

SOLUTION – EXERCISES SECTION 2

1. TitanTech Ltd. produces high-performance tablets, generally selling from 150,000 to 250,000 units per year. The following cost data apply to the activity levels shown:

| Number of Units | 150,000 | 200,000 | 250,000 |
|---------------------|---------------|---------|---------|
| Total costs | | | |
| Fixed | \$ 12,000,000 | | |
| Variable | 18,000,000 | | |
| Total costs | \$ 30,000,000 | | |
| | | | |
| Cost per Unit | | | |
| Fixed | \$ 80 | | |
| Variable | 120 | | |
| Total cost per unit | \$ 200 | | |

Required:

- 1.) Complete the preceding table by filling the missing amounts for 200,000 and 250,000 units.
- 2.) Assume TitanTech actually produces 230,000 units. What are the total costs and cost per unit at this level of activity?
- 3.) If each tablet is sold for \$240, what is TitanTech's operating leverage at 230,000 units sold?

Feedback:

1.)

| Number of Units | 150,000 | 200,000 | 250,000 |
|---------------------|---------------|------------|------------|
| Total costs | | | |
| Fixed | \$ 12,000,000 | 12,000,000 | 12,000,000 |
| Variable | 18,000,000 | 24,000,000 | 30,000,000 |
| Total costs | \$ 30,000,000 | 36,000,000 | 42,000,000 |
| | | | |
| Cost per Unit | | | |
| Fixed | \$ 80 | 60 | 48 |
| Variable | 120 | 120 | 120 |
| Total cost per unit | \$ 200 | 180 | 168 |

2.) Total cost = \$12,000,000 + (230,000 × \$120) = \$39,600,000

Cost per unit = \$39,600,000 / 230,000 units = \$172.17

3.) Sales = \$240 × 230,000 = \$55,200,000

Contribution margin = \$55,200,000 - (\$120 × 230,000) = \$27,600,000

Net income = \$27,600,000 - \$12,000,000 = \$15,600,000

Operating leverage = \$27,600,000 / \$15,600,000 = 1.77

2. Vega Inc. and Orion Ltd. compete in the same market. The following budgeted income statements illustrate their cost structures.

| | Vega Inc. | Orion Ltd. |
|-----------------------------|---------------|---------------|
| Number of customers | 250 | 250 |
| Sales revenue (250 x \$160) | \$ 40,000 | \$ 40,000 |
| Less variable costs | <u>7,500</u> | <u>22,500</u> |
| Contribution margin | \$ 32,500 | \$ 17,500 |
| Less fixed costs | <u>26,000</u> | <u>12,500</u> |
| Net income | \$ 6,500 | \$ 5,000 |

Required:

- (a) If Vega Inc. lowers its price to \$140, it will lure 100 customers away from Orion Ltd. Prepare Vega's income statement based on 350 customers.
- (b) If Orion Ltd. lowers its price to \$140 (assuming that Vega Inc. continues to charge \$160 per customer), Orion would lure 100 customers away from Vega. Prepare Orion's income statement based on 350 customers.
- (c) Which of the companies would benefit more from lowering its sales price to attract more customers, and why?

Feedback:

(a) *Vega Inc. income statement*

| | |
|----------------------------------|---------------|
| Number of customers | 350 |
| Sales revenue (350 x \$140) | \$ 49,000 |
| Less variable costs (\$30 x 350) | <u>10,500</u> |
| Contribution margin | 38,500 |
| Less fixed costs | <u>26,000</u> |
| Net income | \$ 12,500 |

(b) *Orion Ltd. income statement*

| | |
|----------------------------------|---------------|
| Number of customers | 350 |
| Sales revenue (350 x \$140) | \$ 49,000 |
| Less variable costs (\$90 x 350) | <u>31,500</u> |
| Contribution margin | 17,500 |
| Less fixed costs | <u>12,500</u> |
| Net income | \$ 5,000 |

(c) Vega Inc. would benefit more from lowering its sales price to attract new customers. Its net income would increase by **\$6,000** (from \$6,500 to \$12,500), whereas Orion Ltd.'s net income would **remain unchanged at \$5,000**. The difference is due to the companies' cost structures: **Vega Inc. has higher fixed costs and lower variable costs**, while **Orion Ltd. has higher variable costs**. Therefore, an increase in sales volume (at a lower price) results in a greater increase in Vega's contribution margin and net income.

