

Role of Analysis CVP (Cost-Volume-Profit) as Important Indicator for Planning and Making Decisions in the Business Environment

Enkeleda Lulaj

PhD.(cand.) University "Haxhi Zeka ",Peja/Kosovo

Etem Iseni

Prof.Dr., State University of Tetova, Tetova, Macedonia

Abstract

This research intends to know how much the Cost-Volume-Profit Analysis is used to planning and making decisions in the business environment. The research has been done in manufacturing and service enterprises, using the combination of econometric models in order for the research to be as accurate and to have positive effect. The data are realized through structured questionnaires, using the Mann-Whitney U test, Brunner Munzel test, p-value, BootStrap, DF-degree of freedom, percent confidence interval, with the dependent and independent variables etc. In whom case the hypotheses are verified, which are raised .The results of this research showed that amount of product produced has positive effect on sales value to service companies and raising profit to the manufacturing business environment, also exists an important relationship between production and sales, and CVP analysis contributes to growth profitability and break-even in the business environment . So, as conclusion based on the results found from research, cost-volume-profit analysis should be used for making decisions, because the risk threshold evidently decreases by doing such analysis. The great demand from service companies for products it significantly increases profit and producing to manufacturing enterprises.

Keywords: CVP analysis, break even, costs, production, decision making, margin of contribution, risk threshold etc.

Introduction

Managerial accountants, in the business environment should to calculate as: expenses, income, future profits etc. To help in planning and monitoring operations, they use it cost-volume-profit analysis (CVP), by identifying the necessary levels of operational actions: to avoid losses, to increase target profit, to planning future operations, to monitor the performance of the enterprise. They also analyze the operational risk of how to choose the appropriate costs for producing or service a product or more products.

Purpose of Research

The purpose of this research is to see whether applied or not applied the cost-volume-profit analysis during planning and decision making, so what the effects in break even .Another important purpose in this research is to explore the relationship between the CVP analysis and the profitability analysis, in the business environment of the manufacturing and service, then to determine whether the CVP principles are being met and practiced in manufacturing and service enterprises in Kosovo. Which means: basically, the functioning of the CVP analysis is the principle which emphasizes "the lowest level of costs during the activities, and the revenue increases with the growth of activities in the business environment".

Methodology

As ,case study we have chosen the manufacturing and service environment business in the Kosovo, namely the sale a product or more products affects the realization of profit for manufacturing enterprises , then what is the demand of the service companies and what is the demand of the consumers from the service companies (a product or more products). For the most accurate realization of this research, we have used several econometric and statistical models during the observed period such as: Mann-Whitney U test, Brunner Munzel test, Degree of Freedom, Bootstrap including dependent and independent variables. The test is realized with: manufacturing enterprises, service enterprises, and finally with consumers. Qualitative data during the observed period have been verified through raised hypotheses. The econometric and statistical model is processed through the SPSS and R program. Found results will help for planning and effective making decisions through CVP analysis.

The Hypotheses

Main hypotheses:

H1: Exists significant relationship between manufacturing enterprises, service enterprises and customers?

H2: Cost-Volume-Profit Analysis is closely related to planning and decision making in the business environment?

Ancillary hypotheses:

H01: Selling more products (increased service) affects profit growth if the contribution margin covers the fixed costs?

H02: The quantity of products produced has positive effect on sales value in service enterprises, and increased profits of manufacturing enterprises in the business environment?

H03: Selling more products or mixed products (or offering more services) realizes the greatest profit than sale only one product (or offering only one service)?

Literature Review

Cost-Volume -Profit Analysis is management tool with which employees as managerial accountants help in making decisions convincing, which have volume of cost depending on activity within the business and implications in profit. But if the management of the enterprise does not apply the CVP analysis during the decision making process, it will result in low performance and profitability. About the definition, for the CVP analysis have given contribution many authors: According to Gautier Et al 2001¹ the CVP analysis shows the relationship between sales prices, production volume, costs, expenses and income, target profit. According to Drury (2000), the CVP analysis determines performance, measurement, control, stock evaluating, costs that need to be planned for production or service, the creating sales prices etc.² The definition of the CVP analysis according to the Accounting Institute's rules in the official terminology is "Calculating the predetermined cost as sum, should be under the special conditions of work in the enterprise (business environment).³ According to Hilton R.W ⁴according to mathematical approach, CVP shows the relationship between revenue and cost.

What is Cost-Volume-Profit Analysis?

Cost-volume-profit analysis is a technique that examines changes in profits, in sales volume, costs, and prices. CVP analysis can be valuable tool in identifying the stretch and size of the economic problems with which the company facing, this analysis helps locate these problems. The CVP analysis is used to ensure information for planning and decision-making such as: choosing problems during planning of products for sale, expanding or narrowing the production line, exploitation of production capacities during the expansion or recession economy of the country. So that managerial accountants to make planning for the future, they should take it information about:

Products or services that affecting in profit maximizing?

¹ Scientific paper, volume third pg. 2.

² Drury 4 the.Chapter 9

³ Accounting institute regulations

⁴ Hilton R.W

Sales volume to reached target profit?

The necessary income to avoid losses?

The contribution margin should cover fixed costs in order to avoid risk?

Should a firm invest in highly automated machinery and reduce its labor force?

Should a firm advertise more to improve its sales?

The Purpose of CVP Analysis?

The purpose of the CVP analysis is to create a question that can be used to predict the profits of the enterprises, change in profit or any other element within the question that enterprise managers take into account by expressing the relationship between: sales price, sales volume, variable and fixed costs etc., by adhering this question as a powerful tool for the budgeting process, making decisions, controlling the production that the managers do. So in other words, management accountants should focus on this analysis at the beginning of the production or service process, because there is no time for successive changes.¹

The Assumptions of CVP Analysis

Total costs based on business activity are divided into fixed and variable costs,

Selling price is constant ,

Costs are linear and can be divided into variable and fixed elements ,

In multi-product companies ,sales mix is constant ,

In manufacturing companies, inventories do not change etc.

