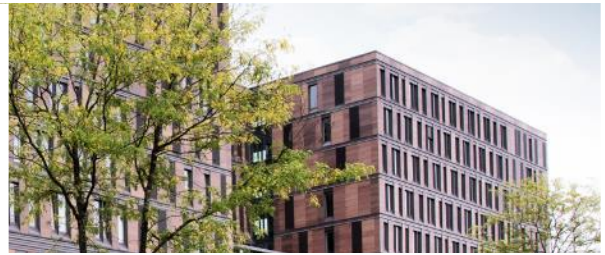
Frankfurt School of Finance & Management

German Excellence. Global Relevance.

Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



AACSB ACCREDITED

EFMD EQUIS ACCREDITED

SESSION 3

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-23

- University Pizza delivers to dorms and apartments.
- Annual fixed costs are $54,000, the selling price is $10 per pizza.
- Variable costs are $6 per pizza (production and delivery).

1. Using unit contribution margin, what is B/E in units?
2. What is the contribution margin ratio?
3. Using contribution margin ratio, B/E in sales $?
4. How many pizzas to sell to earn a net profit of $60,000?

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-23

1. Using unit contribution margin, what is B/E in units?

$$\text{Break-even point (in units)} = \frac{\text{fixed expenses}}{\text{unit contribution margin}}$$

$$= \frac{\$54{,}000}{\$10 - \$6} = 13{,}500 \text{ pizzas}$$

2. What is the contribution margin ratio?

$$\text{Contribution-margin ratio} = \frac{\text{unit contribution margin}}{\text{unit sales price}}$$

$$= \frac{\$10 - \$6}{\$10} = .4$$

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-23

3. Using contribution margin ratio, B/E in sales $?

$$\text{Break-even point (in sales dollars)} = \frac{\text{fixed expenses}}{\text{contribution-margin ratio}}$$

$$= \frac{\$54{,}000}{.4} = \$135{,}000$$

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-23

4. How many pizzas to sell to earn a net profit of $60,000?

Let *X* denote the sales volume of pizzas required to earn a target net profit of $60,000.

$$\$10X - \$6X - \$54{,}000 = \$60{,}000$$

$$\$4X = \$114{,}000$$

$$X = 28{,}500 \text{ pizzas}$$

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-30

- Brad's Bicycle Shop sells two types of speed bikes – high quality & medium quality.
- 70% of the sales are medium quality bikes, fixed costs are $148,500 per year.

Product Type	Sales Price	Invoice Cost	Sales Commission
High	1,000	550	50
Medium	600	270	30

1. Compute unit contribution margin for each product.
2. What is the sales mix?
3. Compute the weighted average contribution margin.
4. What is B/E point in units?
5. How many bikes of each kind must be sold to achieve target profit of $99,000?

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-30

1.

Bicycle Type	Sales Price	Unit Variable Cost	Unit Contribution Margin
High-quality	$1,000	$600 ($550 + $50)	$400
Medium-quality	600	300 ($270 + $30)	300

2. Sales mix:

High-quality bicycles	30%
Medium-quality bicycles	70%

3. Weighted-average unit contribution margin = ($400 × 30%) + ($300 × 70%)
= $330

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E7-30

4. $$\text{Break-even point (in units)} = \frac{\text{fixed expenses}}{\text{weighted-average unit contribution margin}}$$

$$= \frac{\$148{,}500}{\$330} = 450 \text{ bicycles}$$

Bicycle Type	Break-Even Sales Volume	Sales Price	Sales Revenue
High-quality bicycles	135 (450 × .30)	$1,000	$135,000
Medium-quality bicycles	315 (450 × .70)	600	189,000
Total			$324,000

5. Target net income:

$$\text{Sales volume required to earn target net income of \$99,000} = \frac{\$148{,}500 + \$99{,}000}{\$330}$$

$$= 750 \text{ bicycles}$$

This means that the shop will need to sell the following volume of each type of bicycle to earn the target net income:

High-quality	225 (750 × .30)
Medium-quality	525 (750 × .70)

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

CASE 7-55

- Current situation vs. new option:

