Cost-Volume-Profit

LO 1: Apply Concepts

Review Terms
Cost-Volume-Profit Analysis
Cost-Volume-Profit Income Statement
Contribution Margin
Unit Contribution Margin
Breakeven Point
Contribution Margin Ratio

CVP income statement

- Basic CVP income statement shows contribution margin, usually both in total and for a per unit basis

  Sales – Variable Expenses = Contribution Margin

  Sales per unit – Variable cost per unit = contribution margin per unit
- Detailed CVP income statement shows types of variable and fixed costs

Breakeven

- To Determine Breakeven in units:
  Fixed Costs divided by Unit Contribution Margin= Breakeven in units
- To Determine Breakeven in Sales Dollars:
  Fixed Costs divided by Contribution Margin Ratio= Breakeven in dollars

Target Net Income

- To Determine Breakeven in units:
  (Fixed Costs + Target Net Income) divided by Unit Contribution Margin= Breakeven in units
- To Determine Breakeven in Sales Dollars:
  (Fixed Costs+ Target Net Income) divided by Contribution Margin Ratio= Breakeven in dollars

Margin of Safety

1. In Dollars:
   Actual (expected) Sales – Break-even Sales = Margin of Safety in Dollars
2. As a Ratio:
   Margin of Safety in Dollars / Actual (expected) Sales = Margin of Safety Ratio

CVP Analysis

Uses the above equations to study the effects of changes in cost and volume on a company's profit

Practice #1

S Company sells pillows for $90 per unit. The variable expenses are $63 per pillow and the fixed costs are $135,000 per month. The company sells 8,000 pillows per month. The sales manager is proposing a 10% reduction in selling price, which he believes will produce a 25% increase in the number of pillows, sold each month.

Required:

A) What is the current and proposed break-even points in units? Will the proposed break-even point be supported by the 25% increase in pillows?
B) What is the current and proposed margin of safety?
C) Based on A and B, should the company make the proposed changes?
D) If the company makes the proposed change, but also increase advertising expenses by $10,000, how many units must they sell to have a net income of $315,800? What is the dollar sales?

LO 2: Sales Mix

The sales mix is the relative percentage in which a company sells its multiple products and is used to determine breakeven for the company as a whole.

Follow the following steps to determine breakeven in sales dollars or units. To determine sales dollars, use contribution margin ratios and sales mix for sales. To determine units, use contribution margin per unit and sales mix for units.

Step 1: Find sales mix percentage for each product.

Unit
Product 1 unit sales / total unit sales = Product 1 sales mix percentage for units
Product 2 unit sales / total unit sales= Product 2 sales mix percentage for units

Sales
Product 1 total sales dollars / total dollar sales= Product 1 sales mix percentage for sales
Product 2 total sales dollars / total dollar sales= Product 2 sales mix percentage for sales

Note: total unit sales= Product 1 unit sales + Product 2 unit sales

Step 2: Find Weighted Average Unit Contribution Margin

(Contribution Margin Product 1 * Sales Mix Percentage)
+ (Contribution Margin Product 2 * Sales Mix Percentage)
Weighted Average contribution margin

Step 3: Determine Breakeven
Fixed Costs / weighted average contribution margin = Breakeven point

Step 4: Determine individual product amounts

Breakeven point * Sales mix Product 1 = Dollar or units of Product 1 to breakeven
Breakeven point * Sales mix Product 2 = Dollar or units of Product 2 to breakeven

Practice #2

Z Company sells two models of doghouses, the Puppy Palace and the Canine Castle. Fixed costs are $742,875.

	Puppy Palace	Canine Castle
Sales price per unit	$50	$75
Variable cost per unit	30	30
Unit Sales	37,500	12,500

Determine the company's breakeven point in sales units and dollars.

LO 3: Limited Resources

Terms
Theory of constraints

Limited resource decisions: Management must determine which products will maximize net income in multiple produce utilize the same resource. They can do this by determining the contribution margin per unit of the limited resource.

