# An Income Statement Teaching Approach for Cost-Volume-Profit (CVP) Analysis by Using a Company's CVP Model

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*This paper presents an Income Statement teaching approach for Cost-Volume-Profit (CVP) analysis by using a company's CVP Model that is intuitive and student-friendly. This approach would help students learn about CVP analysis and reduces their memorization of equations.*

## INTRODUCTION

This paper extends Wilner's (1987) focus on simplifying the teaching and learning of process costing. We present an alternative to the typical teaching approach for Cost-Volume-Profit (hereafter CVP) analysis (e.g., Garrison et. al 2010; Horngren et. al, 2009). The typical teaching approach is to teach students a series of equations for solving various questions relating to CVP analysis. In our approach, we collapse all the equations into its Variable Costing Income Statement format and use the Income Statement as a "CVP Model" of the company. We believe that this CVP Model provides students with an intuitive understanding of the CVP analysis and reduces their memorization of equations.

## DEVELOPING THE CVP MODEL

The typical approach in teaching CVP analysis is to teach students a series of equations for solving CVP questions. Table 1 presents a sample of these equations.

**TABLE 1**
**SAMPLE EQUATIONS GIVEN IN TEXTBOOKS REGARDING COST-VOLUME-PROFIT (CVP) ANALYSIS**

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**From Garrison et al. (2010) and Horngren et al. (2009)**

Profit = Unit CM x A – Fixed Costs
Profit = CM ratio x Sales – Fixed Costs
Unit Sales to Attain Target Profit = $\frac{\text{Target Profit + Fixed Costs}}{\text{Unit CM}}$

Dollar Sales to Attain Target Profit = $\dfrac{\text{Target Profit} + \text{Fixed Costs}}{\text{CM Ratio}}$

Unit Sales to Breakeven = $\dfrac{\text{Fixed Costs}}{\text{Unit CM}}$

Dollar Sales to Breakeven = $\dfrac{\text{Fixed Costs}}{\text{CM Ratio}}$

(Unit Selling Price x A) – (Unit Variable Cost x A) – Fixed Costs = Income

Target Income = $\dfrac{\text{Target Net Income}}{1 - \text{Tax Rate}}$

Unit Sales = $\dfrac{\text{Fixed Costs} + \dfrac{\text{Target Income}}{1 - \text{Tax Rate}}}{\text{Unit CM}}$

Note:  A = Unit Sales, CM = Contribution Margin,  CM Ratio = CM% = CM ÷ Sales

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In our Income Statement approach, we use the Variable Costing Income Statement to perform CVP analysis. The Variable Costing Income Statement is shown horizontally as:
Sales – Variable Costs – Fixed Costs = Income
which also can be written vertically as:

Sales
- Variable Costs
Contribution Margin
- Fixed Costs
Income

Each of the above Sales and Variable Costs is an equation:

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | Unit Selling Price | x No. of Units |
| - Variable Costs | Unit Variable Cost | x No. of Units |
| Contribution Margin | | |
| - Fixed Costs | | |
| Income | | |

When we complete the rest of the Income Statement, we get:

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | Unit Selling Price | x No. of Units |
| - Variable Costs | Unit Variable Cost | x No. of Units |
| Contribution Margin | (Unit Selling Price – Unit Variable Cost) | x No. of Units |
| - Fixed Costs | Fixed Costs | |
| Income | Income | |

The left-side-view shows the macro-view of a company. The right-side-view shows the micro-view of a company, and it shows the parameters of the company that can be varied or kept constant in a CVP analysis.

In order to know which parameters can be varied or kept constant, some *Cost Behavior knowledge* is required. Therefore, CVP analysis is best taught after students have learnt the topic of Cost Behavior that *Fixed Costs and Unit Variable Cost remain constant* unless there is information provided to change them.

