

Accounting for Managers

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MGM341

Lecture (5)
Cost – volume – profit Analysis
(Break even point)



Learning outcomes

- LO 1** Prepare a CVP income statement to determine contribution margin.
- LO 2** Compute the break-even point.
- LO 3** Determine the sales required to earn target net income and determine margin of safety.

Cost-Volume-Profit Analysis

Cost-volume-profit (CVP) analysis is the study of the effects of changes in costs and volume on a company's profits.

- Important in profit planning.
- Critical factor in management decisions as
 - Setting selling prices,
 - Determining product mix
 - Maximizing use of production facilities.

Cost-Volume-Profit Analysis

Basic Components

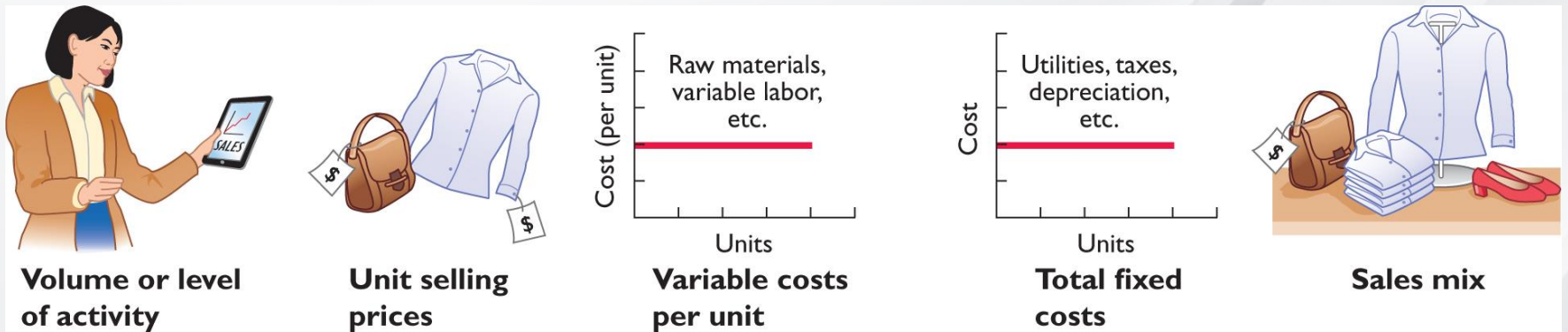


ILLUSTRATION 22.10

Components of CVP analysis

Basic Components

Assumptions

1. Behavior of both costs and revenues is linear throughout the relevant range of the activity index.
2. Costs can be classified accurately as either **variable** or **fixed**.
3. Changes in activity are the only factors that affect costs.
4. All units produced are sold.
5. When more than one type of product is sold, the sales mix will remain constant.

