

I. OVERVIEW

- A. The managerial accountant uses analytical tools to advise line managers in decision making functions. C-V-P (CVP) analysis provides an analytical process to focus on the two purposes for managerial accounting systems:
 - 1. Decision making for planning and control and
 - 2. Product costing for inventory valuation and income determination

- B. CVP analysis works by focusing on the relationship between fixed costs, variable costs and net income;

II. Assumptions Underlying CVP Analysis

- 1. cost behavior is linear; (usually true in the relevant range);
- 2. costs are either fixed or variable; (not always true, even in the relevant range);
- 3. Fixed Costs are constant in relevant range; (usually true);
- 4. Sales Price is fixed in relevant range; OK
- 5. Cost relationships are constant in relevant range; ok
- 6. Relates to one product only or constant sales mix; ok
- 7. Beginning of Year (BOY) inventory = Endo of Year (EOY) inventory; (this is not usually true in the real world, but it is an assumption (limitation) of the CVP model)

III. Importance of CVP Analysis:

- A. Because variable expense can usually be traced directly to their projects or departments, they provide a valuable method of evaluating performance. If we assume that fixed cost are indeed fixed over the short term (and therefore not a "relevant cost" we can look at sales revenue less the variable cost and determine the contribution of each product to profit

VC	=	Variable Costs: constant per unit but change in direct proportion to a change in activity
FC	=	Fixed Costs: variable on a per unit basis but remain constant over time, within the relevant range of activity
CM	=	Contribution Margin: The amount that each unit contributes to profit
CMR	=	Contribution Margin Ratio
VCR	=	Variable Cost Ratio

IV. CVP is sometimes referred to as BREAKEVEN ANALYSIS

- A. The Following relationships exist:

- 1. CM = Contribution Margin
= Sales in \$ - (VC)
= FC + NI

- 2. UCM = Unit Contribution Margin
= $\frac{FC + NI}{\text{Unit Sales}}$

- 3. VCR = VC/SALES IN \$
= 1-CMR

- 4. CMR = Contribution Margin Ratio
= CM/SALES IN \$
= $\frac{FC + NI}{\$ \text{ Sales}}$
= 1-VCR

Students should memorize these relationships because they are fundamental to decision making.

B. Breakeven point: level of sales (measured in either units or dollars) where total revenue = total expenses

1. **Basic equation:** Sales = VC + FC + NI
= (SP)(X) + (VC)(X) + FE + NI where X = # units

2. **Sales in Units** = $\frac{FC + \text{Desired NI}}{UCM}$

3. **Sales in \$** = $\frac{FC + \text{Desired NI}}{CMR}$

NOTE: These two equations are short-cut approaches; the basic equation always works but may be more cumbersome;

C. CVP and taxation

1. Because taxation is based on a % of income before tax, computations must be modified if aftertax NI is desired;

a. in all computations substitute the following when computing desired NI:

$$NI = \frac{\text{Target after-tax income}}{1 - \text{tax rate}}$$

III VARIABLE AND ABSORPTION COSTING

A. Variable Costing (the contribution approach to income statements)

1. Segregates Variable and Fixed costs to concentrate on contribution margin:

Sales.....		\$ 950,000
Less variable expenses:		
Variable Manufacturing Costs.....	\$ 250,000	
Variable Selling Costs.....	150,000	
Variable Administrative Costs....	50,000	<u>450,000</u>
Contribution Margin.....		\$ 500,000
Less Fixed Expenses:		
Fixed Manufacturing Costs.....	\$ 200,000	
Fixed Selling.....	75,000	
Fixed Administrative Costs.....	75,000	<u>\$ 350,000</u>
Net income.....		<u>\$ 150,000</u>

S = VC + FC + NI

This is the Behavioral Costing Income Statement

2. Reasons for variable costing (contribution approach income statements)

- a. Stresses the fixed costs (which must be covered in order to earn net income);
- b. Helps management focus on cost behaviors which in turn should improve managerial control and decision making;
- c. Enables management to easily determine the CMR of each product and thereby stress the more profitable products and/or determine the most profitable product mixes;
- d. Determination of the contribution margin is critical in the production decision; for example, assume a manufacturing company has excess capacity and produces a product with the following cost structure:

Sales price.....	\$ 10
Fixed costs (unit).....	3
Variable cost (unit).....	<u>4</u>
Profit (unit).....	3

The plant manager knows that the CM is \$6/unit (\$10 - \$4). If the plant receives an order for the product at a sales price of \$5 (instead of \$10/unit) the order should be accepted and production increased to meet the demand. This is because the \$5 sales price covers the variable costs of production and provides a \$1 contribution towards fixed cost and net income.

B. Absorption Costing

1. Each unit of production "absorbs" some FC

Sales.....	\$ 950,000
less: COGS (including FC).....	400,000
Gross Profit on Sales.....	\$ 550,000
Less: S & A expenses.....	350,000
Net income	\$ 200,000

$$S = \text{COGS} + \text{S\&A Expense} + \text{NI}$$

This is the Absorption Costing
Income Statement

C. NI and choice of Costing Method

1. The difference in net income of \$50,000 (\$200,000 - \$150,000) is due to the amount of FC retained in inventory under absorption costing.

It must be noted that absorption costing treats fixed cost as a product cost whereas variable costing treats FC as a period cost; the result is that absorption costing income is higher than variable costing income if inventory volume has increased because the fixed costs associated with that inventory are not charged against income until the inventory is sold to outsiders;

IV REVIEW PROBLEMS

1. If fixed costs are \$800 and the breakeven point in dollars is \$2,400 (desired net income is zero), what volume of sales in dollars must be achieved to earn a profit of \$100?