In CVP analysis, the *Unit Selling Price also is assumed to be constant.* Thus, at the right-side-view of the Income Statement, there are *three* constant parameters and these are shown in **bold** below:

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | **Unit Selling Price** | x No. of Units |
| - Variable Costs | **Unit Variable Cost** | x No. of Units |
| Contribution Margin | (Unit Selling Price – Unit Variable Cost) | x No. of Units |
| - Fixed Costs | **Fixed Costs** | |
| Income | Income | |

Both the left- and right-side-views (as shown above and in Panel A of the Appendix) make up a "CVP Model" of a company. When students examine the right-side-view of the CVP Model, they see that there are 3 constant parameters (Unit Selling Price, Unit Variable Cost, and Total Fixed Costs) and that there are two unknowns, Number of Units and Income, and they realize the term C-V-P relates to how the three factors of Costs, Volume (No. of Units), and P (Income) are related to a company.

As the data given for companies can vary, we will limit our discussion in this paper to the following six company situations:

1. Number of units is of interest, and there is no tax given.
Assume Jehan Company sells a single product. The unit selling price is $70, the unit variable cost is $42, and total fixed costs are $84,000.

2. Number of units is of interest, and tax rate is given.
Assume Jehan Company sells a single product *and has a tax rate of 30%.* The unit selling price is $70, the unit variable cost is $42, and total fixed costs are $84,000.

3. Number of units is not of interest, and there is no tax given.
Assume Ezen Company has revenue of $80,000, variable costs $20,000 and fixed costs $40,000.

4. Number of units is not of interest, and tax rate is given.
Assume Ezen Company has revenue of $80,000, variable costs $20,000 and fixed costs $40,000. *It also has a tax rate of 20%.*

5. Company has multiple products, sales mix is available, and there is no tax given.
Assume West Company makes three products, P1, P2, and P3. The sales of P1, P2, and P3 are 2000, 3000, and 5000 units respectively.

6. Company has multiple products and tax, and sales mix information is available.
Assume West Company makes three products, P1, P2, and P3. The sales of P1, P2, and P3 are 2000, 3000, and 5000 units respectively. *The tax rate is 25%.*

We start with the first situation.

**Situation 1: Number of units is of interest, and there is no tax given.**
***Assume Jehan Company sells a single product. The unit selling price is $70, the unit variable cost is $42, and total fixed costs are $84,000.***
We first set up Jehan Company's CVP Model before we do CVP analysis. Based on the knowledge of Cost Behavior, the above data given pertains to the constant parameters that go into the right-side-view of the CVP Model is as follows:

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | **70**X | (where X = number of units) |
| - Variable Costs | **42**X | |
| Contribution Margin | 28X | |
| - Fixed Costs | **84000** | 28X – 84000 = Income |
| Income | Income | |

The right-side-view of the company's CVP Model has two unknowns, X and Income. *Note that most of the CVP analysis can be done using the bottom three rows of the income statement, 28X – 84000 = Income, and the analysis revolves around asking students to solve for X or Income.* Next we use the CVP Model to answer some questions related to CVP analysis.

Q: What is the breakeven point in units?
We use the bottom three rows from the right-side-view of the CVP Model, 28X – 84000 = Income. Breakeven means that the bottom-line of the Income Statement is zero. Thus, let Income = $0^1$, and solve for X.  28X – 84000 = 0, and solving X = 3000.

Q: What is the breakeven point in sales dollars?
Since the first row of the CVP Model is Sales = 70X, Sales = 70(3000) = $210,000.

