

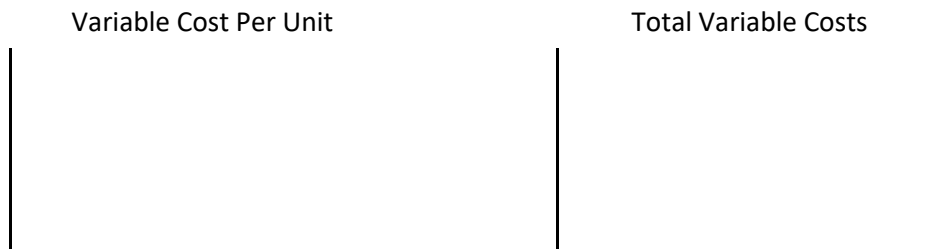
ACCT 102 - Chapter 18

Cost Behavior and Cost-Volume-Profit Relationships

The concepts in this chapter are extremely important as an understanding of these concepts is pivotal to your success in future chapters. We need to understand how costs behave to assist in many different accounting and business decisions. It is very important to understand the behavior and relationship between the different costs and the behavior and relationship between the costs and revenue. Do not memorize, understand the meaning of the costs and what they are revealing about the financial position of the company.

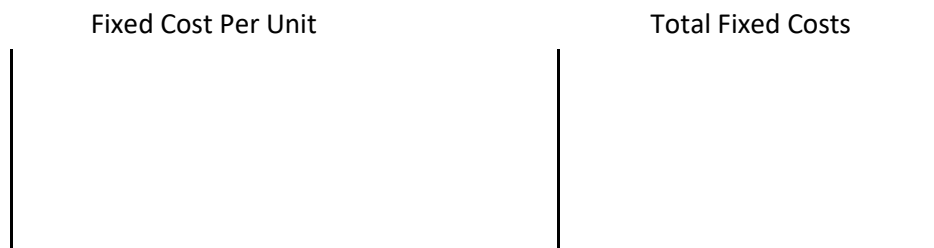
I. Define and classify costs by type:

- A. Variable costs – costs that vary in proportion to changes in the level of activity. The variable cost per unit remains constant; total variable costs increase and decrease proportionately with the activity level.



EX: When Annette Chorde manufactures her tennis court nets, the materials cost of each net is \$25. What is the total materials cost if she produces 2,000 nets? 5,000 nets? 11,250 nets?

- B. Fixed costs – costs that remain the same in total dollar value even as the level of activity changes. The total amount of fixed costs remains constant; however, the fixed cost per unit increases and decreases inversely with the activity level.



EX: Annette Chorde pays \$2,500 in rent per month. What is the rent cost per unit if she produces 2,000 nets? 5,000 nets? 11,250 nets?

C. Mixed costs – have characteristics of both variable and fixed costs.

Mixed Costs



EX: Annette Chorde leases her sewing machine. She pays \$250 per month plus \$3.25 for every hour the machine is used per month. What is the total mixed cost for the machine lease if she uses the machine 180 hours? 210 hours? 320 hours?

D. Step Wise – costs are fixed for a certain range then increase in intervals

Step Wise



- II. Take mixed costs and break them out into components that can be used in a mathematical analysis. (High Low Method)

High-Low Method – a cost estimation technique that is used to separate mixed costs into their variable and fixed components.

EX: Annette Chorde incurred the following costs during a five-month period:

	<u>Production</u>	<u>Total Cost</u>
June	1,010	\$ 55,250
July	920	53,000
August	1,295	62,375
September	1,400	65,000
October	2,200	85,000

	<u>Production</u>	<u>Total Cost</u>
Highest Level		
Lowest Level		
Difference		

Since the total fixed cost does not change with changes in volume of production, the difference in the total cost is the change in total variable cost.

$$\text{Variable Cost per unit} = \frac{\text{Difference in Total Cost}}{\text{Difference in Production}}$$

$$\text{Total Cost} = (\text{Variable Cost per unit} \times \text{Units of Production}) + \text{Fixed costs}$$

Understand and explain how costs behave when activities change. You need to understand this from a cognitive aspect, as well as from a mathematical and graphical perspective.

