kg.

**TABLE 2. EVALUATION OF SALES ACTIVITY BY DEPARTMENTS**

Department	Turnover (RON)	Percentage of turnover (%)
<b>Milling activity</b>	<b>10,714,348</b>	<b>11.57</b>
<b>Bakery, confectionary, pastry, mustard, cooking activity</b>	<b>62,368,184</b>	<b>67.33</b>
o Bakery	40,203,613	43.4
o Confectionary	4,446,483	4.8
o Pastry	4,909,658	5.3
o Sweets	9,726,681	10.5
o Mustard	3,081,750	3.33
<b>Other revenues</b>	<b>19,552,521</b>	<b>21.22</b>
<b>Total</b>	<b>92,635,053</b>	<b>100</b>

CVP analysis of Boromir during 2016 is based on the previously presented data through the level 1 and level 2 management reports. Thus, in the context of CVP analysis, we determine and analyze: the contribution margin, the breakeven point, critical turnover, safety margin and other key indicators in decision-making process.

**TABLE 3. MANAGEMENT REPORT  
LEVEL 1 – QUANTITY-PRICE-COSTS**

No.	Activity indicators	Bread (kg)
1.	Quantity sold (kg)	8,434,683.36
2.	Sale price (RON/kg)	<b>4.76</b>
3.	Variable cost (RON/kg)	2.183
4.	Fixed costs	8,570,000

In the context of the CVP analysis, the data contained in the level 1 management report are processed to determine the specific indicators related to the work carried out on the baking segment in 2016. The results are summarized in Table 4.

**TABLE 4. MANAGEMENT REPORT  
LEVEL 2 – THE ACTUAL SITUATION**

No.	Activity indicators	Bakery
1.	Sold quantity (kg)	8,434,683.36
2.	Sale price (um/kg)	<b>4.76</b>
3.	Unit cost (um/buc)	2.183
4.	Contribution margin per unit (4 = 2-3)	2.58
5.	Fixed costs	8,570,000
6.	Turnover (CA) (6=1 x 2)	40,149,091.08
7.	Variable expenses (7 = 1 x 3)	18,411,133.28
8.	Contribution margin (6-7)	21,737,957.80
9.	<b>Profit/Loss</b>	13,167,957.80
10.	Breakeven point (kg)	3,325,572.37
11.	Critical turnover (Ron) (11=5/9)	15,829,724.49
12.	Safety margin (Ron)	24,319,366.59
13.	Rate of safety margin (%)	60.57

*Contribution margin* indicates the contribution of bakery activity in order to obtain the result and implicitly to cover fixed costs. It can be seen from Table 4 that the contribution margin of the company for the year 2016 is 21,737,957.8 RON covering the total fixed expenses and leads to a favorable result of 13,167,957.80 RON.

Under production and sales of 8,434,683.36 kg, a production of 3,325,572.37 kg is sufficient, representing the breakeven point, so that the company's result is zero. The value of sales at the breakeven point (critical turnover) is 15,829,724.49 RON and corresponds to a production of 3,325,572.37 kg. The current activity of 40,149,091.08 RON is far from the area of losses, which can decrease by about 24.3 million RON (safety margin). *The margin of safety* indicates how much sales can decrease in order for the company to remain in the profitable area, in this case the total volume of sales may decrease by 24,319,366.59 RON, or 60.57% (the safety margin). This in fact determines the risk of becoming unprofitable or assesses the degree of safety in maintaining the profitable area.

Given that the CVP analysis is oriented to forecasting and adopting short-term decisions in a given production and sales structure, we present the impact on the result generated by the change in factors of influence based on expected dates for bakery activity in the year following. For the year 2017, production costs and sales price are constant, and the rest of the indicators vary according to forecasts.