Q: How to draw the CVP graph?
The CVP graph has two straight lines, Sales and Total Costs. To draw the CVP graph, we need the equations of these 2 lines. From the first row of the CVP Model, Sales = 70X. Since Total Costs = Variable Costs + Fixed Costs, we use the second and fourth rows of the CVP Model to get Total Costs = 42X + 84000. The CVP graph is presented as:
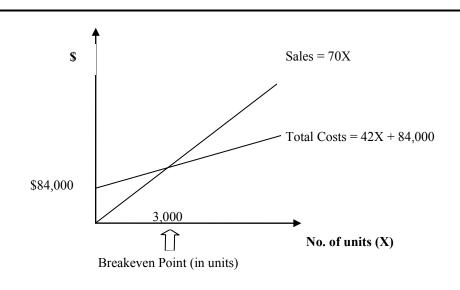
**FIGURE 1**
**COST-VOLUME-PROFIT (CVP) GRAPH**



From the CVP Graph, we can see that the company needs to sell more (less) than the breakeven point in order to make a profit (loss). A measure of how successful a company is the extent to which its sales exceed its breakeven point.

Q: How to draw the Income graph?

    From the bottom three rows of the CVP Model, Income = 28X – 84000. Thus the Income graph is presented as:
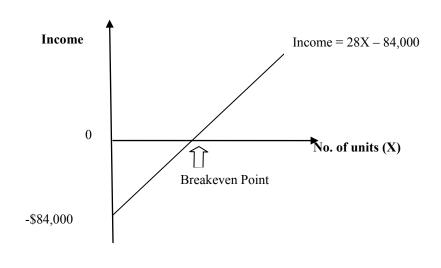
**FIGURE 2**
**INCOME GRAPH**



Q: How many units must the company sell to make an income of $4,000?

    From the bottom three rows of the CVP Model, 28X – 84000 = Income, we let Income = 4000, and solve for X. 28X – 84000 = 4000, X = 3143(rounding).

Q: What is income if the company sells 2500, 4500, or 5000 units?

    Let X = 2500, 4500, and 5000 as follows:

| Number of units (X) | X | 2500 | 4500 | 5000 |
|---|---|---|---|---|
| Sales | **70**X | **70**(2500) | **70**(4500) | **70**(5000) |
| - Variable Costs | **42**X | **42**(2500) | **42**(4500) | **42**(5000) |
| Contribution Margin | 28X | 28(2500) | 28(4500) | 28(5000) |
| - Fixed Costs | **84000** | **84000** | **84000** | **84000** |
| Income | Income | Income | Income | Income |

From the income statements above, we can see clearly how costs behave, that is, Fixed Costs and Unit Variable Cost remain constant. Furthermore, the Unit Selling Price also remains constant. We solve for Income as follows:

| Number of units | X | 2500 | 4500 | 5000 |
|---|---|---|---|---|
| Sales | 70X | 175000 | 315000 | 350000 |
| - Variable Costs | 42X | 105000 | 189000 | 210000 |
| Contribution Margin | 28X | 70000 | 126000 | 140000 |
| - Fixed Costs | 84000 | 84000 | 84000 | 84000 |
| Income | Income | -14000 | 42000 | 56000 |

Q: What is the company's breakeven point if the unit selling price increases by 10%, fixed costs decrease by 5%, and unit variable cost increases by 15%? How many units must the company sell to get a target income of $5,000?

Here, we need to update the CVP Model as its parameters (that is, unit selling price, unit variable cost and total fixed costs) which are usually assumed to be constant are changed. The CVP Model is updated as follows:

| | | |
|---|---|---|
| Sales | **70(1.10)**X | Unit Selling Price is increased by 10% |
| - Variable Costs | **42(1.15)**X | Unit Variable Cost is increased by 15% |
| Contribution Margin | ?X | Unit Contribution Margin has to be updated |
| - Fixed Costs | **84000(0.95)** | Fixed Costs are decreased by 5% |
| Income | Income | |

The CVP Model now has a new set of constant parameters:

| | | |
|---|---|---|
| Sales | **77** X | |
| - Variable Costs | **48.3**X | |
| Contribution Margin | 28.7X | |
| - Fixed Costs | **79800** | 28.7X – 79800 = Income |
| Income | Income | |

Instead of using the whole Income Statement, again we can use its bottom three rows, 28.7X – 79800 = Income, to perform the CVP analysis as this shorter equation is sufficient and easy to solve. To find the breakeven point, we let the bottom-line be zero, that is, let Income = 0, and solve for X. Thus, 28.7X – 79800 = 0, and X = 2781 (rounding).