- III. Understand the concept of and compute a Contribution Margin (in dollars, as a percentage or ratio) and on a per unit basis

Annette Chorde's Income Statement for October in Contribution Margin format (2,200 units):

	Total	Per Unit
Sales	\$ 110,000	
Variable Costs	<u>63,800</u>	
Contribution Margin	46,200	
Fixed Costs	<u>33,600</u>	
Income from Operations	12,600	

Cost-Volume-Profit – the systematic examination of the relationships among selling prices, sales and production volume, costs, expenses, and profits.

Contribution Margin – the excess of sales revenue over variable costs. (**Sales – Variable Costs**)
It is the amount of the sales that goes towards covering the fixed costs. Once fixed costs are covered, for any additional units sold, the CM/unit is a direct increase to the net income.

EX: Annette Chorde has sales for October of \$110,000, what is the contribution margin?

Contribution Margin Ratio – the percentage of each sales dollar available to cover the fixed costs and provide income from operations. (**Contribution Margin/Sales**)

It measures the effect of an increase or a decrease in sales volume on income from operations.

EX: What is the contribution margin ratio for Annette Chorde?

EX: If sales increase by \$40,000, by how much will Income from Operations increase?

Unit Contribution Margin: Sales price per unit – variable cost per unit.

Be able to apply “what if” scenarios using the contribution margin. We will work many exercises from the book and from the outline to illustrate.

IV. Calculate the break even point as well as “target profit” amounts.

Break-Even Point – the level of operations at which a business’s revenues = expenses. At the break-even point, the company will have neither a Net Income nor Net Loss. The break-even point is useful in business planning, especially when expanding or reducing operations.

$$\text{Break-even sales (units)} = \text{Fixed Costs} / \text{Unit Contribution Margin}$$

Proof:

Sales
Variable Costs
Contribution Margin
Fixed Costs
Income from Operations

The break-even point is affected by changes in the fixed costs, unit variable costs, and the unit selling price.

Fixed Costs: If: Fixed Costs ↑ then Break-even point ↑
 If: Fixed Costs ↓ then Break-even point ↓

EX: What is the break-even point in units if fixed costs increase by \$14,700?

EX: What is the break-even point in units if fixed costs decrease by \$6,300?

Unit Variable Costs: If: Unit Variable Costs ↑ then Break-even point ↑
 If: Unit Variable Costs ↓ then Break-even point ↓

EX: What is the break-even point if materials cost increase to \$33 per net?

EX: What is the break-even point if materials cost decrease to \$26 per net?

Unit Selling Price: If: Unit Selling Price ↑ then Break-even point ↓
 If: Unit Selling Price ↓ then Break-even point ↑

EX: What is the break-even point if the sales price increases to \$54 per net?

EX: What is the break-even point if the sales price decreases to \$47 per net?

Target Profit – at break-even, revenue and expenses are equal, however, that is not the goal of business. The goal is to make a profit. Using the break-even analysis, we can determine the number of units that need to be sold in order to earn a target profit.

$$\text{Sales (in units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

EX: Annette Chorde has set a target profit for the month of October of \$21,000. How many tennis court nets does she need to sell to earn her target profit?

- VI. Be able to understand how “sales mix” affects breakeven points and be able to calculate a simple BE point using a variety of mixes

Sales Mix – the relative distribution of sales among the various products sold by a business. Most businesses sell more than one product and each different product has its own sales price, costs and sales volume and, therefore, makes a different contribution to profits.

EX: Annette Chorde had such success with her tennis court nets that she started making pickle ball nets as well. The pickle ball nets sell for \$30 and the material costs are \$16 per unit. The nets sell at a ratio of 6 tennis court nets to 4 pickle ball nets. Fixed costs are \$35,490.

Product	Unit Selling Price	Unit Variable Cost	Unit Contribution Margin
Tennis Court	\$ 50	\$ 29	\$ 21
Pickle Ball	30	16	14

To apply multi-product CVP analysis, estimate break-even point by using a composite unit, which consists of a specific number of units of each product in proportion to the expected sales mix.