Unit contribution margin	/	Limited resource requirement per unit	=	Contribution margin per unit of limited resource

1. Calculate contribution margin per unit
2. Apply above formula to get contribution margin per unit of limited resource

3. Produce product with highest contribution margin per unit of limited resource to meet demand, then produce other products in order of contribution margin per unit of limited resource from highest to lowest.

Practice #3

Management has limited machine hours to produce three different products. Below is the information management has gathered. Which order should they produce the products?

	Product A	Product B	Product C
Sales per unit	$10	$20	$25
Variable Cost per unit	5	8	11
Machine Hours Required per unit	.2	.4	.6

LO 4: Operating Leverage

Terms
Cost structure
Operating leverage
Degree of operating leverage

- Operating leverage quantifies, at a given level of sales, the percent change in operating income caused by a percent change in sales.
- Leverage calculations are a two-step process:
  - calculate the Degree of Operating Leverage

$$\text{Degree of Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Net Income}}$$

  - *Step 2*: calculate the percent change in operating income:

$$\text{Percent change in operating income} = \text{Degree of Leverage} \times \text{Operating Income}$$

Practice #4

P Company sells pillows for $90 per unit. The variable expenses are $63 per pillow and the fixed costs are $135,000 per month. The company sells 8,000 pillows per month.

Required: Compute the current degree of operating leverage. Management expected sales to increase 10% if variable costs decreased $10 per unit and increasing fixed costs by $109,600. Calculate the new degree of operating leverage. Which produces a better degree of operating leverage?

Solution #1

A)

	Current	Proposed
Sales	90	81
Variable Cost	63	63
Contribution Margin	27	18
Fixed Costs	135,000	135,000
Breakeven in units	5,000	7,500

Sales- Variable costs= Contribution margin
Fixed costs/contribution margin= breakeven in units

The proposed breakeven point will require an increase in sales of 50%.

B) Current: (8,000*90)-(5,000*90)= 270,000
Proposed: ((8,000*1.25)*81)-(7,500*81)=
(10,000 *81)-(7,500*81)=202,500
C) No, margin of safety is reduced and break-even sales increase by more than 25%
D) 135,000+10,000= 145,000 in fixed costs
(145,000+315,800)/18= 25,600
(145,000+315,800)/22%= $2,073,600

Solution #2

Step 1:

Unit
Puppy Palace 37,500/50,000= 75%
Canine Castle 12,500/50,000= 25%

Sales
Puppy Palace (37,500*50)/2,812,500= 67%
Canine Castle (12,500*75)/2,812,500= 33%

Step 2:
Puppy Palace 50-30=20 per unit or 40%
Canine Castle 75-30=45 per unit or 60%

	Puppy Palace		Canine Castle	Company Total
Weighted Average Contribution Margin per Unit	20 * 75%	+	45 * 25%	26.25 per unit
Weighted Average Contribution Margin Ratio	40% * 67%	+	60%* 33%	46.6%

Step 3:
$742,875/ 26.25= 28,300 units
$742,875/ 46.6%= $1,594,152

Step 4:
Puppy Palace 28,300* 75%= 21,225

Canine Castle 28,300*25%= 7,075
Puppy Palace $1,594,152* 66.7%=1,063,300
Canine Castle $1,594,152*33.3%= 530,852

Note: Some rounding causes breakeven units * selling price to not exactly equal breakeven in sales dollars

Solution #3

	Product A	Product B	Product C
Sales per unit	$10	$20	$25
Variable Cost per unit	5	8	11
Contribution Margin	5	12	14
Machine Hours Required per unit	.2	.4	.6
Contribution margin per limited resource	$25	$30	$23.33

Produce in the following order: B,A,C

Solution #4

		Present		Proposed
	Per Unit	%	Total	Total
Units	1		8,000	8,800
Sales	$90	100.0	$720,000	$792,000
Variable expenses	63	70.0	504,000	466,400
Contribution Margin	27	30.0	216,000	325,600
Fixed expenses			135,000	244,600
Operating income			$81,000	$81,000
Degree of leverage			2.67	4.02

The changes would produce a better degree of operating leverage because switching the cost structure to higher fixed costs, increases the operating leverage and with a percent change in sales would produce a higher percent change in net income.