Next, to answer how many units the company must sell to get a target income of $5,000, we let Income = 5000. Again, we use the bottom three rows of the CVP Model,
28.7X – 79800 = 5000, thus X = 2955 (rounding).

**Situation 2:  Number of units is of interest, and tax rate is given.**
***Assume Jehan Company sells a single product and has a tax rate of 30%. The unit selling price is $70, the unit variable cost is $42, and total fixed costs are $84,000.***

To incorporate tax, a "CVP Model With Tax" is set up. This is shown in Panel B of the Appendix. This Model also has two unknowns, X and NIBT (that is, Net Income Before Tax instead of Income). In CVP analysis, the tax rate is assumed to be constant. Since this Variable Costing Income Statement is longer than the one shown in Panel A of the Appendix, we perform most CVP analysis using two steps labeled (a) and (b) below; the first step is to use equation (a) and the second step is to use equation (b).

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | **70**X | |
| - Variable Costs | **42**X | |
| Contribution Margin | 28X | |
| - Fixed Costs | **84000** | 28X – 84000 = NIBT …...(b) |
| NIBT | NIBT | |
| - Tax | **0.3**NIBT | Note: Tax is calculated based on NIBT |
| NIAT | **0.7**NIBT | ………………….………… (a) |

When the company needs to find its breakeven point or how many units to achieve a target income, step (a) is performed first whereby we let the bottom-line 0.7NIBT = 0 or 0.7NIBT = Target Income, and we solve for NIBT. Next, we put the NIBT that we found from step (a) into the equation for (b), and solve for X.

Q: What is the breakeven point in units? In sales dollars?

Breakeven is when the bottom-line is zero. Thus, we use equation (a) by letting 0.7NIBT = 0. Solving, we get NIBT = 0.

Next, we use equation (b). From (a), we found NIBT = 0 which we substitute into 28X – 84000 = NIBT and solve for X. Thus, 28X – 84000 = 0, X = 3000 units. To find breakeven in sales dollars, we use the first row of the income statement, Sales = 70X = 70(3000) = $210,000.

Q: If the company's income tax is 30%, how many units must the company sell to earn a target income (or income after tax) of $2,000?

Using the CVP Model with Tax from Panel B of the Appendix, we start with equation (a). The target income is $2000, so we let the bottom-line 0.7NIBT = 2000, and get NIBT = 2857.14. Next, we use equation (b) from the CVP Model; we put what we found from (a) into (b), and solve for X. Thus, 28X – 84000 = 2857.14, and X = 3103(rounding). Thus, the company needs to sell 3103 units to get an income after tax of $2,000.

**Situation 3: Number of units is not of interest, and there is no tax given.**
*Assume Ezen Company has revenue of $80,000, variable costs $20,000 and fixed costs $40,000.*

In some companies, there is no information regarding "Number of Units." Thus, we cannot use the CVP Models in Panels A and B of the Appendix. We can use a CVP "Percentage" Model that is shown in Panel C of the Appendix and as shown below:

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | **Sales%** | x Sales |
| - Variable Costs | **Variable Costs%** | x Sales |
| Contribution Margin | Contribution Margin% | x Sales |
| - Fixed Costs | **Fixed Costs** | |
| Income | Income | |

Like the CVP Models in Panels A and B, the CVP Percentage Model in Panel C also has *three* constant parameters (shown in **bold** above). The percentages (of Sales) are calculated as follows:

| | |
|---|---|
| Sales% | = Sales / Sales |
| Variable Costs% | = Variable Costs / Sales |
| Contribution Margin% | = Sales% - Variable Costs% = Contribution Margin / Sales |

This CVP Percentage Model also has 2 unknowns. These are S (that is, Sales) and Income. In most CVP analysis questions, we let one of the unknowns take on a value, and solve the remaining unknown.