### Contribution margin

The fixed costs of our company are 8,570,000 RON, and the unitary costs of the actual quantity produced and sold are of 2.18 RON / kg, representing the costs that vary according to the quantity of the sold quantity (kg of bread). To see how the operating result changes as a result of the sale of a quantity of 9,500,000 kg of bread compared to the quantity produced and sold in the previous year, respectively 8,434,683 kg the table below shows the differences in operating income based on these projections:

**TABLE 5 MANAGEMENT REPORT  
LEVEL 3 – OPERATING RESULT CORRESPONDING TO ACTUAL AND PREDICTED QUANTITIES**

No.	Indicators	Sold quantity (kg)	
		8,434,683	9,500,000
1.	<b>Sales revenue (4,76 RON/kg)</b>	<b>40,149,091</b>	<b>45,220,000</b>
2.	Variable costs (2,18 RON/kg)	18,411,133	20,710,000
3.	Contribution margin	21,737,958	24,510,000
4.	Fixed costs	8,570,000	8,570,000
5.	<b>Total costs</b>	<b>26,981,133</b>	<b>29,280,000</b>
6.	<b>Operation result (1-4)</b>	<b>13,167,958</b>	<b>15,940,000</b>

As it can be seen, there are changes in variable income and costs. The difference between total revenue and variable costs is contribution margin. In the above cases the contribution margin is obtained as follows:

- The sale of 8,434,683 kg of bread resulted in a total revenue of 40,149,091 RON and the total variable costs of 18,411,133 RON. The difference is a contribution margin of 21,737,958 RON.
- Selling 9,500,000 kg of bread, a total revenue of 45,220,000 is obtained, given the sale price / kg of 4.76, and the total variable cost is 20,710,000. These values led to a contribution margin of RON 24,510,000.

Contribution margin per unit is the indicator used in the calculation of the overall contribution margin and operational result. This indicator is obtained by the difference between the unit sale price and the unit variable cost. In this case, the unit contribution margin is  $4.76 - 2.18 = 2.58$  RON/kg.

Our company excluding fixed costs, carries variable costs per kg of sold bread of 2.18 RON and sells one kg at the price of 4.76 RON. In view of this information, it can be inferred that the contribution margin can be calculated on the basis of the unit gross margin and the quantity sold (e.g. in the case of the sale of a quantity of 9,500,000 kg of bread with a unit margin of 2,58 RON/kg , the gross margin of 24,510,000 RON is obtained). The contribution margin per unit of 2.58 RON indicates that Boromir

recovers for every kg of bread sold 2.58 RON. The company proposes to sell a sufficient amount of bread to recover the fixed costs incurred and to make a profit. Each kg of additional bread sold leads to a gross margin increase of 2.58 RON / kg, recovering the fixed costs and thus increasing the operational profit.

The contribution margin can be expressed as a percentage, i.e. the contribution margin rate, being obtained by reporting the unit gross margin to the sales price. For Boromir, contribution margin will be  $2.58 / 4.76 = 0.5420$ , representing 54.20%. In practice, most companies use the contribution margin rate as a simple way to calculate the contribution margin for different income values. Considering the above mentioned, in the case of Boromir, if 9,500,000 kg are sold, the revenues will be 45,220,000 RON, and the contribution margin rate of 54.20% of the obtained revenues leads to the gross margin of 24,510,000 RON.

We present the methods that contribute to a complex illustration of the CVP analysis and thus the understanding of the relationships that led to the determination of the contribution margin and which expressed the cost-volume-profit relationship.

### Equation method

The equation based on which the sales revenue is determined by the different quantities of kg sold is the following (**Equation 1**):

$$(P_{vz} \times Q_v) - (C_{vu} \times Q_v) - CF = \text{Operating result}$$

Where,

$P_{vz}$  – sale price per unit;

$Q_v$  – sold quantity;

$C_{vu}$  – variable cost per unit;

$CF$  – fixed cost.

In the case of the sale of 9,500,000 kg of bread by applying the above equation, the following are obtained:

$$(4.76 \times 9,500,000 \text{ kg}) - (2.18 \times 9,850,000 \text{ kg}) - 8,570,000 \text{ RON} = \mathbf{15,940,000 \text{ RON}}$$

### Contribution margin method

By rearranging equation 1 the following equation is obtained (**Equation 2**):

$$(MB_u \times Q_v) - CF = \text{Operational result}$$

In the case of Boromir, as presented, the unit contribution margin is 2.58 RON / kg, so in the case of the sale of 9,500,000 kg, the operational result is obtained:

$$(2.58 \text{ RON/kg} \times 9,500,000 \text{ kg}) - 8,570,000 \text{ RON} = \mathbf{15,940,000 \text{ RON}}$$

### Graphic method

Under this method, total costs and total revenue are represented graphically by two straight lines corresponding to total costs and total revenue.