Independent Sales Agents	Own Sales Personnel
• Currently receive a commission of 20% of sales • Demand an increase to 25%	• 3 individuals required (annual salary of $45,000 each) • Plus commissions of 5% of sales • 2 sales managers at fixed annual salaries of $120,000 each

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

CASE 7-55 (CONT'D)

- Budgeted income statement reflects independent sales agents (20%)
- Assume COGS 100% variable
- All income statement fixed costs and the variable cost percentages would remain the same under each scenario

LAKE CHAMPLAIN SPORTING GOODS COMPANY
Budgeted Income Statement
For the Year Ended December 31, 20x4

Sales		$15,000,000
Cost of goods sold		9,000,000
Gross margin		$ 6,000,000
Selling and administrative expenses:		
Commissions	$3,000,000	
All other expenses (fixed)	150,000	3,150,000
Income before taxes		$ 2,850,000
Income tax (30%)		855,000
Net Income		$ 1,995,000

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CASE 7-55 (CONT'D)

1. Estimate B/E point in sales $ based on IS for both scenarios:
   - independent sales agents, 20% commission
   - own sales personnel
2. Compute estimated $ sales volume that yields the same net income if sales commission rises to 25%
3. Compute estimated $ sales volume that would yield an identical net income under both scenarios (25% commission vs. own sales personnel)

CVP ANALYSIS

CASE 7-55 (CONT'D)

1. Estimate B/E point in sales $ based on IS for both scenarios:
   - a) independent sales agents, 20% commission
     - Break-even Point (in sales of $) = Fixed Costs / Contribution Margin Ratio
     - Contribution Margin Ratio = ($15,000,000 - $9,000,000 - $3,000,000)/ $15,000,000 = 0.20
     - Break-Even Point = $150,000 / .20 = $750,000

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

CASE 7-55 (CONT'D)

1. b) own sales personnel

   - 3 individuals required (annual salary of $45,000 each) plus commissions of 5% of sales; 2 sales managers at fixed annual salaries of $120,000 each
   - New fixed costs = previous FC+ salaries of own sales personnel

     New fixed costs = 150,000+3*45,000+2*120,000 = $525,000

     New VC = 9,000,000+5%*15,000,000 = $9,750,000

     New CM ratio = (Sales-VC) / Sales=[15,000,000-9,750,000] / 15,000,000 = 35%

   - New Break-Even Point (in sales of $)= $525,000 / 35% = $1,500,000

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CASE 7-55 (CONT'D)

2. Compute estimated $ sales volume that yields the same net income if sales commission rises to 25%

- Sales Required for Target Profit = (FC+Target Profit) / CM Ratio
- Target Profit: 2,850,000
- New CM = Sales Revenue - COGS - New Commission (25% of Sales) = 15,000,000 - 9,000,000 - 3,750,000 = 2,250,000
- New CM Ratio = CM / Sales = 2,250,000 / 15,000,000 = 15%
- Sales Required for Target Profit = (150,000 + 2,850,000) / 15% = $20,000,000

CASE 7-55 (CONT'D)

3. Compute estimated $ sales volume that would yield an identical net income under both scenarios (25% commission vs. own sales personnel)

- 25% commission: CM ratio 0.15, FC 150,000
- Own agents: CM ratio 0.35, FC 525,000
- 0.15x - 150,000 = 0.35x - 525,000
- x = $1,875,000

CVP ANALYSIS

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P7-46

- Saturn Game manufactures computer games. They sold 25,000 units at $50 each last year. Total costs were $1,050,000 of which $300,000 were fixed.
- Saturn Game is considering changing one part from a $5 item to a $9 item to improve quality. This will require a new machine costing $36,000 with a 6-year life. They use straight line (S/L) depreciation methods.

1. Which was the break-even (B/E) point in units last year?
2. How many units were required last year to earn $280,000?
3. Which is the B/E point in current year with new item used in production but no sales price increase?
4. Same facts as #3 with target income of $200,000 (last year)?
5. What would be the new selling price to maintain last year's CM ratio with new costs?

