Cost-Volume-Profit Analysis

1. The Basic Idea

   • Variable costs are a multiple of sales ($ or units).
   • Total contribution margin is the difference between sales dollars and variable costs.
   • Volume (i.e., the number of units) is the only driver.
   • CVP analysis has the virtue of being quick and easy.

2. Terminology

   • There are two distinctions between contribution margin (CM) and gross margin (GM). Variable marketing and administrative expenses are subtracted to get CM (but not GM), and fixed manufacturing overhead is subtracted to get GM (but not CM).
   • CoGS, or Cost of Goods Sold, usually includes some fixed costs.
   • CM = sales − all variable costs
   • gross profit = GM = sales − CoGS
3. Schema: The CVP Chart

Step 1. Decide on the purpose.

Step 2. In light of the purpose, categorize data as fixed or variable.

Step 3. For variable costs, define the “unit” (e.g., sales dollar, passenger-mile, patient-day).

\[(\text{Units} \times \text{Sales Price}) - (\text{Units} \times \text{Unit variable cost}) - \text{Fixed Costs} = \text{Operating Income}\]

Ask the questions: What is pre-determined in the equation? What is unknown in the equation?

3.1 Assumptions

- volume is the only driver
- linearity
- single product or constant product mix

3.2 Caveats

- CVP is valid only in the relevant range.
- Deciding which costs are fixed and which are variable can be tricky.
- CVP will not work if multiple drivers are appropriate, e.g., in a multi-product setting where product mix can vary.
- Identifying all of the relevant costs for a CVP analysis (or any costing technique) can be tricky.
3.3 Modifications

- What do we do when there are multiple products?

- How do changes in product mix affect the break-even point?

- How does taxation affect CVP analysis?

  Net income = operating income − taxes.
Components of Gross Margin for a Grocery Store*

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Sales</td>
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<tr>
<td>Cost of Goods Sold</td>
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<tr>
<td>Gross Margin</td>
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<tr>
<td>Labor</td>
<td>15</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>3</td>
</tr>
<tr>
<td>Heat and Light</td>
<td>1</td>
</tr>
<tr>
<td>Rent</td>
<td>3</td>
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<td></td>
<td>22</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>3</td>
</tr>
<tr>
<td>Taxes</td>
<td>1.5</td>
</tr>
<tr>
<td>Net Income</td>
<td>1.5</td>
</tr>
</tbody>
</table>

* Data are based on information from the Food Marketing Institute, 1750 K Street, N.W., Washington, DC 20006.