For Ezen Company, the percentages come to:

| | | |
|---|---|---|
| Sales% | = 80000 / 80000 | = 100% or 1.00 |
| Variable Costs% | = 20000 / 80000 | = 25% or 0.25 |
| Contribution Margin% | = Sales% - Variable Costs% | |
| = Contribution Margin / Sales | | |
| = 0.75 | | |

The CVP Percentage Model for Ezen Company is:

| Sales | **1.00**S | (where S = Sales) |
| - Variable Costs | **0.25**S | |
| Contribution Margin | 0.75S | |
| - Fixed Costs | **40000** | 0.75S – 40000 = Income |
| Income | Income | |

We use just the bottom three rows of the Model, 0.75S – 40000 = Income, to solve the CVP questions below.
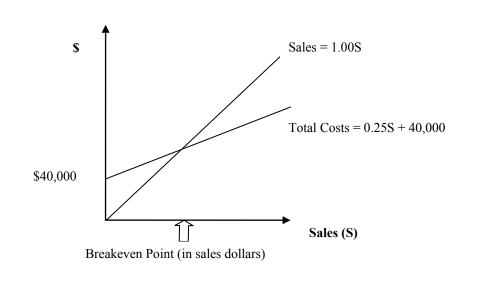
Q: What is the breakeven point for Ezen Company?
    Breakeven is when the bottom-line is zero. Let Income = 0, and solve for S. Thus, 0.75S – 40000 = 0, S = $53,334.

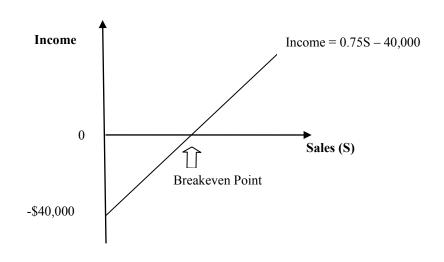Q: What do the CVP and Income graphs look like?
    The CVP graph has two lines, Sales and Total Costs. Their equations from the CVP Percentage Model are Sales = 1.00S and Total Costs = Variable Costs + Fixed Costs = 0.25S + 40000.

**FIGURE 3**
**COST-VOLUME-PROFIT (CVP) GRAPH**



The Income graph has 1 line, the Income line. Again, from the CVP Percentage Model for Ezen Company, Income = 0.75S – 40000.

**FIGURE 4**
**INCOME GRAPH**



Q: How much sales must the company make to generate an income of $12,000?

The CVP Percentage Model has two unknowns, S and Income. To answer this question, we let Income = 12000, and solve for S. Thus, $0.75S - 40000 = 12000$, and $S = \$69,334$ (rounding).

Q: What is income if sales are $20000, $25000, or $80000?

Using the bottom three rows of the Model, $0.75S - 40000 = Income$, we let S = $20000, $25000, and $80000, and solve for Income.

| Sales (S) | S | 20000 | 25000 | 80000 |
|---|---|---|---|---|
| Sales | **1.00**S | **1.00**(20000) | **1.00**(25000) | **1.00**(80000) |
| - Variable Costs | **0.25**S | **0.25**(20000) | **0.25**(25000) | **0.25**(80000) |
| Contribution Margin | 0.75S | 0.75(20000) | 0.75(25000) | 0.75(80000) |
| - Fixed Costs | **40000** | **40000** | **40000** | **40000** |
| Income | Income | -25000 | -21250 | 20000 |

Q: Assume the current sales are $100,000. The company is considering a proposal to spend $8,000 on advertising to increase its sales by 5%? Is the proposal a good idea?

The current CVP Percentage Model for Ezen Company is:

| Sales | **1.00**S | (where S = Sales) |
|---|---|---|
| - Variable Costs | **0.25**S | |
| Contribution Margin | 0.75S | |
| - Fixed Costs | **40000** | $0.75S - 40000 = Income$ |
| Income | Income | |

When S = 100000, Income = $0.75(100000) - 40000 = 35000$.