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP-ANALYSE

P7-46

1. $$\text{Unit contribution margin} = \frac{\$1{,}250{,}000 - \$750{,}000}{25{,}000 \text{ units}}$$

$$= \$20 \text{ per unit}$$

$$\text{Break-even point (in units)} = \frac{\text{fixed costs}}{\text{unit contribution margin}}$$

$$= \frac{\$300{,}000}{\$20} = 15{,}000 \text{ units}$$

2. $$\text{Number of sales units required to earn target net profit} = \frac{\text{fixed costs} + \text{target net profit}}{\text{unit contribution margin}}$$

$$= \frac{\$300{,}000 + \$280{,}000}{\$20} = 29{,}000 \text{ units}$$

CVP-ANALYSE

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P7-46

3. $$\text{New break-even point (in units)} = \frac{\text{new fixed costs}}{\text{new unit contribution margin}}$$

$$= \frac{\$300{,}000 + (\$36{,}000/6)^{*}}{\$20 - \$4^{\dagger}} = 19{,}125 \text{ units}$$

*Annual straight-line depreciation on new machine

†$4.00 = $9.00 – $5.00 *increase* in the unit cost of the new part

4. Number of sales units required to earn target net profit, given manufacturing changes

$$= \frac{\text{new fixed costs} + \text{target net profit}}{\text{new unit contribution margin}}$$

$$= \frac{\$306{,}000 + \$200{,}000^{*}}{\$16}$$

$$= 31{,}625 \text{ units}$$

*Last year's profit: ($50)(25,000) – $1,050,000 = $200,000

AACSB ACCREDITED EFMD EQUIS ACCREDITED

CVP-ANALYSE

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P7-46

5.

- Original variable cost was 60% of selling price
  - (Price = $50, VC = $750,000/25,000 units = $30 → 30/50 = 60%)

- In order to maintain the CM ratio, new variable cost must also be 60% of selling price
  - New variable cost is $34.00 ($4 increase)
  - ➢ Price to maintain CM ratio: $34.00 /60% = $56.67

AACSB ACCREDITED EFMD EQUIS ACCREDITED

P7-46

5. alternative approach

– Let *P* denote the price required to cover increased direct-material cost and maintain the same contribution-margin ratio

$$\frac{P - \$30 - \$4}{P} = .40$$

$$P - \$34 = .40P$$

$$.60P = \$34$$

$$P = \$56.67 \text{ (rounded)}$$

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E8-23

- Sea Star Company manufactures diving masks with a variable cost of $12.50. The masks sell for $17.00. Budgeted fixed manufacturing overhead for the most recent year was $396,000. Actual production was equal to planned production.

- Under each of the following conditions, state
  1. whether operating income is higher under variable or absorption costing and
  2. the amount of the difference in reporting operating income under the two methods.
- Treat each condition as an independent case.

AACSB ACCREDITED EFMD EQUIS ACCREDITED

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E8-23

1.	Production	110,000 units
	Sales	107,000 units
2.	Production	88,000 units
	Sales	93,000 units
3.	Production	80,100 units
	Sales	80,100 units

AACSB ACCREDITED EFMD EQUIS ACCREDITED

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

E8-23

1. Inventory increases by 3,000 units → operating income higher under absorption costing.
   Fixed overhead rate per unit = $396,000 / 110,000 = $3.60
   Difference in reported OI = $3.60 x 3,000 = $10,800

2. Inventory decreases by 5,000 units → operating income higher under variable costing.
   Fixed overhead rate per unit = $396,000 / 88,000 = $4.50
   Difference in reported OI = $4.50 x 5,000 = $22,500

3. Inventory remains unchanged, so there is no difference in reported operating income

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P8-38

1. Great Outdoze, Inc. manufactures high-quality sleeping bags, which sell for $130 each. We have the following information:

Direct Material (per sleeping bag)	$ 40
Direct Labor (per sleeping bag)	$ 22
Variable MOH (per sleeping bag)	$ 16
Budgeted fixed MOH	$ 400,000
Production (actual & budgeted)	25,000
Sales	22,000
Variable S&A (per sleeping bag)	$ 2
Fixed S&A	$ 60,000

AACSB ACCREDITED EFMD EQUIS ACCREDITED

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P8-38

1. Compute product costs per sleeping bag under
   a) Absorption costing
   b) Variable costing
2. Prepare operating income statements for the year using
   a) Absorption costing
   b) Variable costing
3. Reconcile the operating income reported under the two methods using the shortcut method.