These assumptions help CVP analysis for the exact profit forecasting, but sometimes business operations cannot match all assumptions, in such cases the analysis results in approximation with these assumptions that help in making decisions.

Methods of Cost-Volume-Profit Analysis

There are two main methods that used in the CVP analysis:

Graphic approach - This method is very useful, because it highlights relations between the cost-volume-profit in a wider aspect of business activities (manufacturing and service). In this case it enables managers, greater perspective to planning and making decisions for the future² . The steps included in the graphical method are three: the profit area, the loss zone, the equilibrium zone. Based on three areas, managerial accountants should to planning production quantity, sales price, target profit, risk threshold.

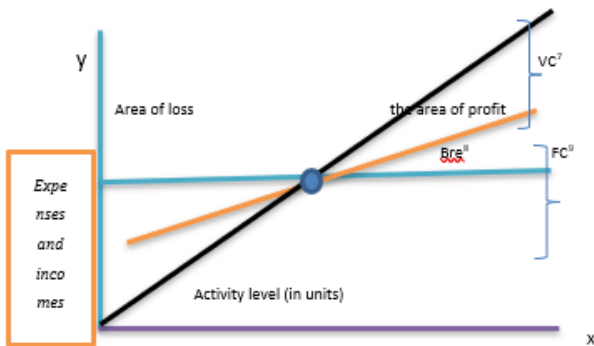


Fig.1. Cost-Volume-profit Analysis in Enterprise (Classical Approach)

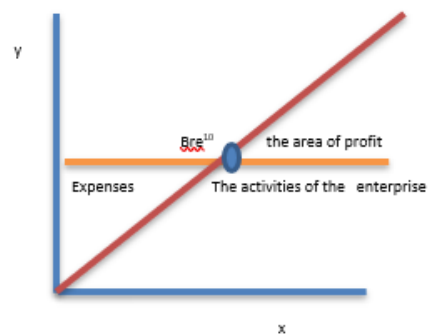
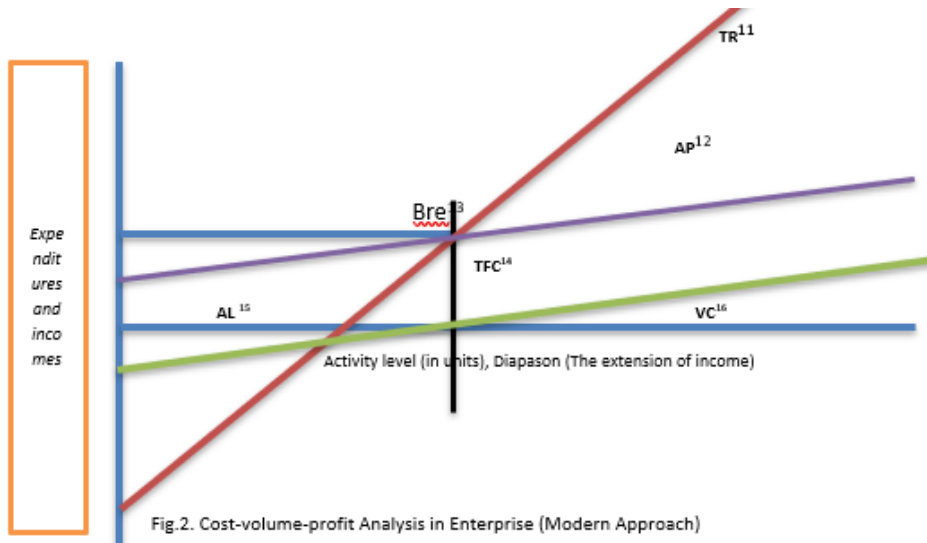


fig. 2. Break-even of the enterprise

¹ Cost accounting chapter 17 cost volume profit analyses ,pg.590

² Gautier et al 2001 accounting theory and practice



Algebraic approach- This approach helps to incorporate marginal contribution, income statement, and estimation of several cost-volume-profit factors such as: sale price for unit, variable costs for unit, fixed costs of sales, target profit, marginal contribution for unit etc.

$$\text{Contribution} = \text{sales} - \text{variable cost} \quad (1)^1$$

$$\text{Profit} = \text{contribution} - \text{fixed cost} \quad (2)^2$$

$$\text{Sales} - \text{variable cost} = \text{fixed cost} + \text{profit} \quad (3)^3$$

$$\text{Sales (in units)} = \text{fixed cost} + \text{target net income} / \text{contribution margin per unit} \quad (4)^4$$

$$\text{Targeted operating income} = \text{target net profit} / 1 - \text{tax rate} \quad (5)^5$$

$$\text{Quantity of products to be sold} = \text{Fixed costs} + \text{Targeted operating income} / \text{contribution margin per unit} \quad (5)^6$$

$$\text{Risk threshold} = \text{Fixed costs} / \text{Margin of contribution per unit} \quad (6)$$

Expressed in monetary units (€)

$$\text{Risk Threshold} = \text{Fixed Costs} / \text{Contribution Margin Report} \quad (7)$$

Where:

$$\text{Contribution Margin Report} = \text{Contribution Margin per Unit} / \text{Revenue from sale per Unit} \quad (8)$$

For sale:

$$\text{Risk Threshold} = \text{Fixed Costs} * \text{Value of Sales} / \text{Margin of Contribution} \quad (9)$$

¹ The contribution margin equation - the margin of the contribution must cover fixed costs, thus the revenue exceeds fixed costs. The unit contribution margin is the ratio between the sales price and the variable cost per unit (Horngren 2006) 2006)

² Ibid

³ This difference helps the business to know whether it is in the risk threshold or not. The level of sales in which operating income is equal to zero, sales above the risk threshold result in profit, while sales below the risk threshold result in losses.