The proposed CVP Percentage Model is:

| Sales | **1.00**S*(1.05)* | (where S = Sales) |
|---|---|---|
| - Variable Costs | **0.25**S*(1.05)* | |
| Contribution Margin | 0.75S*(1.05)* | |
| - Fixed Costs | **40000 + 8000** | 0.75S(1.05) – 48000 = Income |
| Income | Income | |

At S = 100000, the proposed Model shows Income = 0.75(100000)1.05 – 48000 = 30750. Since the proposal will bring in a lower income of $4,250 (or 35000 - $30750), the proposal is not a good idea.

**Situation 4: Number of units is not of interest, and tax rate is given.**
*Assume Ezen Company has revenue of $80,000, variable costs $20,000 and fixed costs $40,000. It also has a tax rate of 20%.*
    The CVP Percentage Model With Tax, as shown in Panel D of the Appendix, is set up for Ezen Company such that it has only two unknowns, S and NIBT:

| *Left-side-view* | *Right-side-view* | | |
|---|---|---|---|
| Sales | **1.00**S | (where S = Sales) | |
| - Variable Costs | **0.25**S | | |
| Contribution Margin | 0.75S | | |
| - Fixed Costs | **40000** | 0.75S – 40000 = NIBT | (b) |
| NIBT | NIBT | | |
| - Tax | **0.2**NIBT | | |
| NIAT | **0.8**NIBT | | (a) |

The tax rate is assumed to be constant. As the Income Statement with Tax is longer, we can use two short equations, starting with (a) and followed by (b).

Q: What is the breakeven point?
    Since breakeven is when the bottom-line is zero, we use equation (a), and let 0.8NIBT = 0. Solving, we get NIBT = 0. The next step is to put NIBT = 0 into equation (b). Thus 0.75S – 40000 = 0, and solving, we get S = $53334(rounding).

Q: How much sales to get a target income (that is, income after tax) of $2,000?
    We use the CVP Percentage Model with Tax as shown in Panel D of the Appendix. We start with (a). Since the bottom-line is $2,000, we let 0.8NIBT = 2000, and we get NIBT = 2500. Next, we put NIBT = 2500 into (b). Thus, 0.75S – 40000 = 2500, and we get S = $56,667.

**Situation 5: Company has multiple products, sales mix is available. and there is no tax given.**
*Assume West Company makes three products, P1, P2, and P3. The sales of P1, P2, and P3 are 2000, 3000, and 5000 units respectively. Further information includes:*

| | *P1* | *P2* | *P3* |
|---|---|---|---|
| *Unit selling price* | *$ 10* | *$ 6* | *$ 4* |
| *Unit variable cost* | *2* | *2* | *2* |
| *Unit contribution margin* | *8* | *4* | *2* |

*The total fixed costs for West Company are $15,000.*
    Preliminary work is needed before we can set up a CVP Model for a company with multiple products. The preliminary work is to (i) determine the *sales mix* for the company and (ii) use this sales mix to determine a "weighted contribution margin" that is used as a constant parameter in the CVP model.
 (i) Sales Mix
The total sales for the company are 2000 + 3000 + 5000 = 10000. The sales mix for P1 is 2000/10000 = 0.2, P2 is 3000/10000 = 0.3, and P3 is 5000/10000 = 0.5.