CVP Income Statement

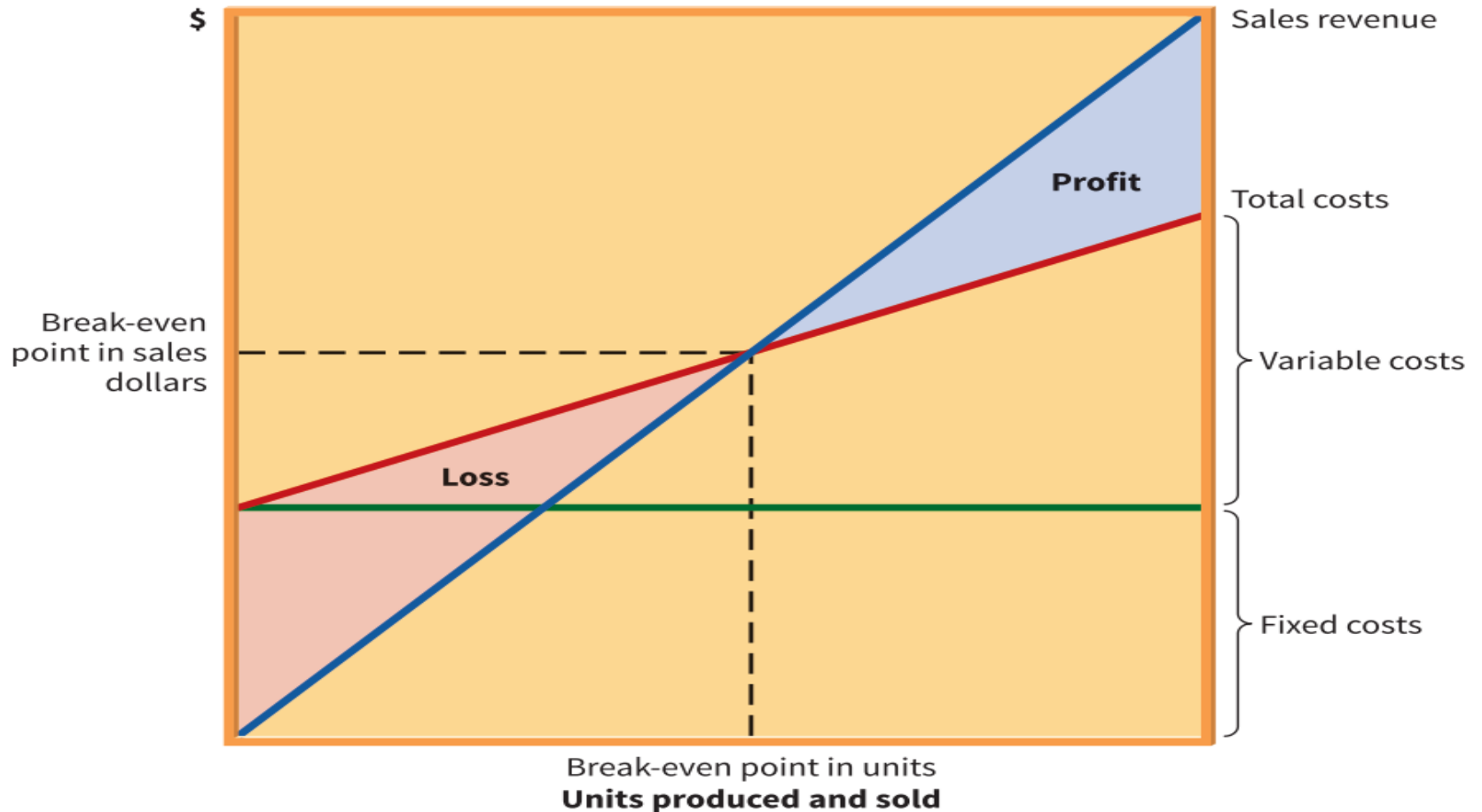
Sales (Selling price per unit x Sold units).	xx
Less	(-)
Variable cost (Variable cost per unit x Sold units).	(xx)
Contribution Margin (C.M)	Xx
Less	(-)
Fixed Cost	(xx)
Net Income	x

Cost-Volume-Profit Analysis

CVP Income Statement

- A statement for **internal use**.
- Classifies costs and expenses as fixed or variable.
- Reports **contribution margin** in body of statement.
 - **Contribution margin** – amount of revenue remaining after deducting variable costs.
- Reports **same net income** as a traditional income statement.

Graphic Presentation



Computing Break-Even Analysis

(1) Computing Break-even point (B.E.P)	(2) Computing break-even point to achieve target income	(3) Computing margin of safety and margin of safety percentage
a) B.E.P in units $= \frac{\text{Fixed cost}}{\text{Contribution margin/unit}}$ ↓ Selling price/unit - Variable cost/unit Or $= \frac{\text{B.E.P (value)}}{\text{Selling price/unit}}$ b) B.E.P in value $= \frac{\text{Fixed cost}}{\text{Contribution margin ratio}}$ ↓ $\frac{\text{Sales} - \text{V.C}}{\text{Sales}}$ Or $\frac{\text{S.P.P.U} - \text{V.C.P.U}}{\text{S.P.P.U}}$ Or Break-even point (units) x selling price/unit	a) In units $= \frac{\text{Fixed cost} + \text{target income}}{\text{Contribution margin/unit}}$ b) In value $= \frac{\text{Fixed cost} + \text{target income}}{\text{Contribution margin ratio}}$	(1) Margin of safety a) In units $= \text{Actual sales (units)} - \text{B.E.P (units)}$ b) In value $= \text{Actual sales (value)} - \text{B.E.P (Value)}$ (2) Margin of safety percentage a) In units $= \frac{\text{Margin of safety (unit)}}{\text{Actual sales(Units)}}$ b) In value $= \frac{\text{Margin of safety (value)}}{\text{Actual Sales (value)}}$

CVP Income Statement

Illustration: Fandi Electronics produces cell phones. Relevant data for the cell phones sold by this company in June 2020 are as follows.

Unit selling price of cell phone	€500
Unit variable costs	€300
Total monthly fixed costs	€200,000
Units sold	1,600

CVP Income Statement

Illustration shows CVP income statement for Fandi in case of selling **1600 cell phones**.

**Fandi Electronics
CVP Income Statement
For the Month Ended June 30, 2020**

	Total	Per Unit
Sales (1,600 cell phones)	€800,000	€500
Variable costs	480,000	300
Contribution margin	320,000	€200
Fixed Costs	200,000	
Net income	€120,000	

CVP Income Statement

Unit Contribution Margin

- Contribution margin is available to **cover fixed costs** and to **contribute to income**
- Formula for **unit contribution margin** and the computation for Fandi Electronics are:

Unit Selling Price	-	Unit Variable Costs	=	Unit Contribution Margin
€500	-	€300	=	€200

Fandi's CVP income statement assuming a zero net income in case of selling **1000 cell phones**.