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P8-38

1. Compute product costs per sleeping bag under

	(a) Absorption Costing	(b) Variable Costing
Direct material	$40	$40
Direct labor	22	22
Manufacturing overhead		
Variable	16	16
Fixed ($400,000 ÷ 25,000)	16	
Total absorption cost per unit	$94	
Total variable cost per unit		$78

AACSB ACCREDITED EFMD EQUIS ACCREDITED

INVENTORY COSTING

P8-38

2. Prepare operating income statements for the year

A. GREAT OUTDOZE, INC. OPERATING INCOME STATEMENT FOR THE YEAR ENDED DECEMBER 31, 20X4 **ABSORPTION COSTING**	
Sales revenue (at $130 per unit)	$2,860,000
Less: Cost of goods sold (at absorption cost of $94 per unit)	2,068,000
Gross margin	$ 792,000
Less: Selling and administrative expenses:	
Variable (at $2 per unit)	44,000
Fixed	60,000
Operating income	$ 688,000

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P8-38

2. Prepare operating income statements for the year

B. GREAT OUTDOZE, INC. OPERATING INCOME STATEMENT FOR THE YEAR ENDED DECEMBER 31, 20X4 VARIABLE COSTING	
Sales revenue (at $130 per unit)	$2,860,000
Less: Variable expenses:	
Variable manufacturing costs ($78 per unit)	1,716,000
Variable selling & administrative costs ($2 per unit)	44,000
Contribution margin	$1,100,000
Less: Fixed expenses:	
Fixed manufacturing overhead	400,000
Fixed selling and administrative costs	60,000
Operating income	$ 640,000

AACSB ACCREDITED EFMD EQUIS ACCREDITED

INVENTORY COSTING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P8-38

3. Reconcile the operating income reported under the two methods using the shortcut method.

Change in inventory (in units)	×	predetermined fixed overhead rate	=	absorption-costing income minus variable-costing income
3,000 unit increase	×	$16	=	$48,000

AACSB ACCREDITED EFMD EQUIS ACCREDITED

SESSION 4

P14-58

- Oceana Co. sells 3 products, manufactured in 4 departments.
- Machine and labor skills are specialized, hence cannot be switched from one department to another.
- Inventory remains constant, price and cost data as follows:

	Product		
	M50	T79	B81
Unit costs:			
Direct material	$ 28	$ 52	$ 68
Direct labor:			
Department 1	48	24	48
Department 2	84	56	56
Department 3	$ 96	—	$ 64
Department 4	36	$ 72	36
Variable overhead	108	80	100
Fixed overhead	60	40	128
Variable selling expenses	12	8	16
Unit selling price	784	492	668

P14-58

EXPECTED SALES DEMAND

Product	Monthly Unit Sales
M50	500
T79	400
B81	1,000

EXPECTED CAPACITY

	Department			
Monthly Capacity Availability	1	2	3	4
Normal machine capacity in machine hours	3,500	3,500	3,000	3,500
Capacity of machines being repaired in machine hours	(500)	(400)	(300)	(200)
Available machine capacity in machine hours	3,000	3,100	2,700	3,300
Available labor in direct-labor hours	3,700	4,500	2,750	2,600

P14-58

- Requirements per product:

Labor and Machine Specifications per Unit of Product

Product	Labor and Machine Time				
M50	Direct-labor hours	2	3	3	1
	Machine hours	1	1	2	2
T79	Direct-labor hours	1	2	—	2
	Machine hours	1	1	—	2
B81	Direct-labor hours	2	2	2	1
	Machine hours	2	2	1	1

1. Calculate monthly requirement for MH and DLH to determine bottleneck
2. Determine the monthly production schedule that maximizes profit
3. Identify alternatives management might consider to meet the entire demand

P14-58

- Determine bottleneck
  - Machine hour

	Department			
Product	1	2	3	4
M50	500	500	1,000	1,000
T79	400	400	—	800
B81	2,000	2,000	1,000	1,000
Total required	2,900	2,900	2,000	2,800
Total available	3,000	3,100	2,700	3,300
Excess (deficiency)	100	200	700	500