#### *The cost line*

The fixed costs are 8,570,000 RON for any sold quantity. In order to delimit the total cost line, the fixed costs of 8,570,000 RON to 0 kg sold (point A) are used as the point because the variable costs are 0 when no bread is sold. We will select a second point by choosing a convenient quantitative level, in this case 9,500,000 kg, and determine the total cost of the quantity sold. The variable costs for this quantity are 20,710,000 RON, and the fixed ones of 8,570,000 RON, so the total costs for 9,500,000 kg of sold bread are 29,280,000 RON, representing point B. So by joining the two points we get the line *Total costs*.

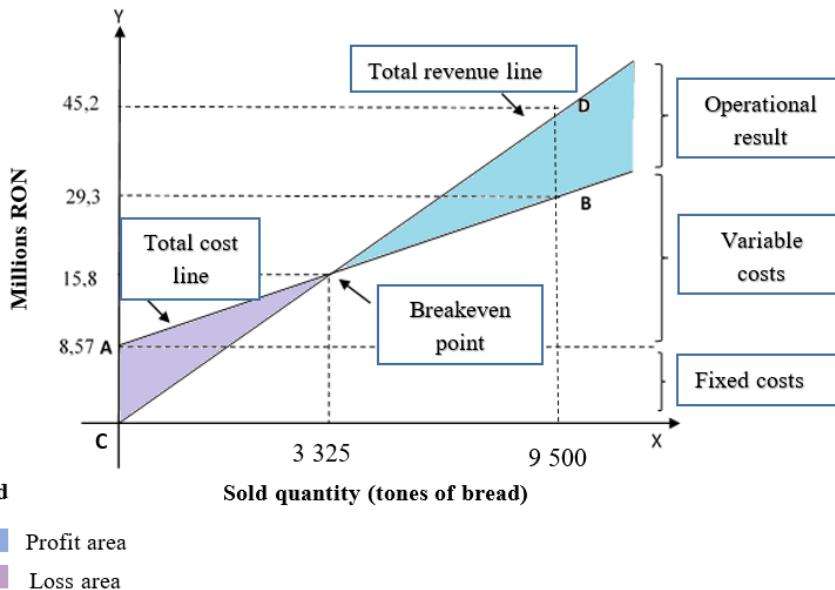
#### *Total revenue line*

To begin with, select point C, i.e. the point considered convenient, 0 incomes per 0 kg of bread sold. A second point will be selected by choosing a variant of the suitably sold quantity and determining the corresponding sales revenue. At 9,500,000 kg of bread sold, the total revenue is 45,220,000 RON (4.76 RON / kg x 9,500,000 kg), which is the point D. Considering the above, the *total revenue line* is the line under C by point D.

Profit or loss at any sales level can be determined by the vertical distance between the two lines at the related level (Figure 1). For quantities smaller than 3,325,572 kg of sold bread, total costs exceed total revenue, and the purple area indicates sales losses. For quantities greater than 3,325,572 kg of bread, total revenue exceeds total costs, and the blue area indicates sales revenue. At 3,325,572 kg of bread

sold, total revenue is equal to total cost. So the sale of 3,325,572 kg of bread is the breakeven point of the company.

**FIGURE 1 GRAPHICAL PRESENTATION OF TOTAL COSTS AND REVENUES (GRAPHICAL METHOD)**



### The breakeven point (PR)

The breakeven point is the sold amount for which the total revenue is equal to the total expense, so the result is 0.

$$PR = \frac{CF}{MB_u}$$

For our company the breakeven point is as follows:

$$PR = 8,570,000 / 2.58 = 3,325,572 \text{ kg}$$

In the case of multi-production companies, they are accustomed to calculating the equilibrium point directly in monetary units by using the previously calculated contribution margin (54.20%).

$$CA^* = \frac{CF}{R_{Mb}}$$

Where,

*CA\** – critical turnover;

*R<sub>Mb</sub>* – contribution margin rate.

