

9-35

Connelly Inc., a manufacturer of quality electric ice cream makers, has experienced a steady growth in sales over the past few years. Since her business has grown, Jan Delany, the president, believes she needs an aggressive advertising campaign next year to maintain the company's growth. To prepare for the growth, the accountant prepared the following data for the current year:

Variable costs per ice cream maker	
Direct labor	\$13.50
Direct materials	\$14.50
Variable overhead	\$6.00
Total variable costs	\$34.00
Fixed costs	
Manufacturing	\$67,000.00
Selling	\$42,000.00
Administrative	\$356,000.00
Total fixed costs	\$480,500.00
Selling price per unit	\$65.00
Expected sales (units)	30,000

- 1.If the costs and sales price remain the same, what is the projected operating profit for the coming year?
- 2.What is the breakeven point in units for the coming year?
- 3.Jan has set the sales target for 35,000 ice cream makers which she thinks she can achieve by an additional fixed selling expense of \$200,000 for advertising. All other costs remain as in requirement 1. What will be the operating profit if the additional \$200,000 is spent on advertising and sales rise to 35,000 units?
- 4.What will be the new breakeven point if the additional \$200,000 is spent on advertising?
- 5.If the additional \$200,000 is spent for advertising in the next year, what is the required sales level in units to equal the current year's income at 30,000 units?

1. Sales = variable cost + fixed cost + target operating profit

$$30,000(\$65) = 30,000(\$34) + \$480,500 + N$$

$$N = \$449,500$$

2. BE units: $\$65Q = \$34Q + \$480,500$

$$Q = 15,500 \text{ units}$$

3. Operating profit: $35,000(\$65) - 35,000(\$34) - \$480,500 - \$200,000 = N$

$$N = \$404,500$$

(operating profit falls by $\$45,000 = \$31 \times 5,000 - \$200,000$, from $\$449,500$ to $\$404,500$ as a result of the plan to increase sales with increased advertising)

4. BE units: $\$65Q = \$34Q + \$680,500$

$$Q = 21,952 \text{ units}$$

(operating profit is lower, per part 3 above, and breakeven is also higher)

5. $\$65Q = \$34Q + \$680,500 + \$449,500$

$$Q = 36,452 \text{ units}$$

(to justify the advertising plan, sales would have to rise to at least 36,452 units, somewhat above the projected 35,000 units)

9-38

Harold McWilliams owns and manages a general merchandise store in a rural area of Virginia. Harold sells appliances, clothing, auto parts, and farming equipment, among a wide variety of other types of merchandise. Because of normal seasonal and cyclical fluctuations in the local economy, he knows that his business will also have these fluctuations, and he is planning to use CVP analysis to help him understand how he can expect his profits to change with these fluctuations. Harold has the following information for his most recent year. Cost of goods sold represents the cost paid for the merchandise he sells, while operating costs represent rent, insurance, and salaries, that are entirely fixed.

Sales	650,000
Cost of goods sold	422,500
Contribution margin	227,500
Operating costs	105,000
Operating profit	122,500

1. What is Harold's margin of safety in dollars? What is the margin of safety ratio?
2. What is Harold's margin of safety and operating profit if sales should fall to \$500,000?

1. First, calculate the breakeven point, using the contribution margin ratio:

$$\text{CMR} = \$227,500/\$650,000 = .35$$

$$\text{Breakeven in dollars} = \$105,000/.35 = \$300,000$$

And

$$\text{Margin of safety} = \$650,000 - \$300,000 = \$350,000$$

$$\text{Margin of safety ratio} = \$350,000/\$650,000 = 53.85\%$$

2. If sales fall to \$500,000, the breakeven point will remain the same, but the margin of safety will change:

$$\text{Margin of Safety} = \$500,000 - \$300,000 = \$200,000$$

Operating profit can be determined in a variety of ways:

Contribution margin	=	$\$500,000 \times .35$	=	\$175,000
Less fixed costs				<u>105,000</u>
Operating profit			\$	70,000

Or, using the relationship between the margin of safety and operating profit:

$$\text{Operating profit} = \text{Margin of Safety} \times \text{CMR}$$

$$\$70,000 = \$200,000 \times .35$$

Why this works:

$$\text{Margin of Safety} \times \text{CMR} = \text{operating profit}$$

$$\begin{aligned} (\text{Expected Sales} - \text{Breakeven}) \times \text{CMR} &= \text{Expected Sales} \times \text{CMR} - \text{Breakeven} \times \text{CMR} \\ &= \text{Contribution margin} - \text{fixed costs} = \text{operating profit} \end{aligned}$$

(Note that breakeven in sales dollars \times CMR = fixed costs)

Triangle Business Service Inc (TBS) is a delivery service specializing in small parcels, envelopes and packages. TBS guarantees delivery of within 90 minutes for any business or residence in the Triangle (Greensboro-High Point-Winston Salem) area. The owner of the business is currently evaluating the choice between two different cost structures, for a planned increase in the business operations. One option is to buy 200 vehicles and hire delivery personnel to deliver the packages. Option two is to hire delivery personnel who would use their own vehicles for deliveries; the delivery personnel in this case would be compensated for their time and also for the use of their vehicles. For corporate purposes, the delivery personnel under option two would be required to attach a magnetic decal to their car or truck to identify it as a provider for TBS. Option one is the high fixed cost, high leverage option, and option two has the lower fixed cost but significantly higher variable costs. For simplicity, we assume that each package is delivered for the same price of \$60.