3. Income statements for three companies are provided below:

| | Nova Corp. | Altair Ltd. | Zenith Inc. |
|---------------------|------------|-------------|-------------|
| Sales (25 units) | \$ 1,250 | \$ 1,250 | \$ 1,250 |
| Less variable costs | 750 | 375 | - |
| Less fixed costs | 250 | 625 | 1000 |
| Net income | \$ 250 | \$ 250 | \$ 250 |

Required:

- Prepare new income statements for the firms assuming each sells one additional unit (i.e. each firm sells 26 units)
- Briefly describe the effect of cost structure on profitability.

Feedback:

- (a) Income statements

| | Nova Corp. | Altair Ltd. | Zenith Inc. |
|---------------------|------------|-------------|-------------|
| Sales (26 units) | \$ 1,300 | \$ 1,300 | \$ 1,300 |
| Less variable costs | 780 | 390 | - |
| Less fixed costs | 250 | 625 | 1,000 |
| Net income | \$ 270 | \$ 285 | \$ 300 |

(b) Companies with high **operating leverage** experience higher profitability when sales increase. The more fixed costs, the higher the fluctuation in net income. Company C has the highest operating leverage ($\$1250 / \$250 = 5$), and it experienced the greatest increase in net income with the increase in sales volume.

4. World-renowned motivational speaker Dr. Lisa Hartman often charges up to \$180,000 for a two-hour keynote address. She was recently invited to speak at an event hosted by the Global Education & Leadership Forum (GELF). Given the nonprofit mission of GELF, Dr. Hartman offered a reduced flat fee of \$120,000. GELF planned to invite 400 attendees, each expected to contribute \$600. Concerned about the high upfront cost, the event coordinator proposed an alternative arrangement: Dr. Hartman would be paid 55% of the total revenue, with no other payments.

Required:

- Classify the two payment options based on cost behavior (fixed vs. variable):

Scenario A: GELF pays Dr. Hartman a \$120,000 flat fee:

Scenario B: GELF pays Dr. Hartman 55% of the seminar revenue:

- Assuming no additional expenses, compute budgeted income under each scenario, assuming 400 attendees.
- Suppose GELF increases attendance by 20% (to 480 attendees). For each scenario, calculate the percentage increase in profit.
- For both 400 and 480 attendees, compute: Cost per attendee and Profit per attendee
- Summarize the impact on financial risk and profit potential when shifting from a fixed-cost structure to a variable-cost structure.

Feedback:

(a) Cost behavior of the two offers:

\$120,000 flat fee: **Fixed**

55% of revenue: **Variable**

(b) Profit computations:

| | Scenario A | Scenario B |
|-----------------------|------------|------------|
| Number of attendees | 400 | 400 |
| Revenue (400 x \$600) | \$ 240,000 | \$ 240,000 |
| Costs | 120,000 | 132,000 |
| Profit | \$ 120,000 | \$ 108,000 |

(c) Percentage increase in profit:

| | Scenario A | Scenario B |
|-----------------------|------------|------------|
| Number of attendees | 420 | 420 |
| Revenue (480 x \$600) | \$ 288,000 | \$ 288,000 |
| Costs | 120,000 | 158,400 |
| Profit | \$ 168,000 | \$ 129,600 |
| % increase in profit | 40% | 20% |

