



## Notes – Chapter 8

### Cost Volume Profit Analysis

- I. Fundamental Planning Questions
  - a. Questions management hopes to answer using CVP techniques
  - b. What level of sales is needed to break-even?
  - c. What level of sales is needed to achieve some particular level of profit?
  - d. How does the bottom line change with respect to cost structure?
  - e. How does profitability change as more (or fewer) products are introduced?
- II. Assumptions
  - a. Selling price is constant in relevant range.
  - b. Costs are linear
  - c. Sales mix is constant in multi-product companies.
  - d. Inventories are constant.
  - e. Just understand the limitations these assumptions impose.
- III. Contribution-Margin Income Statement
  - a. Same numbers as the conventional income statement, but using a different analysis.
  - b. Deemed more useful for management purposes, less useful by outsiders.
  - c. Splits costs into Variable and Fixed
  - d. Contribution Margin
    - i. Amount of revenue left after deducting variable costs.
    - ii. Per-unit Contribution Margin is the amount that can be obtained in profit (or toward covering fixed costs) by manufacturing one more unit.
- IV. Break-Even Point
  - a. Equation Method
    - i. Profit = Revenue – Variable Expenses – Fixed Expenses
    - ii. Revenue = Units Sold \* Price
    - iii. Variable Expenses = Per-Unit Expense \* Units Manufactured
    - iv. Set profit to 0, solve for sales given the current price and per-unit variable cost.
    - v. Example
      1.  $(\$500)(x) + (\$300)(x) - \$80,000 = 0$
      2.  $x = 400$  units
    - vi. Can take that calculated amount and plug back into the Contribution Margin income statement and see that the bottom line is 0.
  - b. Contribution Margin Approach
    - i. Straightforward intuitively, follows directly from the equation.
    - ii. Revenue – Variable Expenses = Fixed Expenses
    - iii. (Per-Unit Revenue)(Units) – (Per-Unit Expense)(Units) = Fixed Expenses
    - iv. (Units)(Per-Unit Revenue – Per-Unit Expense) = Fixed Expenses
    - v. (Units)(Per-Unit Contribution Margin) = Fixed Expenses
    - vi. Units Required to Break-Even = Fixed Expenses / Per-Unit CM
  - c. Break-Even in terms of Sales Dollars
    - i. How much revenue is needed to break even?
    - ii. CM Ratio = CM% = Contribution Margin / Sales
    - iii. Fixed Expenses / CM Ratio = Break-Even Sales Revenue
- V. Given Profit Level
  - a. Use either the Equation Approach or Contribution Margin Approach from above.
  - b. Substitute (Fixed Costs + Profit) for (Fixed Costs) in either.
  - c. In essence, solve for a “break-even” point that includes profits, but then express it in terms of real costs.
- VI. Profitability vs. Sales
  - a. Plot total sales against units sold.
  - b. Then plot total costs against units sold.

- c. Approach
  - i. To plot each, pick some level of sales and use those figures to represent one set of data.
  - ii. Total Sales starts at (0, 0) and passes through the point defined by your data (Units Sold, Total Sales)
  - iii. Total Costs starts at (0, Fixed Expenses) and passes through the point defined by your data (Units Produced, Total Cost)
- d. Interpretation
  - i. Lines cross at the break-even point (which shows both units produced and total revenue)
  - ii. Distance between the lines is profit or loss.
- e. Profit-Volume Graph
  - i. Plot profit against volume.
  - ii. Just Sales – Expenses, derived from the previous graph.
- VII. Profitability vs. Cost Structure
  - a. Operating Leverage: The degree to which total cost depends on units produced.
  - b. Leverage Factor = Contribution Margin / Net Income
  - c.  $(\text{Percent Increase in Sales}) * (\text{Leverage Factor}) = (\text{Percent Increase in Income})$
  - d. More leverage means more ability to derive profit from sales.
  - e. More leverage comes from more fixed costs.
  - f. The downside is that, while a small increase in revenue can result in a big increase in profit, a small decrease in revenue will have the opposite effect.
- VIII. Multiple Products
  - a. Find the percentage each product comprises of the total number of units produced.
  - b. Apply that percentage to the per-unit contribution margin for the product, and sum to find the average Per-Unit CM.
  - c. Break-Even is then Fixed Expenses / (Weighted-Average Unit CM)
  - d. Remember, this holds only if the sales mix is fixed.
- IX. Income Taxes
  - a. Previous analysis has ignored the effects of taxes.
  - b. Always do that first, then take the next step to account for taxes.
  - c.  $\text{After Tax Net Income} = \text{Before Tax Net income} - (\text{Tax Rate})(\text{Before Tax Net Income})$
  - d.  $\text{Before Tax Net Income} = \text{After Tax Net Income} / (1 - \text{Tax Rate})$