<u>Item</u>	Drivers' Cars	TBS's Cars
Delivery price per package	\$60	\$60
Variable cost per package delivered	\$48	\$30
Contribution margin per unit	\$12	\$30
Fixed costs (per year)	\$600,000	\$3,000,000

1. What is the break-even point, in terms of number of deliveries per year, for the each alternative?
2. How many deliveries would have to be made under each alternative to generate a pre-tax profit of \$25,000 per year?
3. How many deliveries would have to be made under option two (drivers use their cars) to generate a pre-tax profit equal to 15% of sales revenue?
4. Assume an effective income-tax rate of 40%. What number of deliveries would be needed to generate an after-tax profit of \$36,000 for the TBS-Cars alternative?
5. Which decision alternative is the more profitable for TBS? Which alternative is more risky, and why?

1. Break-even calculations (deliveries per year):

(a) Drivers use their own vehicles

$$\text{B/E point} = \$600,000/\$12 = 50,000 \text{ deliveries per year}$$

(b) TBS buys its own delivery vehicles

$$\text{B/E point} = \$3,000,000/\$30 = 100,000 \text{ deliveries per year}$$

2. Required sales volume to achieve targeted pre-tax profit of \$25,000 if drivers use their vehicles

$$\text{Required volume} = (\$600,000 + \$25,000)/\$12 = 52,084 \text{ (rounded up from } 52,083.3) \text{ deliveries/yr}$$

Required sales volume to achieve targeted pre-tax profit of \$25,000 if drivers use TBS vehicles

$$\text{Required volume} = (\$3,000,000 + \$25,000)/\$30 = 100,834 \text{ deliveries/yr}$$

3. Required sales volume to achieve targeted pre-tax profit expressed as percentage of sales:

Target pre-tax profit percentage 15%

Let X = required sales volume. Then,

Desired profit = 0.15 x (p x X), and:

$$0.15 \times (p \times X) = (p \times X) - (v \times X) - F$$

p = \$60 per delivery

v = \$48 per delivery

F = \$600,000 per year

$$.15 \times (\$60X) = \$60X - \$48X - \$600,000$$

$$X = 200,000 \text{ deliveries per year}$$

Sales at 200,000 units = 200,000 x \$60 = \$12,000,000

Profit at 200,000 units = .15 x \$12,000,000 = \$1,800,000

$$= \$12 \times 200,000 - \$600,000$$

4. Required sales (deliveries per year) to achieve targeted after-tax profit of \$36,000, given an income-tax rate of 40%:

First, express targeted after-tax profit in terms of pre-tax dollars,

$$N = N/(1 - t) = \$36,000/(1 - .4) = \$60,000$$

Second, solve for required sales volume, X:

$$X = (\$3,000,000 + \$60,000) / \$30 = 102,000 \text{ deliveries per year}$$

5. The indifference point is defined as the volume level, X, that results in equal profits for the two options.

$$\$60X - \$48X - \$600,000 = \$60X - \$30X - \$3,000,000$$

$$\$12X - \$600,000 = \$30X - \$3,000,000$$

$$\$18X = \$2,400,000$$

$$X = 133,333 \text{ deliveries per year}$$

Above 133,333 deliveries, TBS would prefer to own the cars.

Assessment of risk? The contribution margin generated from sales must be sufficient to cover fixed costs; any excess after coverage of fixed costs translates directly to pre-tax profit. If the contribution margin is not sufficient to cover the fixed costs, then a loss occurs for the period. That is, cost structures characterized by relatively higher amounts of fixed costs are riskier. A measure of this risk is the degree of operating leverage. The greater the proportion of fixed costs in the organization's cost structure, the higher the degree of operating leverage, and therefore the riskier the cost structure. In the present problem, the riskier cost structure, by far, is to buy the cars. Note that we can also interpret the degree of operating leverage as a measure of the sensitivity of profit to changes in sales volume. This explains why companies with high degrees of operating leverage work hard, especially at the margin, to increase sales volume. This is particularly true if the company is currently operating near the break-even point. In this case, even small percentage changes in sales volume can lead to dramatic percentage changes in pre-tax profits.