**Fandi Electronics
CVP Income Statement
For the Month Ended June 30, 2020**

	<u>Total</u>	<u>Per Unit</u>
Sales (1,000 cell phones)	€500,000	€500
Variable costs	<u>300,000</u>	<u>300</u>
Contribution margin	200,000	€200
Fixed Costs	<u>200,000</u>	
Net income	<u>€ 0</u>	

Assume that Fandi sold one more cell phone, for a total of **1,001 cell phones sold.**

**Fandi Electronics
CVP Income Statement
For the Month Ended June 30, 2020**

	<u>Total</u>	<u>Per Unit</u>
Sales (1,001 cell phones)	€500,500	€500
Variable costs	<u>300,300</u>	<u>300</u>
Contribution margin	200,200	€200
Fixed Costs	<u>200,000</u>	
Net income	€ 200	

Contribution Margin Ratio

- Shows the percentage of sales available to apply toward fixed costs and profits.
- Formula for **contribution margin ratio** and the computation for Fandi Electronics are:

Unit Contribution Margin	÷	Unit Selling Costs	=	Contribution Margin Ratio
€200	÷	€500	=	40%

CVP income statement, with net income and percent of sales data.

**Fandi Electronics
CVP Income Statement
For the Month Ended June 30, 2020**

	<u>Total</u>	<u>Percent of Sales</u>
Sales (1,001 cell phones)	€500,500	100%
Variable costs	<u>300,300</u>	<u>60</u>
Contribution margin	200,200	40%
Fixed costs	<u>200,000</u>	
Net income	€ 200	

Contribution margin:

- a. Is revenue remaining after deducting variable costs.
- b. May be expressed as unit contribution margin.
- c. Is selling price less cost of goods sold.
- ➡ d. Both (a) and (b) above.

DO IT! 3 CVP Income Statement

Khor Industries produces and sells a cell phone-operated thermostat. Information regarding the costs and sales of thermostats during September 2020 are provided below.

Unit selling price of thermostat	\$2,550
Unit variable costs	\$960
Total monthly fixed costs	\$5,700,000
Units sold	4,000

Prepare a CVP income statement for Khor Industries for the month of September. Provide per unit values and total values.

DO IT! 3 | CVP Income Statement

Prepare a CVP income statement for Khor Industries for the month of September. Provide per unit values and total values.

Khor Industries
CVP Income Statement
For the Month Ended September 30, 2020

	<u>Total</u>	<u>Per Unit</u>
Sales		
Variable costs		
Contribution margin		
Fixed costs		
Net income		

Break-Even Analysis

- Process of finding **break-even point** level of activity at **which total revenues equal total costs** (both fixed and variable)
- Can be computed or derived
 - by using **contribution margin**, or
 - from a **cost-volume-profit (CVP) graph**.
- Expressed either in **units** or in **sales**

DO IT! 4 Break-Even Analysis

Yunxuan Group has a unit selling price of \$400, variable costs per unit of \$240, and fixed costs of \$180,000. Compute the break-even point in units

Fixed Costs	÷	Unit Contribution Margin	=	Break-Even Point in Units
	÷		=	

Target Net Income

To determine required **units** for Fandi Electronics:

Yunxuan Group has a unit selling price of \$400, variable costs per unit of \$200, and fixed costs of \$200,000.

Compute sales to achieve target income \$120000

(Fixed Costs + Target Net Income)	÷	Unit Contribution Margin	=	Required Units
(\$200,000 + €120,000)	÷	\$200	=	1,600 units

Target Net Income

To determine required sales value :

(Fixed Costs + Target Net Income)	÷	Contribution Margin Ratio	=	Required Sales
(€200,000 + €120,000)	÷	50%	=	€640,000

Margin of Safety

- Difference between **actual or expected sales** and sales at **break-even point**
- Measures “cushion” that a particular level of sales provides
- May be expressed **in sales or as a ratio**
- Assuming actual/expected sales are \$750,000 and break even point is \$500,000:

Actual (Expected) Sales	–	Break-Even Sales	=	Margin of Safety
\$750,000	–	\$500,000	=	\$250,000

Margin of Safety Ratio

- Computed by dividing margin of safety by actual (or expected) sales
- The higher the sales percentage, greater margin of safety
- Assuming actual/expected sales are €750,000:

Margin of Safety	÷	Actual (Expected) Sales	=	Margin of Safety Ratio
\$250,000	÷	\$750,000	=	33%

DO IT! 5 | Break-Even, Margin of Safety, and Target Net Income

Praveen Ltd. makes travel bags that sell for \$3,920 each. For the coming year, management expects fixed costs to total \$22,400,000 and variable costs to be \$2,940 per unit.