Critical turnover for our company is 15,829,724 RON (8,570,000 / 0.5420).

The breakeven point provides managers information about the amount to be sold in order not to enter the loss area. This indicator is very useful if managers are interested in how they can get a target result to establish their strategies and plans to do so.

### Safety margin

The margin of safety expresses how much the activity may decrease, in monetary units, so that it does not fall into the area of losses. Sales may decrease as a result of a better product being introduced by one of the competitors, or if marketing programs are poorly executed, etc.

In our study case, the fixed costs are 8,570,000 RON the sales price is 4.76 RON/kg and the unitary costs of 2.18 RON/kg. According to Table 5, in the case of the sale of an expected quantity of 9,500,000 kg, the turnover obtained is 45,220,000 RON, and the critical turnover (breakeven point in monetary units) is 15,829,724 RON. Based on this information, the safety margin can be obtained either in physical units or in monetary units (RON).

$$MS \text{ (RON)} = (CA - CA^*)$$

$$MS \text{ (kg)} = (Q_v - PR)$$

Based on these formulas, the following safety margin values were obtained:

$$MS \text{ (RON)} = 45,220,000 \text{ RON} - 15,829,724 = 29,390,276 \text{ RON}$$

$$MS \text{ (kg)} = 9,500,000 \text{ kg} - 3,325,572 \text{ kg} = 6,174,428 \text{ kg}$$

The results show that in the case of a manufactured and sold quantity of 9,500,000 kg of bread, Boromir may drop the sale by approx. 6 million kg valued at 29.4 million RON without being in danger of entering the area of losses.

### Using CVP analysis in decision making process

Managers also use CVP to determine other decisions, most of which are strategic decisions. Such a decision, for example, may be to choose additional features for an existing product. Different choices may affect the sales price, unit variable costs, fixed costs, the quantity sold and the result. CVP analysis

helps managers in decision-making process regarding the product by estimating the expected profitability of these decisions.

Strategic decisions involve a variable risk. CVP analysis can be used to assess the extent to which the outcome will be impaired if the predicted data is not reached (Example: What would be the impact on the result if less than 10% of the income is obtained?) Assessing this risk affects also other strategic decisions a company can take. For example, if the probability of a decrease in sales is high, the manager could change the cost structure to have higher costs compared to lower fixed costs.

a. *Decision regarding advertising*

Scenario 1. For the next year, the company expects sales of 9,500,000 kg of bread for which it has a profit of 15,940,000 RON. In addition, the company is considering investing in promoting bakery products of 1 million RON, after which is expected sales to increase by 8%. If this investment brings a positive change in profit or not, we will analyze in Table 6 presented below.

**TABLE 6. MANAGEMENT REPORT**  
**LEVEL 4 – SCENARIOS ON THE PROMOTION OF BAKERY PRODUCTS**

No.	Elements	Sales without advertising	Sales with advertising	Difference
1.	Sold quantity (kg)	9,500,000	10,260,000	760,000
2.	Sale price (RON/kg)	4.76	4.76	-
3.	Turnover (1x2)	45,220,000	48,837,600	3,617,600
4.	Variable costs (1 x 2,18 RON/kg)	20,710,000	22,366,800	1,656,800
5.	Contribution margin (3 - 4)	24,510,000	26,470,800	1,960,800
6.	Fixed costs	8,570,000	9,570,000	1,000,000
7.	Operating result (5-6)	15,940,000	16,900,800	960,800

Based on Table 6, it is noticed that the profit registered an increase from 15,940,000 RON to 16,900,800 RON, which means for Boromir it is recommended to make the investment regarding the advertising of products. If we focus on the difference column, the contribution margin increased by 1,960,800 RON, while the fixed expenses by one million, which led to the increase of the result by 960,800 million. Analysis of differences leads us to deepen our CVP analysis as we focus on revenue and costs that will change as a result of a decision.