Sales volume = \$2,700

2. When the Bailey Co. has sales of \$10,300, there is a net profit of \$520; when sales are \$14,500 profit is \$1,360. What is the Bailey Company's breakeven point in dollars?

BEP = \$7,700

3. Suppose Teapots have a UCM of \$1.25 and a breakeven point of 176,000 units (with zero net income). If the desired net income is \$78,000, what number of teapots must be sold?

238,400 units

4. Suppose the variable cost ration (VCR) is .70 and the income is \$57,000 when sales are \$378,000. What is the breakeven point in dollars?

\$188,000

5. Suppose Niner's breakeven point is \$96,000. What profit can the company expect from sales of \$150,000 when sales of 124,000 yields a profit of \$7,000?

\$13,500

6. Your company asks you to predict the breakeven point for sales of product X in March. Your investigation reveals that the breakeven point in January is 2000 units and produced sales revenues of \$48,000. The breakeven point in February was 3,400 units and produced \$61,200 of sales revenue. If management has decided on a sales price of \$22 per unit in March, what is the breakeven point in both \$ and units?

2,318 units; \$50,996

V. REVIEW QUESTIONS

1. CVP analysis usually assumes changing variable costs per unit and unchanging total fixed costs within the relevant range. T F
2. Breakeven analysis is typically based on the assumption that the efficiency and productivity of operations are not affected by changes in the level or volume of activity. T F
3. CVP analysis usually assumes constant unit selling prices at various activity volumes. T F
4. Total gross margin minus total variable expenses is equal to net income. T F
5. In the computation of the breakeven point, the necessary data include both the total fixed costs and the income tax rate. T F
6. In the computation of the breakeven point, the necessary data include both the contribution margin and the income tax rate. T F
7. Wall Company reported for a certain period sales \$400,000, variable costs \$80,000, and fixed costs \$240,000. The contribution margin ratio is 20%. T F
8. Frane Company's income statement showed sales of \$600,000, fixed expenses \$200,000, and variable expenses \$360,000. Breakeven sales would be \$500,000. T F
9. Lark Company sold in one month 2,000 units of a uniform product for \$300,000. Variable expenses were \$100,000, and fixed expenses were \$220,000. The breakeven point is 2,200 units. T F
10. For a merchandising company, the gross margin would always be equal to or larger than the contribution margin. T F
11. CVP analysis usually assumes at various activity levels:
 - (1) constant contribution-margin ratios
 - (2) unchanging total fixed costs
 - (3) both of the above
 - (4) none of the above
12. The several assumptions that underlie the typical cost-volume-profit graphs include:
 - (1) constant efficiency and productivity
 - (2) a constant sales mix
 - (3) both of the above
 - (4) neither of the above
13. The breakeven point would tend to be decreased by:
 - (1) an increase in total fixed costs
 - (2) a decrease in the contribution-margin ratio
 - (3) either of these
 - (4) neither of these
14. The breakeven point would tend to be decreased by:
 - (1) an increase in the variable-cost ratio
 - (2) an increase in total fixed costs
 - (3) either of the above
 - (4) neither of the above

15. The traditional approach to the income statement makes a primary classification of expenses according to:

- (1) management functions of the business
- (2) cost behavior patterns
- (3) relative sizes of the expenses
- (4) some other basis

16. Contribution margin is equal to sales minus:

- (1) all manufacturing costs of goods sold
- (2) all variable selling and administrative expenses
- (3) variable manufacturing cost of goods sold
- (4) some other answer

17. Given for Drone Corp.: variable expenses \$60,000, fixed expenses \$133,000, sales \$200,000. How much must sales be to obtain a pre-tax net income of \$14,000?

- (1) \$210,000
- (2) \$207,000
- (3) \$190,000
- (4) \$193,000

18. For a certain month, a company reported \$45,000 of sales, \$18,000 of variable expenses, and \$24,000 of fixed expenses. What is the breakeven sales per month?

- (1) \$43,200
- (2) \$40,000
- (3) \$60,000
- (4) none of the above

19. If the level of activity volume rises from a point within the relevant range to a point above the upper boundary of the relevant range:

- (1) variable costs per unit would probably change
- (2) total fixed costs would probably increase
- (3) both of the above results would probably occur
- (4) neither of the above results would probably occur

20. If the level of activity volume falls from a point within the relevant range to a point below the lower boundary of the relevant range:

- (1) total fixed costs would probably decrease
- (2) variable costs per unit would probably change
- (3) both of the above results would probably take place
- (4) neither of the above results would probably take place

21. Given:

	Case A	Case B
Total variable expenses	\$ 24,000	\$ 33,600
Total fixed expenses	33,600	20,000
Sales	60,000	56,000

- (a) Breakeven sales
- (b) Sales that would produce a \$12,000 profit before income taxes, assuming no change in selling prices.
- (c) Sales that would provide a profit of 10% of sales before income taxes, assuming no change in selling prices.
- (d) Breakeven sales if total fixed expenses are increased by \$7,200 and the selling price is increased by 25% per unit.

Note: Assume no change in the ratio of variable expenses to the number of product units produced and sold.

- 1. F
- 2. T
- 3. T
- 4. F
- 5. F
- 6. F
- 7. T
- 8. F
- 9. T
- 10. F
- 11. (3)
- 12. (3)
- 13. (4)
- 14. (4)
- 15. (1)
- 16. (4)
- 17. (1)
- 18. (2)
- 19. (3)
- 20. (3)
- 21.

	<u>Case A</u>	<u>Case B</u>
A.	\$56,000	\$50,000
B.	\$76,000	\$80,000
C.	\$67,200	\$66,667
D.	\$48,000	\$41,846