(ii) Weighted Contribution Margin
We weight the first three rows by the sales mix:

|  | P1 | P2 | P3 | West |
|---|---|---|---|---|
| Weighted Unit Selling Price | 10(0.2) | 6(0.3) | 4(0.50) | 5.8 |
| Weighted Unit Variable Cost | 2(0.2) | 2(0.3) | 2(0.50) | 2.0 |
| Weighted Contribution Margin | 8(0.2) | 4(0.3) | 2(0.50) | |
| | = 1.6 | = 1.2 | = 1 | 3.8 |

to get:

|  | P1 | P2 | P3 | West |
|---|---|---|---|---|
| Sales | 2T | 1.8T | 2.0T | 5.8T |
| Variable Costs | 0.4T | 0.6T | 1.0T | 2.0T |
| Contribution Margin | 1.6T | 1.2T | 1.0T | 3.8T |

where T = Total Company Sale Units. The West Company's CVP Model with Multiple Products is:

| Sales | **5.8**T | (where T = Total Company Sale Units) |
|---|---|---|
| - Variable Costs | **2.0**T | |
| Contribution Margin | 3.8T | |
| - Fixed Costs | **15000** | 3.8T – 15000 = Income |
| Income | Income | |

The CVP Model for Multiple Products is similar to the earlier CVP Models (see Panels A to D of the Appendix) that we discussed. The CVP Model for Multiple Products also has two unknowns, T (No. of Company's Sales in Units) and Income.

Q: What is the breakeven point?
 Breakeven is when the bottom-line is zero, $3.8T – 15000 = 0$. Solving, we get T = 3948 (rounding). To get the individual product sales, we use the sales mix; breakeven sales for P1 is 0.2(3948), P2 is 0.3(3948), and P3 is 0.5(3948).

Q: How many units of P1, P2, and P3 must the company sell to make an Income of $60,000?
 To answer this question, we use the CVP Model which was set up above for West Company. Let Income = 60000, so $3.8T – 15000 = 60000$. Solving, T = 19737. Using the sales mix information, sales of P1, P2, and P3 should be 0.2(19737), 0.3(19737), and 0.5(19737) respectively.

**Situation 6: Company has multiple products and tax, and sales mix information is available.**
*Assume we use the same West Company as given in example 5, but includes a tax rate of 25%.*
 We set up a CVP Model With Tax similar to what was set up in Panels B and D of the Appendix. For this example 6, the CVP Model has two unknowns, NIBT and T, where T = total company sales.

| *Left-side-view* | *Right-side-view* | |
|---|---|---|
| Sales | **5.8**T | (where T = Total Company Sale Units) |
| - Variable Costs | **2.0**T | |
| Contribution Margin | 3.8T | |
| - Fixed Costs | **15000** | 3.8T - 15000 = NIBT …........ (b) |
| NIBT | NIBT | |
| - Tax | **0.25**NIBT | |
| NIAT | **0.75**NIBT | ………..……………………….. (a) |
| / | | |

We use two steps, (a) and (b), to answer most CVP questions.

Q: What is the breakeven point?

Since breakeven is when the bottom-line is zero, we use equation (a) to get 0.75NIBT = 0, and solving we get NIBT = 0. The next step is to put NIBT = 0 into equation (b). Thus 3.8T – 15000 = 0, and solving we get T = 3948(rounding). The breakeven sales of P1, P2, and P3 should be 0.2(3948), 0.3(3948), and 0.5(3948) respectively.

Q: How much sales to get a target income (that is, income after tax) of $60,000?

We use the CVP Percentage Model with Tax as shown in Panel F of the Appendix. We start with (a). Since the bottom-line is $60,000, we let 0.75NIBT = 60000, and we get NIBT = 80000. Next, we put NIBT = 80000 into (b) to get 3.8T – 15000 = 80000. Solving, we get T = 25000. Furthermore, the sales of P1, P2, and P3 should be 0.2(25000), 0.3(25000), and 0.5(25000) respectively.

## CONCLUSION

We present an Income Statement teaching approach for CVP Analysis using a company's CVP model. This approach would help students see which of the company's parameters are held constant and which of them can be varied in their learning of CVP analysis. This approach also would reduce students' memorization of equations.