Compute the break-even point in sales using the contribution margin (CM) ratio.

Contribution margin ratio =

Break-even point in sales =

DO IT! 5 | Break-Even, Margin of Safety, and Target Net Income

Praveen Ltd. makes travel bags that sell for \$3,920 each. For the coming year, management expects fixed costs to total \$22,400,000 and variable costs to be \$ 2,940 per unit.

Compute the margin of safety and margin of safety ratio assuming actual sales are \$96,768,000.

Margin of safety =

Margin of safety ratio =

DO IT! 5 | Break-Even, Margin of Safety, and Target Net Income

Praveen Ltd. makes travel bags that sell for \$3,920 each. For the coming year, management expects fixed costs to total \$22,400,000 and variable costs to be \$2,940 per unit.

Compute the sales required to earn net income of \$28,700,000.

Required sales =

Additional Examples

1. Ahmed Company has a unit contribution margin of L.E. 120 and a contribution margin ratio of 40%. What is the unit selling price?

a) L.E. 200	b) L.E. 300	C) L.E. 48	D) Cannot be determined.
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Answer

$$\text{CM Ratio} = \frac{\text{Contribution margin per unit}}{\text{Selling price}}$$

$$40\% = \frac{\text{L.E. 120}}{\text{Selling price}}$$

$$\text{Selling price} = (120/40\%) = \text{L.E 300}$$

2. If the Sales are L.E. 500,000 and variable costs are L.E. 330,000. What is the contribution margin ratio?

a) 52%	b) 34%	C) 66%
D) Cannot be determined because amounts are not expressed per unit.		

Answer

$$\begin{aligned}
 \text{CM Ratio} &= \frac{\text{Sales} - \text{Variable cost}}{\text{Sales}} \\
 &= \frac{\text{L.E. 500,000} - \text{L.E. 330,000}}{\text{L.E.500,000}} = 34\%
 \end{aligned}$$

3. If the Company has a product with a selling price per unit of L.E. 200, the unit variable cost is L.E. 110, and the total fixed costs are L.E. 300,000. How much is Company 's contribution margin ratio?

a) 45 %	b) 55 %	C) 150 %	D) 182%
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Answer

$$\text{CM Ratio} = \frac{\text{Selling price} - \text{Variable cost/unit}}{\text{Selling price}}$$

$$= \frac{\text{L.E. 200} - \text{L.E. 110}}{\text{L.E.200}} = 45\%$$

4. If the Company has a unit contribution margin of L.E. 30 and a contribution margin ratio of 60%. How much is the selling price of each unit?

a) L.E. 50	b) L.E. 75	C) L.E. 18
D) Cannot be determined without more information		

Answer

$$\text{CM Ratio} = \frac{\text{Contribution margin per unit}}{\text{Selling price}}$$

$$60\% = \frac{\text{L.E. 30}}{\text{Selling price}}$$

$$\text{Selling price} = (30/60\%) = \text{L.E 50}$$

5.If Fixed costs are L.E. 900,000 and the variable costs are 75% of the unit selling price. What is the break-even point in pounds?

- | | | | |
|--------------------------|---------------------------|--------------------------|---------------------------|
| a) L.E. 2,100,000 | b) L.E. 2,700,000. | C) L.E. 3,600,000 | D) L.E. 1,200,000 |
|--------------------------|---------------------------|--------------------------|---------------------------|

Answer

CM ratio = sales ratio – Variable cost ratio

CM ratio= 100%- 75% = 25%

Break even point (Value) =	Fixed cost
	CM Ratio

= $\frac{\text{L.E. 900,000}}{25\%}$ = L.E 3600,000

6.Ahmed Company sells product (A) for L.E. 60 each. Variable costs are L.E. 40 per unit, and fixed costs total L.E. 120,000. How many product (A) must Company sell to earn net income of L.E. 280,000?

a) 20000	b) 7000	C) 5000	D) 6000
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Answer

$$\text{Sales to achieve target income} = \frac{\text{Fixed costs} + \text{Target income}}{\text{Selling price} - \text{V.C/unit}}$$

$$\text{BEP} = \frac{120,000 + 280,000}{60 - 40} = 20000 \text{ units}$$

7.If the Compony has actual sales of L.E. 800,000 and a break-even point of L.E. 520,000. How much is its margin of safety ratio?

a) 35 %	b) 46 %	C) 54 %	D) 65 %
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Answer

Margin of safety ratio	=	$\frac{\text{Actual sales - BEP}}{\text{Actual sales}}$
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Margin of safety ratio	=	$\frac{800,000 - 520,000}{800,000}$	=35%
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Thank You

