NOTATION USED IN CHAPTER 3 SOLUTIONS

SP: Selling price

VCU: Variable cost per unit

CMU: Contribution margin per unit

FC: Fixed costs

TOI: Target operating income

**3-1** Define cost–volume–profit analysis.

Cost-volume-profit (CVP) analysis examines the behavior of total revenues, total costs, and operating income as changes occur in the units sold, selling price, variable cost per unit, or fixed costs of a product.

**3-2** Describe the assumptions underlying CVP analysis.

The assumptions underlying the CVP analysis outlined in Chapter 3 are

1. Changes in the level of revenues and costs arise only because of changes in the number of product (or service) units sold.

2. Total costs can be separated into a fixed component that does not vary with the units sold and a variable component that changes with the number of units sold.

3. When represented graphically, the behaviors of total revenues and total costs are linear (represented as a straight line) in relation to number of units sold within a relevant range and time period.

4. The selling price, variable cost per unit, and fixed costs are known and constant.

**3-3** Distinguish between operating income and net income.

Operating income is total revenues from operations for the accounting period minus cost of goods sold and operating costs (excluding income taxes):

Operating income = Total revenues from operations – Costs of goods sold and operating, costs (excluding income taxes)

Net income is operating income plus nonoperating revenues (such as interest revenue) minus nonoperating costs (such as interest cost) minus income taxes. Chapter 3 assumes nonoperating revenues and nonoperating costs are zero. Thus, Chapter 3 computes net income as:

Net income = Operating income – Income taxes

**3-4** Define contribution margin, contribution margin per unit, and contribution margin percentage.

Contribution margin is the difference between total revenues and total variable costs. Contribution margin per unit is the difference between selling price and variable cost per unit. Contribution-margin percentage is the contribution margin per unit divided by selling price.

**3-5** Describe three methods that managers can use to express CVP relationships.

Three methods to express CVP relationships are the equation method, the contribution margin method, and the graph method. The first two methods are most useful for analyzing operating income at a few specific levels of sales. The graph method is useful for visualizing the effect of sales on operating income over a wide range of quantities sold.

**3-6** Why is it more accurate to describe the subject matter of this chapter as CVP analysis rather than as breakeven analysis?

Breakeven analysis denotes the study of the breakeven point, which is often only an incidental part of the relationship between cost, volume, and profit. Cost-volume-profit relationship is a more comprehensive term than breakeven analysis examining how total revenues, total costs and profits change with changes in the number of units sold.

**3-7** ―CVP analysis is both simple and simplistic. If you want realistic analysis to underpin your decisions, look beyond CVP analysis.‖ Do you agree? Explain.

CVP certainly is simple, with its assumption of output as the only revenue and cost driver, and linear revenue and cost relationships. Whether these assumptions make it simplistic depends on the decision context. In some cases, these assumptions may be sufficiently accurate for CVP to provide useful insights. The examples in Chapter 3 (the software package context in the text and the travel agency example in the Problem for Self-Study) illustrate how CVP can provide such insights. In more complex cases, the basic ideas of simple CVP analysis can be expanded.

**3-8** How does an increase in the income tax rate affect the breakeven point?

An increase in the income tax rate does not affect the breakeven point. Operating income at the breakeven point is zero, and no income taxes are paid at this point.

**3-9** Describe sensitivity analysis. How has the advent of the electronic spreadsheet affected the use of sensitivity analysis?

Sensitivity analysis is a ―what-if‖ technique that managers use to examine how an outcome will change if the original predicted data are not achieved or if an underlying assumption changes. The advent of the electronic spreadsheet has greatly increased the ability to explore the effect of alternative assumptions at minimal cost. CVP is one of the most widely used software applications in the management accounting area.

**3-10** Give an example of how a manager can decrease variable costs while increasing fixed costs.

Examples of decreasing variable costs and increasing fixed costs include:

Manufacturing––substituting a robotic machine for hourly wage workers

Marketing––changing a sales force compensation plan from a percent of sales dollars to a fixed salary

Customer service––hiring a subcontractor to do customer repair visits on an annual retainer basis rather than a per-visit basis