⁴ Based on this formula, can be calculated incomes from operations.

⁵ If we want to see the impact of profit tax on CVP analysis, we use this formula

⁶ Using the contribution margin method, with the purpose of determining the target operating income according to the formula

CMR (unit) = selling price - variable cost per unit/ selling price (10)¹

CMR (Total) = Total Sales - Total Variable Cost / Total Sales (11)²

CMR = fixed cost + profit / contribution + cost variable (12)³

Notes:

CMR = change in profit / change in sales volume (13)⁴

Operating leverage rate = Margin of contribution / Net operating income (18)⁵

When and for What CVP Analysis Will Be Used

CVP analysis used to provide general information on relations Cost-Volume-Profit for business environment. Accountants also use it to provide the necessary information: for sale, for planning, for control, decision making problems, budget control, sale price decision, product replacement, distribution channel selection, sales volume setting, performance measurement, product quality, customer requirements (Meigs, 1996).

The profit forecast- First, the firm decides on its sales, the costs before the profit calculation, and then decides on the production.

Decision-Making for Mixed Products

Decision and planning which ones products will be produced and which ones will be abandoned, will help the business environment (manufacturing enterprises and service enterprises) to maximize profit. This will be realized by taking into consideration of the sales and production that has been made in the previous years, all this depends on the demand of consumers what to produce or what to serve, and what to be abandoned.

Budget Control

Budget control is the creation of a budget regarding the responsibility of the manager, the policy requirements, and the continuous comparison of the production and service process (J.O.Kalu)⁶. Budget control has to do with using the budget to control operational activities or to secure individual actions, as well as to provide a basis for its re-scrutiny. Cost-volume-profit analysis can be used in the budget control field to compare the sales budget, volume, cost, and actual profit.⁷

Decision-Making on Prices

The price decision affects the quality of production and sales, revenue = cost. Managers need to understand patterns of behavior, the product cycle chain, to reach profit (Horngren 2006)⁸. According to Horngren (2006), great influences on the price decision have customers, competitors and cost. Consumers influence the price, through their demand for products or services, based on the features of the product, quality, etc. The cost also affects the price decision, because the cost affects the supply. The lower the cost of producing a product the greater is the opportunity to supply the consumer with the product or service, thus affecting the growth of operating income. The use of cost-volume-profit analysis in this field is necessary to examine the cost of manufactured products and the planned profit before making the price decision.⁹

Case Study in Manufacturing and Service Enterprises

This research makes the combination of analysis during the design of the length of the research, determining if the principles of CVP analysis used in the business environment. The purpose of this analysis is to test the credibility of the data from the hypotheses raised, and from the questionnaire realized with the consumers, manufacturing and services enterprises.

¹ Security margin report - Shows discounts in possible sales, that may occur before we have operational loss

² ibid

³ Security margin report - Shows discounts in possible sales, that may occur before we have operational loss

⁴ This happens when the sales price is left out altogether.

⁵ This happens when the sales price is left out altogether.

⁶ J.O.Kalu

⁷ CVP analysis

⁸ Horngren 2006).

⁹ Horngren 2006).

$$r_{xy} = \frac{\sqrt{(n\sum x^2) - (\sum x)^2(n\sum y^2) - (\sum y)^2}}{(19)}$$

$$\frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

or

$$r^2_{xy} = \frac{\sum xy^3}{\sqrt{(\sum x)^2(\sum y)^2 - (20)}}$$

$$\sqrt{(\sum x)^2(\sum y)^2 - (20)}$$

$$T - Is \text{ calculated} = \sqrt{n - 2} / \sqrt{1 - r^2} - (21)$$

Product	Product x	Product y	Product z
Sales price per unit	10€	7€	5€
Variable cost per unit	5	5	4
Margin of contribution per unit	5	2	1
Report for mixed sale	3	3	2
Fixed costs for the observed period 150 euros			
Net income for the observed period 700 euros			

Product	Product x	Product y	Product z
Sales price per unit	10€	7€	5€
Variable cost per unit	5	5	4
Margin of contribution per unit	5	2	1
Report for mixed sale	3	3	2
Fixed costs for the observed period 150 euros			
Net income for the observed period 700 euros			

Table .1.Sales for mixed products⁵

Point of profitability:

Step 1: $NI^6 = (P^7_1 * Rm^8_1) + (P^7_2 * Rm^8_2) + (P^7_3 * Rm^8_3)$ (22)

Step 1: $(10€ * 3) + (7€ * 3) + (5€ * 2) = 30 + 21 + 10 = 61€$ ⁹

Step 2: Total price for three products / mixed sales ratio (23)

Step 2: $61 \text{ euro} / 8 = 7,625$ ¹⁰

Step 3: Difference from MK¹¹ to Mixed Sales * Variable X - Fixed Costs=0 (24)

Step 3: $7.63\text{euro} * X \text{ variable} - 150 \text{ euro} = 0$

$7.63\text{euro} * X \text{ variable} = 150 \text{ euro}$

Variable $X = 150 / 7.63$

Variable $X = 19,66$ ¹²

Step 4: Total variables X * MSR / MSR for three products (25)¹³

¹ n-number of years or months

² x-dependent variables

³ y-independent variables

⁴ Correlation coefficient

⁵ Model elaborated by the authors for the auxiliary hypotheses H0₁ and H0₃

⁶ Net income

⁷ Sales price per unit

⁸ Report for mixed sale

⁹ 61€ the total for the ratio between sales and sales prices for mixed (mixed)