*b. Decision to reduce sale price*

Scenario 2. We have previously determined that Boromir is recommended to advertise its products as this will lead to increased sales and, implicitly, profit growth. In this scenario, the company plans to lower the price to 4.5 RON/kg and to sell a quantity 15% higher than the expected quantity of 9,500,000 kg, i.e. 10,925,000 kg. At this quantity variable costs could be reduced to 2 RON/kg as a result of renegotiating prices with suppliers and getting discounts on raw materials.

So, in order to see if it is appropriate to reduce the sales price, we have presented the following calculation below:

<i>Contribution margin after reducing sale price at 4.5 RON/kg</i>	$(4.5 - 2) \times 10,925,000 \text{ kg}$	27,312,500 RON
<i>Contribution margin by maintaining the sale price at 4.76 RON/kg</i>	$(4.76 - 2) \times 9,500,000 \text{ kg}$	26,220,000 RON
<b><i>Difference over contribution margin by price reduction</i></b>		<b>1,092,500 RON</b>

Decreasing the price will lead to the increase of the contribution margin by 1,092,500 RON and given that the fixed costs of 8,570,000 RON will not change, the operating profit will increase by 1,092,500 RON. In this case, it is obvious that such a price reduction is indicated.

*c. Strategic decision on the structure of fixed and variable costs*

Managers have the ability to decide on fixed and variable costs in the overall cost structure, which is a strategic decision. In this section we describe various factors that managers and accountants consider to be involved in making this strategic decision

Scenario 3. In Boromir's analysis, the initial fixed costs borne by it are of 8,570,000 RON and the variable cost per unit is 2.18 RON/kg. If the fixed costs increase to 10,000,000 RON and the cost per unit is reduced to 1.8 RON, we will get the following necessary quantities to be sold for a target result of 25 million RON.

**TABLE 7. MANAGEMENT REPORT**

Fixed costs (RON)	Variable costs (RON/kg)	Required quantity to be sold at 4.76 RON / kg to obtain the target result of	
		0 RON (breakeven point)	25,000,000 RON
8,570,000	2.18	3,325,572	13,011,628
10,000,000	1.8	3,378,378	11,824,324

Analyzing the above table, it is noted that an increase in fixed costs to 10,000,000 RON leads to a risk of loss recording (the breakeven point increases to 3,378,378 kg of bread) but it is necessary to sell a smaller quantity of bread (kg) respectively 11,824,324 kg to achieve the target profit of 25,000,000 RON. CVP analysis helps managers to evaluate different fixed and variable cost structures. Being in a situation of uncertainty about the structure of fixed and variable costs, managers' choice will be influenced by their level of confidence in the sale of the product and the acceptance of a risk of registering a negative result (loss) in a low demand for the product. For example, if Boromir's risk tolerance is high, it will choose to incur higher fixed expense with significant benefits on the outcome. If the company strategy implies aversion to the risk of loss, the company will choose to bear the lowest fixed costs, although the benefits on the result are diminished.

Concluding, the CVP analysis is oriented towards forecasting and short-term decisions, taking into account an initial situation. In the case of Boromir, we find that using the CVP relationship a number of favorable decisions can be adopted for the company, such as investing in advertising that leads to favorable outcomes, reducing the sales price, alternating fixed and variable costs by changing their structure total costs borne by society and other strategic decisions essential to the future of society.

The overall situation of the company is very favorable, by analyzing the key indicators in the decision-making process, i.e. the global contribution margin, the critical turnover, the safety margin in absolute and relative values, the management succeeding in adopting a series of decisions involving maximizing results and efficiency on production activity in the baking segment, the segment analyzed in the context of CVP analysis.

#### 4. CONCLUSION

In this research on CVP analysis we examined the effect of CVP analysis on the decision making process in the bakery industry in Romania (Boromir case). The paper also showed that CVP analysis is a commonly used tool that provides management with useful information to make appropriate and reasonable decisions when a company is experiencing cost, volume, and product implications.