ACCT 102 – Cost-Volume-Profit

Cerritos Deli sells a combination sandwich in only one length – five feet. The sandwich is very popular amongst college students. The ingredients are simple: bologna, ham, turkey, roast beef, and cheese. Information from the most recent month of operations is below:

February 2025

Sales (300 sandwiches)		\$6,000.00
Variable Expenses:		
Bread	\$ 660.00	
Cold cuts & cheese	1,590.00	
Wages	600.00	
Supplies	<u>540.00</u>	<u>3,390.00</u>
Contribution Margin		2,610.00
Fixed Expenses:		
Rent	\$1,800.00	
Insurance	290.00	
Advertising	<u>155.00</u>	<u>2,245.00</u>
Net Income		\$ 365.00

Each of the following questions should be considered independent of the others. Go back to the original data given above for each question.

1. What is the contribution margin ratio?
2. What is the unit contribution margin?
3. How many sandwiches must Cerritos Deli sell to break even?
4. If sales volume increases by 4%. By how much will net income increase?

5. The owner of Cerritos Deli is thinking of increasing the sales price per sandwich by 3%, by what percentage will net income increase?

6. The owners of the deli are thinking of putting a coupon in the local newspaper next month for \$2 off the regular price of the sandwich. The ad in the paper will increase advertising cost by \$30. If the ad is placed, how many sandwiches will Cerritos Deli need to sell to break even?

7. The cold cut supplier for the deli informed the owners of a new, cheaper substitute for bologna. The price of the cold cuts will decrease by \$0.55. Unfortunately, the owners anticipate that sales of the sandwich might suffer. They anticipate that the total number of sandwiches sold will decrease to 270 per month. Should the owners choose to use the cheaper bologna?

8. The deli wants to have a net income before tax of \$750. How many sandwiches will they need to sell?

9. The landlord just notified Cerritos Deli that their rent per month will increase to \$1,900 per month effective March 1. And, due to an increase in student fees, we gave our employees (who are all students at Cerritos College) a raise, so our wages will now be \$800 per month. What is the new break-even point?

Dimples Enterprises sells golf balls. Consider each of the following exercises independently.

Selling price per unit	\$25
Variable costs per unit	16
Total Fixed Costs	\$42,750

- a. Compute the break even in terms of units.

- b. Compute the break even in terms of sales dollars?

- c. If variable costs per unit increase by 25% and total fixed costs decrease by 20%, how many golf balls does Dimples need to sell to break even?

- d. If Dimples wants to earn a net income of \$50,400 before tax, how many golf balls must be sold?

- e. Assume Dimples can sell 10,000 golf balls. What price per unit must Dimples charge in order to earn a net income of \$59,750?

Multi-Product, Inc. has the following information about its three products:

	Product A	Product B	Product C
Sales price per unit	\$40	\$150	\$10
Variable Cost per unit	22	105	3
Number of units sold last year	20,000	30,000	10,000

Bailey Co. currently has only one store. The firm is considering opening a second store which will cost an additional \$10,000 of fixed costs per year while providing additional sales revenue of \$75,000 per year. Variable expenses are currently 60% of sales; this percentage will not change if the new store is opened. By how much will net income increase if the new store is opened?

Fox sells a single product for \$40 per unit. Fixed costs were \$160,000 and variable costs equal 75% of revenue. If fixed costs increase by \$10,000, Fox will have to increase sales by how many units just to earn profits equal to those before costs increased?

Margin of Safety

Polly Ester Manufacturing makes a duffle bag that currently sells for \$60 each. The variable costs to make this product are \$42 per unit. Fixed cost total \$81,000 per year.

1. How many units must be sold to break even?
2. What will be the company's sales revenue at the break-even point?
3. Assume that the company's current sales are \$360,000 (6,000 units) per year. Calculate the company's margin of safety
 - a. in dollars
 - b. in units
 - c. as a percentage

Understand and calculate the operating leverage and margin of safety

Margin of Safety – indicates the possible decrease in sales that may occur before an operating loss results.

$$\text{Margin of Safety} = \frac{\text{Expected Sales} - \text{Break-even sales}}{\text{Expected Sales}}$$