¹⁰ 7,625 -The average difference from the contribution margin for mixed sales

¹¹ Margin of Contribution

¹² Total units that included in three products from mixed sales

¹³ For reason, partial units cannot be sold until to the final product

Step 4:

Products x: $19.66 * 3/3 + 3 + 2 = 58.98 / 8 = 7.373 \approx 7$ units

Products y: $19.66 * 3/3 + 3 + 2 = 58.98 / 8 = 7.373 \approx 7$ units

Products z: $19.66 * 2/3 + 3 + 2 = 39.32 / 8 = 4.915 \approx 5$ units

Step 5: Testing for business environment for the sales of three products

Step 5: (MC¹ * Unit sold per product X) + (MC * Unit sold per product Y) + (MC * Unit sold per product Z)(26)

$(5 \text{ €} * 7 \text{ units}) + (2 \text{ €} * 7 \text{ units}) + (1 \text{ €} * 5 \text{ units}) = 35 + 14 + 4 = 53 \text{ euro}^2$

Units sold for target profit = $FC^3 + TP^4 / MCu^5$ (27)

$UsTp^6 = 150 + 700/8 = 850/8 = 106.25^7$

Sales $(106.25 * 22 \text{ euro}) = 2337.5$

-V.C $(106.25 * 14 \text{ euro}) = 1487.5$

MC $(106.25 * 14 \text{ euro}) = 850$

-FC150

Operating income 700 euro⁸

Variable	The quantity of products produced has positive effect on sales value in service enterprises, and increased profits of manufacturing enterprises in the business environment (mixed products ,fixed costs , margin of contribution, purchase price, selling price, offerings of manufacturing and service enterprises , requests from customers and service enterprises etc.)	
	Co-efficient	P-value
Constant	817248.3	658902.2
T	1.240	
sales value of GB and PB	.146	0.028
T	5.233**	
R	.856**	
R ²	.732	
F.ratio	27.380	

Table 2.The results obtained from the regression analysis⁹

¹ Margin of contribution

² Margin of contribution per units

³ Fixed costs

⁴ Target profit

⁵ Margin of contribution per units

⁶ Units sold for target profit

⁷ Target profit

⁸ Hypotheses H01 and H03 are confirmed, where with the sale of some products when the contribution margin covers fixed costs, then the enterprise will realized profit, so statistically the Ho1 and H03 are important.

⁹ Explanation: important at 5% level. The second auxiliary hypothesis is confirmed

MANUFACTURING ENTERPRISES		SERVICE ENTERPRISES	
Consumers ¹	Evaluation	Consumers ²	Evaluation
1	4	1	7
2	3	2	9
3	6	3	10
4	2	4	5
5	5	5	8
6	2	6	6

Table 3. Customer assessment for service companies, and evaluation of service companies for products produced by manufacturing enterprises.³

Evaluation for the manufacturing enterprises and the service enterprises⁴

$$S1: T1 = 4 + 1.5 + 5.5 + 7.5 + 1.5 + 3 = 23$$

$$S1: T2 = 5.5 + 10 + 9 + 7.5 + 3 + 12 = 55$$

$$S3: N = 6$$

$$\mu = n1 \cdot n2 + nX (nx+1) / 2 - TX \quad (32)$$

$$S4: \mu = 6 \cdot 6 + 6(6+1) / 2 - 55$$

$$\mu = 36 + 21 - 55$$

$$\mu = 2$$

S5: Use of critical values U for test M-W .The significance level 5%⁵

$$N1 = 20$$

$$N2 = 20$$

$$\text{Total } 127^6$$

S6: Use of critical values U for test M-W .The significance level 1%⁷

$$N1 = 20$$

$$N2 = 20$$

$$\text{Total } 105^8$$

For n1=6 and n2=6 critical value per U is 5% evaluation for both enterprises.



For n1=6 and n2=6 critical value per U is 1% evaluation for both enterprises.

$${}^9\mu = 2^{10}$$

Testing .05 significance level =5

Testing .01 significance level =2

Data analysis through other tests such as: Brunner Munzel test and Bootstrap Method for confirmed (substantiate) the auxiliary and main hypotheses.

¹ Explanation, numbers 1-6 have to do with 600 consumers in both companies for the observed period.

² Explanation, numbers 1-6 have to do with 600 consumers in both companies for the observed period.

³ Explanation: The assessment of this test was done by the service companies and consumers, taking into account all the variables (dependent and independent)

⁴ Explanation: Mann-Witney test for both enterprises

⁵ Significance 5% level

⁶ M-W test

⁷ Significance 1% level

⁸ M-W test

⁹ Hypothesis is confirmed

¹⁰ Data realized by the interview

We Analyzed the Questions for Both Enterprises: ¹

Questions (6,10,22,25 manufacturing enterprises) and questions (3,6,7,9,10,13 service enterprises)for confirming the first auxiliary hypothesis **H0₁**

Questions(1,3,6,7,9,12,13,14,21,25,27,29 manufacturing enterprises) and questions (3,6,7,9,13,7 service enterprises) for confirming the second auxiliary hypothesis **H0₂**

Questions(15,16, 22, 27 , manufacturing enterprises) and questions (15,16,21,22 ,service enterprises) for confirming the third auxiliary hypothesis **H0₃**

Questions(8,12,14,17 , manufacturing enterprises) and questions (6,7,8,17,21,27, service enterprises) for confirming the main hypothesis **H1**

Questions(1,2,4,5,11,13,18,19,20,21,23,24,25,26,27,28,29,30,manufacturing enterprises) and questions (1,2,4,5,11,12,13,14,18,19,20,21,23,24,25,26,28,29,30, service enterprises) for confirming the main hypothesis **H2**