Scenario A $(\$168,000 - \$120,000) / \$120,000 = 40\%$

Scenario B $(\$129,600 - \$108,000) / \$108,000 = 20\%$

(d) *Cost per attendee:*

400 attendees

Scenario A, $\$120,000 / 400 = \300

Scenario B, $\$132,000 / 400 = \330

480 attendees

Scenario A, $\$120,000 / 480 = \250

Scenario B, $\$158,400 / 480 = \330

(d-1) *Profit per attendee*

400 attendees

Scenario A, $\$120,000 / 400 = \300

Scenario B, $\$108,000 / 400 = \270

480 attendees

Scenario A, $\$168,000 / 480 = \350

Scenario B, $\$129,600 / 480 = \270

(e) Shifting from a fixed cost structure (Scenario A) to a variable cost structure (Scenario B) reduces GELF **financial risk**. For example, if no one attends, GELF pays nothing. However, shifting to variable costs also reduces the **potential for profits**. For example, a 20 percent increase in attendance results in a 40% increase in profit under the fixed cost Scenario but only a 20% increase in profits under the variable cost Scenario.

5. Assume that Microsoft and Sony both plan to introduce a new hand-held video game. Microsoft plans to use a heavily automated production process to produce its product while Sony plans to use a labor-intensive production process. The following revenue and cost relationships are provided:

| | Microsoft Game | Sony Game |
|----------------------------|----------------|------------|
| Selling price per unit | \$ 150 | \$ 150 |
| Variable costs per unit | | |
| Direct materials | \$ 27.00 | \$ 27.00 |
| Direct labor | \$ 7.50 | \$ 30.00 |
| Overhead | \$ 7.50 | \$ 30.00 |
| Selling and administrative | \$ 3.00 | \$ 3.00 |
| Annual fixed costs | | |
| Overhead | \$ 600,000 | \$ 240,000 |
| Selling and administrative | \$ 135,000 | \$ 135,000 |

Required:

- Compute the contribution margin per unit for each company.
- Prepare a contribution income statement for each company assuming each company sells 8,000 units.
- Calculate net income for each firm if sales volume increases by 10%.
- Which firm will have more stable profits when sales change? Why?

Feedback:

- (a) Contribution margin per unit:

| | Microsoft Game | Sony Game |
|-------------------------------------|----------------|-----------|
| Revenue | \$ 150.00 | \$ 150.00 |
| Less variable costs: | | |
| Direct materials | \$ 27.00 | \$ 27.00 |
| Direct labor | \$ 7.50 | \$ 30.00 |
| Overhead | \$ 7.50 | \$ 30.00 |
| Selling and administrative expenses | \$ 3.00 | \$ 3.00 |
| Contribution margin | \$ 105.00 | \$ 60.00 |

- (b) Contribution income statements:

| | Microsoft Game | Sony Game |
|-------------------------------------|----------------|--------------|
| Revenue (8,000 x \$150) | \$ 1,200,000 | \$ 1,200,000 |
| Less variable costs: | | |
| Direct materials | \$ 216,000 | \$ 216,000 |
| Direct labor | \$ 60,000 | \$ 240,000 |
| Overhead | \$ 60,000 | \$ 240,000 |
| Selling and administrative expenses | \$ 24,000 | \$ 24,000 |
| Contribution margin | \$ 840,000 | \$ 480,000 |
| Less fixed costs | | |
| Overhead | \$ 600,000 | \$ 240,000 |
| Selling and administrative expenses | \$ 135,000 | \$ 135,000 |
| Net income | \$ 105,000 | \$ 105,000 |

(c) Increase in NI with a 10% increase in sales volume:

| | Microsoft Game | Sony Game |
|-------------------------------------|----------------|----------------|
| Revenue (8,800 x \$150) | \$ 1,320,000 | \$ 1,320,000 |
| Less variable costs: | | |
| Direct materials | 237,600 | 237,600 |
| Direct labor | 66,000 | 264,000 |
| Overhead | 66,000 | 264,000 |
| Selling and administrative expenses | <u>26,400</u> | <u>26,400</u> |
| Contribution margin | \$ 924,000 | \$ 528,000 |
| Less fixed costs | | |
| Overhead | 600,000 | 240,000 |
| Selling and administrative expenses | <u>135,000</u> | <u>135,000</u> |
| Net income | \$ 189,000 | \$ 153,000 |

(d) The lower the fixed costs, the more stable will be net income. Because Sony has approximately half the fixed costs of Microsoft, its earnings should be more stable. Note also that Sony's unit contribution margin is considerably less than Microsoft's. As sales rise, Microsoft will gain contribution margin (and thus profit) faster than Sony and, of course, when sales fall will lose contribution margin faster than Sony.