## ENDNOTES

[1] Breakeven is when the bottom-line of the Income Statement is zero. Other ways of describing breakeven involves rearranging the Income Statement equation, that is, at breakeven,
Sales – Total Costs = 0
Sales = Total Costs
Sales – (Variable Costs + Fixed Costs) = 0
Sales – Variable Costs = Fixed Costs
Contribution Margin = Fixed Costs
Unit Contribution Margin(Number of Units at breakeven) = Fixed Costs, that is, Number of Units at breakeven = Fixed Costs ÷ Unit Contribution Margin.

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**APPENDIX**

## COST-VOLUME-PROFIT (CVP) MODEL

**Panel A: CVP Model for a company where number of units is of interest, and there is no tax given**

| *Left-side-view* | *Right-side-view* | |
| --- | --- | --- |
| Sales | **Unit Selling Price** | x No. of Units |
| - Variable Costs | **Unit Variable Cost** | x No. of Units |
| Contribution Margin | (Unit Selling Price – Unit Variable Cost) | x No. of Units |
| - Fixed Costs | **Fixed Costs** | |
| Income | Income | |

**Panel B: CVP Model for a company where number of units is of interest, and the tax rate is given**

| *Left-side-view* | *Right-side-view* | |
| --- | --- | --- |
| Sales | **Unit Selling Price** | x No. of Units |
| - Variable Costs | **Unit Variable Cost** | x No. of Units |
| Contribution Margin | (Unit Selling Price – Unit Variable Cost) | x No. of Units |
| - Fixed Costs | **Fixed Costs** | |
| Net Income Before Tax | Net Income Before Tax | |
| - Tax | **- Tax Rate** x Net Income Before Tax | |
| Net Income After Tax | (1 – **Tax Rate**) x Net Income Before Tax | |

**Panel C: CVP Model for a company where number of units is not of interest, and there is no tax given**

| *Left-side-view* | *Right-side-view* | |
| --- | --- | --- |
| Sales | **Sales Percentage** | x Sales |
| - Variable Costs | **Variable Costs Percentage** | x Sales |
| Contribution Margin | Contribution Margin Percentage | x Sales |
| - Fixed Costs | **Fixed Costs** | |
| Income | Income | |

**Panel D: CVP Model for a company where number of units is not of interest, and the tax rate is given**

| *Left-side-view* | *Right-side-view* | |
| --- | --- | --- |
| Sales | **Sales Percentage** | x Sales |
| - Variable Costs | **Variable Costs Percentage** | x Sales |
| Contribution Margin | Contribution Margin Percentage | x Sales |
| - Fixed Costs | **Fixed Costs** | |
| Net Income Before Tax | Net Income Before Tax | |
| - Tax | **- Tax Rate** x Net Income Before Tax | |
| Net Income After Tax | (1 – **Tax Rate**) x Net Income Before Tax | |

**Panel E: CVP Model for a company with multiple products and the sales mix is available, and there is no tax given**

*Left-side-view*                          *Right-side-view*
Sales                                     **Weighted Unit Selling Price**          x T
- Variable Costs                          **Weighted Unit Variable Cost**          x T
Contribution Margin                       Weighted Unit Contribution Margin        x T
- Fixed Costs                             **Fixed Costs**
Income                                    Income

where T = Total Company Units

**Panel F: CVP Model for a company with multiple products and the sales mix is available, and the tax rate is given**

*Left-side-view*                          *Right-side-view*
Sales                                     **Weighted Unit Selling Price**          x T
- Variable Costs                          **Weighted Unit Variable Cost**          x T
Contribution Margin                       Weighted Unit Contribution Margin        x T
- Fixed Costs                             **Fixed Costs**
Net Income Before Tax                     Net Income Before Tax
- Tax                                     - **Tax Rate** x Net Income Before Tax
Net Income After Tax                      (1 – **Tax Rate**) x Net Income Before Tax

where T = Total Company Units

Note: In the right-side-view, model parameters in bold are assumed constant in CVP analysis.