Since our data originates from a Likert-Scale questionnaire ranging values from 1 to 5, the usual one sample t-test is inappropriate. Hence, we select the advanced method proposed by Brunner-Munzel, which compares two groups for stochastic equality. In doing so, we combine the Brunner-Munzel test approach with a Bootstrap Method, in order to generate a second group, which results from a completely randomized synthetic sample. Mathematically, this corresponds in testing:

H0: p= P(X < Y) + 0.5*P(X = Y) <= 0.5 vs. H1: p > 0.5 (28)²

$$T = \sqrt{n} \frac{Xn1 - Xn2}{\sqrt{\frac{s1 + s2}{n1 + n2}}} \quad (29)$$

n₁=n₂

p= P (X₁<X₂) + 1/2P(X₁=X₂) (30)

p= P (X₁<Y₁) + 1/2P(X₁=Y₁) (31)

Using the Brunner.Munzel.test function in R. Using B = 10,000 bootstrap replicates, we approximate the p-value of the Brunner-Munzel test by using the strong law of large numbers, which guarantees the convergence of the sample mean p-Values to the true p value to confirm the first auxiliary hypothesis **H0₁** for two enterprises . The results can be obtained in the following table 4 :

MANUFACTURING ENTERPRISES					SERVICE ENTERPRISES				
Variabl e	Brunner-Munzel Test , Bootstrap	P- Value	Df	Percent confidence interval	Variable	Brunner-Munzel Test ,Bootstrap	P- Value	Df	Percent confidenc e interval
P6	0.063*	0.022	23.5	95%	P3	0.027**	0.013	21.6	95%
P10	0.08*	5.07	26.4	95%	P6	0.047***	0.416	17.5	95%
P22	0.16	0.10	19.7	95%	P7	0.020**	0.001	16.8	95%
P25	0.022**	0.01	22.4	95%	P9	0.038**	0.137	27.7	95%
					P10	0.042**	0.269	17.6	95%
					P13	0.025**	0.006	19.6	95%

Table.4:Bootstrap p values of the one –sided Brunner Munzel test using 10000 replicates based on n= 15 observations .

¹ Brunner Munzel test , Bootstrap method

² Mathematically testing the hypotheses for manufacturing enterprises and service enterprises

The first auxiliary hypothesis is proved 95%, but only two variables show no satisfactory result. Explanation below¹

Using the Brunner.Munzel.test function in R. Using B = 10,000 bootstrap replicates, we approximate the p-value of the Brunner-Munzel test by using the strong law of large numbers, which guarantees the convergence of the sample mean p-Values to the true p value to confirm the second auxiliary hypothesis **H0₂** for two enterprises . The results can be obtained in the following table 5 :

MANUFACTURING ENTERPRISES					SERVICE ENTERPRISES				
Variable	Brunner-Munzel Test , BootStrap	P- Value	Df	Percent confidence interval	Variable	Brunner-Munzel Test , BootStrap	P- Value	Df	Percent confidence interval
P1	0.055*	0.706	27.3	95%	P3	0.027**	0.013	21.6	95%
P3	0.014***	1.306	23.7	95%	P6	0.047**	0.416	17.5	95%
P6	0.063*	0.022	23.5	95%	P7	0.027**	0.001	16.8	95%
P7	0.054*	0.673	25.5	95%	P9	0.038**	0.137	27.7	95%
P9	0.020**	0.001	20.1	95%	P13	0.025**	0.006	19.6	95%
P12	0.10*	1.98	26.4	95%	P27	0.020**	0.012	27.4	95%
P13	0.030**	0.034	21.4	95%					
P15	0.041**	0.203	27.3	95%					
P21	0.028**	0.025	16.4	95%					
P25	0.022**	0.01	22.4	95%					
P27	0.043**	0.267	25.9	95%					
P29	0.036**	0.094	23.25	95%					

Table.5:Bootstrap p values of the one –sided Brunner Munzel test using 10000 replicates based on n= 15 observations .

The second auxiliary hypothesis is proved 95%, but only four variables show no satisfactory result to manufacturing enterprises. Explanation below²

Using the Brunner.Munzel.test function in R. Using B = 10,000 bootstrap replicates, we approximate the p-value of the Brunner-Munzel test by using the strong law of large numbers, which guarantees the convergence of the sample mean p-Values to the true p value to confirm the third auxiliary hypothesis **H0₃** for two enterprises . The results can be obtained in the following table 6 :

¹ Based on data analysis through methods and econometric tests, for the first auxiliary hypothesis **H0₁** , for manufacturing and service enterprises , we can conclude: In the manufacturing enterprises from 30 compiled variables, for the first auxiliary hypothesis are adapted 4 variables, of which 3 are confirmed at the level of significance 5% (or 95%), while 1 variable not indicates neither results. So, the variable that has given the most satisfactory result for this hypothesis is Q25 (0.01% -0.05%), while the one that has not given any positive result is Q22 (0.005% -0.1%). In the service enterprises from 30 compiled variables, for the first auxiliary hypothesis are adapted 6 variables, of which 5 are confirmed at the level of significance 5% (or 95%), while 1 variable it shows result but not very good. So, the variable that has given the most satisfactory result for this hypothesis is Q7 (0.01% -0.05%), while the one that has shown result but not very good is Q6 (0.005% -0.1%)

² Based on data analysis through methods and econometric tests, for the second auxiliary hypothesis **H0₂**, for manufacturing and service enterprises, we can conclude: In the manufacturing enterprises from 30 compiled variables, for the second auxiliary hypothesis are adapted 12 variables, of which 8 are confirmed at the level of significance 5% (or 95%), while 4 variable have shown result, but not very good. So, the variable that has given the most satisfactory result for this hypothesis is Q3 (0.01% -0.05%), whereas the one that has shown result but not very good is Q12 (0.005% -0.1%). In the service enterprises from 30 compiled variables, for the second auxiliary hypothesis are adapted 6 variables, of which 6 are confirmed at the level of significance 5% (or 95%).So, the variable that has given the most satisfactory result for this hypothesis is Q27 (0.01% -0.05%).

