Cost-Value-Profit Relationships

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## CVP Analysis Assumptions

When performing CVP analysis, we make a few assumptions:

1. The selling price is constant. It does not change based on volume.
2. Costs are linear and can be accurately divided into variable and fixed elements. The variable element is constant per unit and the fixed unit is constant in total over the entire relevant range.
3. In multiproduct companies, the sales mix is constant. The sales mix is the ratio of production for the different products. Some products will have higher demand and will need to be produced more. For example, a ratio of 6:1 indicates that one product is produced in 6 times the amount of the other.
4. In manufacturing companies, inventories do not change. The number of units produced equals the number of units sold.

## CVP Analysis Formulae

|  |  |  |
| --- | --- | --- |
| Acoustic Concepts, Inc.  Contribution Income Statement  For the month of June | | |
|  | Total($) | Per Unit($) |
| Sales (400 units) | 100,000 | 250 |
| Variable Expenses | (60,000) | (150) |
| Contribution Margin | 40,000 | 100 |
| Fixed Expenses | (35,000) |  |
| Net Operating Income | 5,000 |  |

The Contribution Margin Ratio can be calculated using the total values or the per unit values. Both will give the same result.

Notice that the Variable Expense Ratio and the Contribution Margin Ratio sum to . This is always true, so we can calculate one value given the other.

## Break Even Point Analysis

The **break even point** (BEP) is the point at which the company has neither made any profit nor faced any loss. It can be expressed as a dollar value (BEP[dollars]) or as the quantity of units sold (BEP­[units]).

We can calculate the BEP using either the formula method or the equation method.

In addition to the BEP, we can also calculate the unit or dollar sales to attain a specified **target profit**. In the examples below, suppose that the target profit is .

### Formula Method

### Equation Method

The sales value specified in the table above includes the profit amount, so we cannot use it directly. Instead, we have to calculate the total sales for units from the price per unit. Similarly, the variable expenses will be lower, so we need to calculate it from the variable expense per unit. Only the fixed cost will remain the same.

## Margin of Safety

The **margin of safety** is the difference between the break even point and the amount of sales required to reach the expected profit. It is the amount by which total sales can fall before we start to incur a loss.

## Operating Leverage

The **operating leverage** measure the change in the net operating income due to a change in the sales volume.

A small increase in the sales volume can cause a huge change in the net operating income. From the table provided at the top of this note,

Thus, for a 10% increase in the sales volume, we have a increase in the net operating income.

If we are asked to prove this, we must prepare a new income statement, with the sales volume increased by the amount required. This will also affect the total variable expense and the contribution margin.

|  |  |  |
| --- | --- | --- |
| Acoustic Concepts, Inc.  Contribution Income Statement  For the month of June | | |
|  | Total($) | Per Unit($) |
| Sales (440 units) | 110,000 | 250 |
| Variable Expenses | (66,000) | (150) |
| Contribution Margin | 44,000 | 100 |
| Fixed Expenses | (35,000) |  |
| Net Operating Income | 9,000 |  |

Question: Would you recommend making the changes?

Answer: Yes. I recommend the changes should be made, since the changes increase the company’s Net Operating Income from $60,000 to $72,000 and also increase the Margin of Safety from $240,000 to $390,000.