6. Aurora Apparel Co. operates a chain of boutique clothing stores. Below are the company's reported operating results for 2023:

| Income Statement | |
|--|--------------|
| Sales revenue | \$ 2,500,000 |
| Cost of goods sold: | \$ 1,400,000 |
| Gross margin | \$ 1,100,000 |
| Employee commissions and bonuses (4% of sales) | \$ (100,000) |
| Depreciation expense | \$ (180,000) |
| Salaries expense | \$ (320,000) |
| Shipping and delivery expense (2% of sales) | \$ (50,000) |
| Advertising expense | \$ (90,000) |
| Net income | \$ 360,000 |

Required: Prepare an income statement for Cannon Company using the contribution margin format.

Feedback:

| Income Statement | |
|--|----------------|
| Sales revenue | \$ 2,500,000 |
| Less variable expense: | |
| Cost of goods sold: | \$ (1,400,000) |
| Employee commissions and bonuses (4% of sales) | \$ (100,000) |
| Shipping and delivery expense (2% of sales) | \$ (50,000) |
| Contribution margin | \$ 950,000 |

| | |
|----------------------|--------------|
| Less fixed expenses | |
| Depreciation expense | \$ (180,000) |
| Salaries expense | \$ (320,000) |
| Advertising expense | \$ (90,000) |
| Net income | 360,000 |

7. The following contribution margin income statements are provided for two competing companies, Solis Inc. and Luna Ltd.:

| | Solis Inc. | Luna Ltd. |
|---------------------|------------|------------|
| Revenue | \$ 820,000 | \$ 820,000 |
| Less variable costs | \$ 328,000 | \$ 574,000 |
| Contribution margin | \$ 492,000 | \$ 246,000 |
| Less fixed costs | \$ 442,000 | \$ 201,000 |
| Net income | \$ 50,000 | \$ 45,000 |

Required:

- 1) Show each company's cost structure by inserting the percentage of the company's revenue represented by each item on the contribution income statement.
- 2) Compute each company's magnitude of operating leverage.
- 3) Using the operating leverage measures computed in requirement 2, determine the increase in each company's net income (percentage and amount) if each company experiences a 10 % increase in sales.
- 4) Assume that sales are expected to continue to increase for the foreseeable future, which company probably has more desirable cost structure? Why?

Feedback:

1)

| | Solis Inc. | | Luna Ltd. | |
|---------------------|------------|-------|------------|-------|
| Revenue | \$ 820,000 | 100% | \$ 820,000 | 100% |
| Less variable costs | \$ 328,000 | 40% | \$ 574,000 | 70% |
| Contribution Margin | \$ 492,000 | 60% | \$ 246,000 | 30% |
| Less fixed costs | \$ 442,000 | 53,9% | \$ 201,000 | 24,5% |
| Net income | \$ 50,000 | 6,1% | \$ 45,000 | 5,5% |

2) Magnitude of operating leverage:

Solis Inc. = \$492,000 contribution margin / \$50,000 net income = 9,84

Luna Ltd. = \$246,000 contribution margin / \$45,000 net income = 5,47

3) Expected profits when sales increase by 10%:

Solis Inc.: 10%×9,84 magnitude of operating leverage = 98,4%

If sales increase by 10%, net income should increase to \$99,200

Luna Ltd.: 10%×5,47 magnitude of operating leverage = 54,7%

If sales increase by 10%, net income should increase to \$69,615

4) Cost structures: Assuming sales continue to increase, Solis Inc. will fare better than Luna Ltd. because its contribution margin ratio is higher (60% vs. 30%) and its operating

leverage is higher (9,84 vs 5,47). This means that as sales increase, Solis Inc's net income will increase more rapidly than Luna Ltd's.