MANUFACTURING ENTERPRISES					SERVICE ENTERPRISES				
Variabl e	Brunner-Munzel Test , BootStrap	P- Value	Df	Percent confidenc e interval	Variabl e	Brunner-Munzel Test ,BootStr ap	P- Value	Df	Percent confiden ce interval
P16	0.022**	0.002	26.2	95%	P15	0.050**	0.665	21.4	95%
P15	0.041**	0.203	27.3	95%	P16	0.061*	0.853	22.6	95%
P22	0.057*	0.759	27.4	95%	P21	0.019***	0.002	15.4	95%
P27	0.043**	0.267	25.9	95%	P22	0.020**	0.013	23.8	95%

Table 6. Bootstrap p values of the one –sided Brunner Munzel test using 10000 replicates based on n= 15 observations .

The third auxiliary hypothesis is proved 95%, but only two variables show no satisfactory result. Explanation below ¹

Based on the three auxiliary hypotheses elaborated above, we now will confirmed or not, the main hypotheses.

Mathematically this corresponds with testing:

$$T = \sqrt{n} \frac{X_{n1} - X_{n2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad (32)$$

$$n_1 = n_2$$

$$p = P(X_1 < X_2) + 1/2P(X_1 = X_2) \quad (33)$$

$$p = P(X_1 < Y_1) + 1/2P(X_1 = Y_1) \quad (34)$$

$$H1: p = P(X < Y) + 0.5*(X = Y) \leq 0.5 \text{ vs. } H1 : P > 0.5 \quad (35)$$

Using the Brunner.Munzel.test function in R. Using B = 10,000 bootstrap replicates, we approximate the p-value of the Brunner-Munzel test by using the strong law of large numbers, which guarantees the convergence of the sample mean p-Values to the true p value to confirm the main hypothesis H1 for two enterprises . The results can be obtained in the following table 7:

MANUFACTURING ENTERPRISES					SERVICE ENTERPRISES				
Variab le	Brunner-Munzel Test BootStrap	P- Value	Df	Percent confiden ce interval	Variab le	Brunner-Munzel Test BootStrap	P- Value	Df	Percent confide nce interval

¹ Based on data analysis through methods and econometric tests, for the third auxiliary hypothesis H0₃, for manufacturing and service enterprises, we can conclude: In the manufacturing enterprises from 30 compiled variables, for the third auxiliary hypothesis are adapted 4 variables, of which 3 are confirmed at the level of significance 5% (or 95%), while 1 variable has shown result, but not very good. So, the variable that has given the most satisfactory result for this hypothesis is Q16 (0.01% -0.05%), whereas the one that has shown result but not very good is Q22 (0.005% -0.1%). In the service enterprises from 30 compiled variables, for the third auxiliary hypothesis are adapted 4 variables, of which 3 are confirmed at the level of significance 5% (or 95%), while 1 variable has shown result, but not very good. So, the variable that has given the most satisfactory result for this hypothesis is Q22 (0.01% -0.05%), whereas the one that has shown result but not very good is Q16 (0.005% -0.1%).

P8	0.022**	0.002	20.6	95%	P6	0.047**	0.416	17.5	95%
P12	0.033**	0.050	23.0	95%	P7	0.029**	0.001	16.8	95%
P14	0.01*	3.01	17.7	95%	P8	0.020**	0.019	18.5	95%
P17	0.025**	0.007	24.0	95%	P17	0.023**	0.003	17.3	95%
					P21	0.021**	0.001	19.2	95%
					P27	0.027**	0.012	27.4	95%

Table 7. Bootstrap p values of the one –sided Brunner Munzel test using 10000 replicates based on n= 15 observations .

The main hypothesis is proved 95%, but only one variables show no satisfactory result at manufacturing enterprises. Explanation below¹

Using the Brunner.Munzel.test function in R. Using B = 10,000 bootstrap replicates, we approximate the p-value of the Brunner-Munzel test by using the strong law of large numbers, which guarantees the convergence of the sample mean p-Values to the true p value to confirm the main hypothesis H2 for two enterprises . The results can be obtained in the following table 8:

MANUFACTURING ENTERPRISES					SERVICE ENTERPRISES				
Variable	Brunner-Munzel Test BootStrap	P- Value	Df	Percent confidence interval	Variable	Brunner-Munzel Test BootStrap	P- Value	Df	Percent confidence interval
P1	0.022**	0.001	27.4	95%	P1	0.041**	0.209	25.3	95%
P2	0.045**	0.147	18.6	95%	P2	0.049**	0.475	22.8	95%
P4	0.032**	0.051	24.7	95%	P4	0.035**	0.099	16.7	95%
P5	0.020**	0.001	17.7	95%	P5	0.017***	0.001	20.9	95%
P11	0.028**	0.019	19.4	95%	P11	0.042**	0.235	25.1	95%
P13	0.042**	0.251	19.1	95%	P12	0.018***	0.001	23.5	95%
P18	0.034**	0.066	22.1	95%	P13	0.017***	0.001	20.0	95%
P19	0.036**	0.097	27.9	95%	P14	0.035**	0.060	18.4	95%
P20	0.023**	0.231	17.3	95%	P18	0.047**	0.400	27.7	95%

¹ Based on data analysis through methods and econometric tests, for the main hypothesis H1,for manufacturing and service enterprises, we can conclude: In the manufacturing enterprises from 30 compiled variables, for the main hypothesis are adapted 4 variables, of which 3 are confirmed at the level of significance 5% (or 95%), while 1 variable not showing any results. So, the variable that has given the most satisfactory result for this hypothesis is Q8 (0.01% -0.05%), while not showing any results is Q14 (0.1 %-).In the service enterprises from 30 compiled variables, for the main hypothesis are adapted 6 variables, all are confirmed at the level of significance 5% (or 95%) . But, the variable that has given the most satisfactory result for this hypothesis is Q7 (0.01% -0.05%).