The paper presents the existing relationship between the cost elements, volume and profit, based on the revision of specialized literature. The paper highlights the usefulness of implementing CVP analysis within organizations as organizations aim to maximize profits by modifying the factors that will lead to this goal. In this respect, using the technique *what if* there are a series of scenarios that make it possible to make conclusive decisions.

The case study of Boromir with the aim of highlighting the effect of CVP analysis on the outcome has led to the possibility of adopting favorable strategic decisions (such as investing in advertising, reducing sales prices), involving maximizing results and efficiency over production activity in the baking segment, the segment analyzed in the context of CVP analysis.

Following the results, we underline the following proposals:

- a. Each of these elements: cost, volume, profit should be considered in the management decision making process. These issues must be dealt with together, because plausible decisions are not achievable by their separate use, but rather analyzed in a form called cost-volume-profit analysis;
- b. The management of the bakery industry and other CVP analysis users should determine the best approach to analysis (either graphical or algebraic) in order to adopt it.
- c. The bakery industries should present the results of previous years in terms of cost-volume-profit in a trend analysis and should be used to compare performance with other industries;
- d. To increase managerial efficiency in the baking industry, CVP analysis should be applied in the decision making process;
- e. The benefit of cost-effective control, of high production capacity and profitability growth will only be derived by properly applying the CVP analysis;
- f. In order to maximize profits, the manufacturing industry should increase the production quantity as well as the volume of the sold quantity, which implicitly leads to the increase of the sales value;
- g. Within this industry should be hired experts with the necessary knowledge of the concept and application of accounting principles and accounting techniques;
- h. The bakery industry should include, in addition to CVP analysis and other managerial tools such as activity-based costs, inventory of stocks in decision-making process.

## REFERENCES

- ACCA (2017). Cost - Volume - Profit Analysis. Retrieved from: <http://www.accaglobal.com/ng/en/student/exam-support-resources/fundamentals-exams-study-resources/f5/technical-articles/CVP-analysis.html>.
- Banker, R., Basu, S., Bizalov, D. and Chen, J.Y.S. (2013). *Asymmetries in Cost-Volume-Profit Relation: Cost Stickiness and Conditional Conservatism*, Fox School of Business, Temple University, Philadelphia: Alter Hall.
- Bashir, F., Batool, S. and Rizwan, R. (2011). *How Cost-Volume-Profit Analysis is done? A practice*, Institute of Management Sciences, Multan.

- Boromir SA (n.d.). Comunicate Financiare ale societății Boromir SA. Retrieved from: <http://www.boromir.ro/comunicate-financiare>.
- Budugan, D. and Georgescu, I. (2008). *Use of the Cost/Volume/Profit Analysis to estimate earnings*, Analele Științifice ale Universității „Alexandru Ioan Cuza” din Iași. Retrieved from: <http://anale.faaa.uaic.ro/anale/ro/Arhiva%202008%20-%20Budugan/207>.
- Caraiani, C., Dascălu, C. and Lungu, C.I. (2014). *Contabilitate managerială. Tehnologii integrative pentru deciziile de afaceri*, Ediția a 2-a bilingvă, București: Editura ASE.
- Gonzales, L. (2001). Multiproduct CVP analysis based on contribution rules, *International Journal of Production Economics*, 73(3), 273-284.
- Horngren, C.T., Datar, S.M. and Rajan, M. (2012). *Cost Accounting – A Managerial Emphasis* 14<sup>th</sup> ed, Pearson Prentice Hall.
- Ihemeje, J.C., Okereafor, G. and Ogungbangbe, B.M. (2015). Cost-volume-profit Analysis and Decision Making in the Manufacturing Industries of Nigeria, *Journal of International Business Research and Marketing*, 1(1), pp. 7-15.
- Okoye, E.I. (2006). The analysis of probability concept in curvilinear Cost-Volume-Profit (CCVP) and the view of economists, *Kogi Journal of Management*, 1(2), Retrieved from: <https://ssrn.com/abstract=1792327>.
- Tulvinschi, M. and Chirita, I. (2012). *The opportunity and need of the Cost-Volume-Profit Analysis in agriculture*, Lucrări Științifice – vol. 52, seria Agronomie, pp. 702-707.