P14-58

- Determine bottleneck
  - DL hour

	Department			
Product	1	2	3	4
M50	1,000	1,500	1,500	500
T79	400	800	—	800
B81	2,000	2,000	2,000	1,000
Total required	3,400	4,300	3,500	2,300
Total available	3,700	4,500	2,750	2,600
Excess (deficiency)	300	200	(750)	300

➢ The scarce resource is direct-labor hours (DLH) in Department 3

P14-58

2. Production schedule
   - Oceana should first produce the product that maximizes contribution margin per unit of the scarce resource (DLH in Dep 3). **M50 and B81 require DLH in Department 3.**

		Product		
		M50	T79	B81
	Sales price	$784	$492	$668
	Variable costs			
	Direct material	$ 28	$ 52	$ 68
	Direct labor	264	152	204
	Variable overhead	108	80	100
	Variable selling	12	8	16
	Total variable costs	$412	$292	$388
	Contribution margin	**$372**	**$200**	**$280**

DECISION MAKING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P14-58

2. Production schedule
   - **Contribution Margin per DLH in Department 3.**

Product	Contribution Margin	Department 3 DLH	CM per DLH
M50	$372	3	$124
B81	280	2	140

   - **How many product can be produced**

	Units	Dep. 3 DLH Required	Balance (DLH)
Maximum DLH available in Dep 3			2,750
Product B81 first	1,000	2,000	750
Product M50 second	250	750	-0-

AACSB ACCREDITED EFMD EQUIS ACCREDITED

P14-58

2. Production schedule

Product	Contribution Margin per Unit	Units Produced	Contribution to Profit
M50	$372	250	$ 93,000
T79	200	400	80,000
B81	280	1,000	280,000
Total contribution margin			$453,000

P14-58

3. To supply the additional quantities of M50 that are required, Oceana should consider:
   - subcontracting the additional units.
   - operating on an overtime basis.
   - acquiring labor from outside the community.

P14-50

Handy Dandy Tools makes electronic tools. They have met all production requirements and still have capacity. Assume endless demand.

- Variable overhead is applied on the basis of direct labor hours
- Fixed overhead is applied on the basis of machine hours.
- If they have excess machine capacity and can add labor as needed how should they devote their excess capacity to maximize profits?

DECISION MAKING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P14-50

	Basic	Deluxe	Pro
Selling price	$116	$130	$160
Direct material	32	40	38
Labor at $20/hour	20	30	40
Variable overhead	16	24	32
Fixed overhead	32	10	30

Facts we can see from above:

- Labor hours are 1 for basic, 1.5 for deluxe and 2 for pro models, respectively
- Variable overhead is 80% of labor costs
- It takes 3.2 times the machine hours to make a basic as it does a deluxe
- It takes 3 times the machine hours to make a pro as it does a deluxe (application of fixed overhead)

P14-50

When there is no limit on production capacity the Pro model should be manufactured since it has the *highest contribution margin per unit*.

	Basic Model	Deluxe Model	Pro Model
Selling price	$116	$130	$160
Direct material	32	40	38
Direct labor	20	30	40
Variable overhead	16	24	32
Total variable cost	$ 68	$ 94	$110
Contribution margin	$ 48	$ 36	$ 50

P14-50

- What should they do if labor time is a limiting factor?

When labor is in short supply the Basic model should be manufactured, since it has the *highest contribution margin per direct-labor hour*.

	Basic Model	Deluxe Model	Pro Model
Contribution margin per unit	$48	$36	$50
Direct-labor hours required	1	1.5	2
Contribution margin per direct-labor hour	$48	$24	$25

DECISION MAKING

Frankfurt School of Finance & Management
German Excellence. Global Relevance.

P14-50

- What if the limiting factor is machine hours?
- → We have to first find a common “denominator” to make the assessment.

	Basic	Deluxe	Pro
CM per unit from above	$48	$36	$50
Relative machine hours	3.2	1.0	3.0
CM per machine hour	$15	$36	$16.67

As Deluxe models generate highest CM per machine hour, produce that model.

AACSB ACCREDITED EFMD EQUIS ACCREDITED