P21	0.028**	0.025	16.4	95%	P19	0.044**	0.304	25.3	95%
P23	0.028**	0.014	27.17	95%	P20	0.030**	0.038	18.7	95%
P24	0.015***	5.899	21.9	95%	P23	0.020**	0.122	27.2	95%
P25	0.036**	0.088	20.3	95%	P24	0.037**	0.116	20.5	95%
P26	0.039**	0.190	16.3	95%	P25	0.068**	4.48	14.7	95%
P27	0.045**	0.341	24.3	95%	P26	0.033**	0.058	19.0	95%
P28	0.031**	0.034	23.4	95%	P28	0.040**	0.199	18.8	95%
P29	0.039**	0.154	22.4	95%	P29	0.024**	0.006	17.0	95%
P30	0.032**	0.050	21.8	95%	P30	0.018***	0.001	23.7	95%

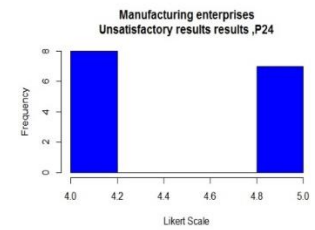
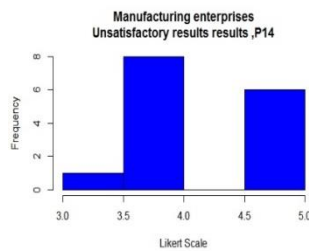
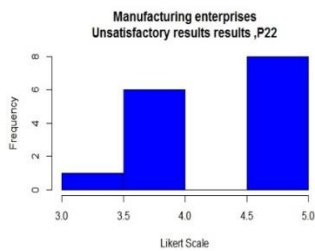
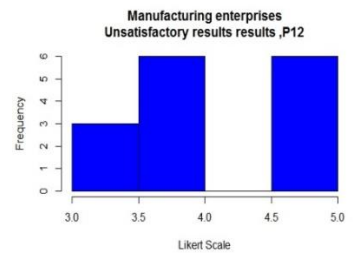
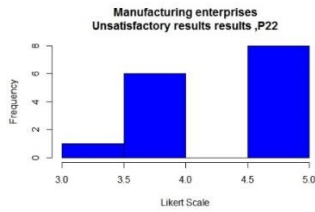
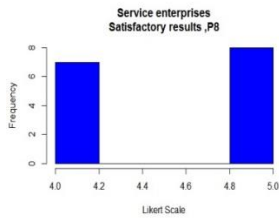
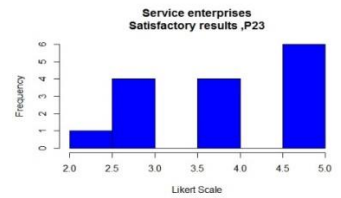
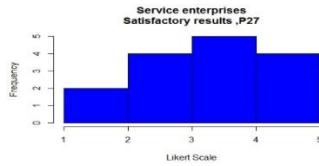
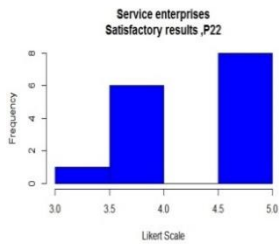
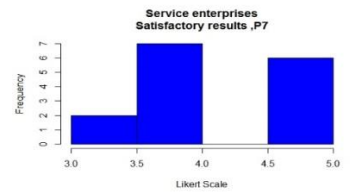
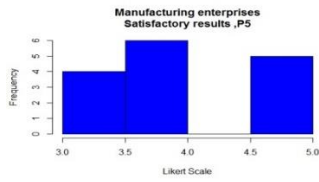
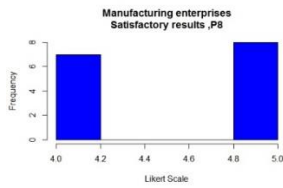
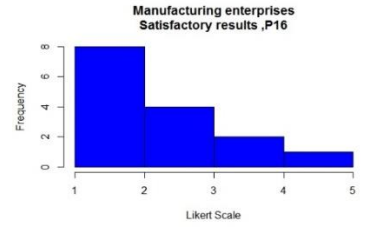
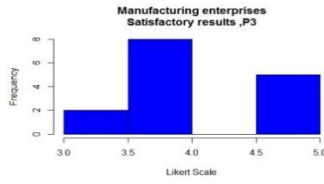
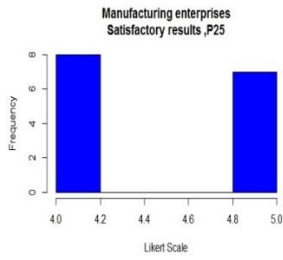
Table 8. Bootstrap p values of the one –sided Brunner Munzel test using 10000 replicates based on n= 15 observations .

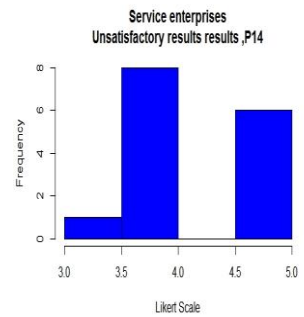
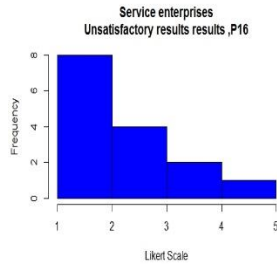
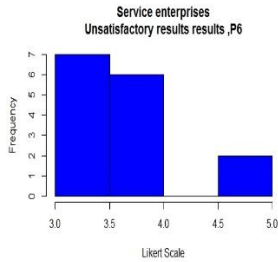
The main hypothesis is proved 95%, but only one variables show no satisfactory result at manufacturing enterprises. Explanation below¹

NR.	HYPOTHESES	THIS INDICATES THE OUTCOME ,THE MOST SATISFACTORY	THIS INDICATES THE OUTCOME ,BUT NOT VERY GOOD
1	The main hypothesis H1		
A	Manufacturing enterprises	8	14
B	Service enterprises	8	/
2	The main hypothesis H2		
A	Manufacturing enterprises	5	24
B	Service enterprises	23	14
3	The auxiliary hypothesis H0 ₁		
A	Manufacturing enterprises	25	22
B	Service enterprises	7	6
4	The auxiliary hypothesis H0 ₂		
A	Manufacturing enterprises	3	12
B	Service enterprises	27	/
5	The auxiliary hypothesis H0 ₃		
A	Manufacturing enterprises	16	22
B	Service enterprises	22	16

Table 8: Analysis of results between the two companies for the three auxiliary hypotheses and the 2 main ones

¹ Based on data analysis through methods and econometric tests, for the main hypothesis H2, for manufacturing and service enterprises, we can conclude: In the manufacturing enterprises from 30 compiled variables, for the main hypothesis are adapted 18 variables, of which 17 are confirmed at the level of significance 5% (or 95%), while 1 variable has shown result, but not very good. So, the variable that has given the most satisfactory result for this hypothesis is Q5 (0.01% -0.05%), whereas the one that has shown result but not very good is Q24 (0.01%). In the service enterprises from 30 compiled variables, for the main hypothesis are adapted 18 variables, of which 14 are confirmed at the level of significance 5% (or 95%), while 4 variable has shown result, but not very good. So, the variable that has given the most satisfactory result for this hypothesis is Q23 (0.01% -0.05%), while the one that has shown result but not very good is Q14 (0.1%).





Conclusions and Recommendations

Based on the research carried out during this scientific study, we conclude that cost-volume-profit analysis is an important measure during planning and decision making for business environment in manufacturing and service enterprises. We can further emphasize that this analysis has important role in the decisions taken by management of manufacturing and service companies. During the course of this research, an examination of the effect of cost-volume-profit analysis on competitive enterprises, we can conclude for following findings:

The purpose of this research was to review the effect of the CVP analysis in the planning and decision making process, because in previous periods for reasons inefficiency has awakened ignorance by enterprises and in this case the CVP analysis was ignored during making decision.

The study found that CVP analysis is considered and plays a major role in the decision-making process in the production environment, influencing decisions made by management for the products to be produced, costs, and sales,

CVP analysis plays an important role in service companies, influencing decision-making by management for: the products to be served, to be purchased by manufacturing companies, and customer requirements.

Also, this research shows that production and service enterprises pay particular attention to this analysis during the planning process based on the previous years,

Further, this study revealed that applying of techniques cost-volume-profit analysis, to during the decision-making process increases management efficiency to a large extent,

In addition, it was found that the benefits derived from the application of this analysis include: effective cost control, high production and service capacity, and increased profitability,

The research also found that the value of product sales and the quantity produced has a positive effect on the profit realized by the manufacturing and service companies, in coordination with market and consumer demand, so there is a link between production, service and consumers,

Also exists a link between cost of production, service costs and realized profit,

This study, it has concluded that CVP analysis is a tool used to provide useful information for making important and reasonable decisions for efficient management,

In conclusion we can emphasize that the CVP analysis needs to be applied even more in all businesses, because the managerial effect will be more profitable and risk management will be greater, given that the contribution margin should always cover fixed costs. Because in the moment when fixed costs are greater than units produced and sold, then we will result in a negative result,

Each of these elements; cost, volume and profit should be taken into account in the process of making managerial decisions and planning, in both as manufacturing and service enterprises,

Manufacturing enterprises in the business environment needs to explore the market in order to produce those products that have biggest sales, and they must also report the results of the past years to CVP analysis, by making the right innovations during planning and decision making,

Service companies in the business environment need to explore the market in order to serve with the products that have the biggest sales, and they must also report the results of the past years to CVP analysis, by making the right innovations during planning and decision making,

High production and servicing capacity, as and profit growth will only if the cost-benefit analysis is applied correctly,

Manufacturing and service enterprises, in the business environment should employ well-known experts who will make the correct application of the CVP analysis,

This research is of great importance, and all the hypotheses were verified through econometric models, serving all researchers for further or more extensive analysis.

Biography for authors:

- [1] Enkeleda Lulaj , punon në Universitetin “Haxhi Zeka” në Pejë ,Shteti i Kosovës . Mban mësim për lëndët e Kontabilitetit dhe Financave , gjithashtu është Anëtare e Bordit Drejtues të Universitetit.Ka dhe publikime të tjera nga lëmia e financave dhe kontabilitetit . Studion për Doktoraturë në Maqedoni /Tetovë!
- [2] Prof.Dr.Etem Iseni ,punon në Universitetin e Tetovës ,Shteti i Maqedonisë . Mban mësim për lëndët e Kontabilitetit dhe Financave ,Ka dhe publikime të tjera nga lëmia e financave dhe kontabilitetit .
- [3] This section in the bibliography will be written in Albanian:

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