

Break-even Point

(Cheat Sheet)

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Break-even Point

The break-even point is the level of sales that result in a business having a net income of zero. In other words, its revenues will be exactly equal to its expenses.

The break-even point calculation that is found in managerial accounting textbooks is based on knowing how a company's costs or expenses will change as sales change. Hence, the break-even point is based on the following amounts:

- Total amount of fixed expenses
- Variable expenses per unit or as a percentage of sales
- Selling price or sales dollars
- Contribution margin (which can be determined from the sales and variable expenses)

Fixed Expenses

Fixed expenses are the expenses that will *not change in total* as the sales volume changes. For example, if a retail store's rent is \$30,000 per year and will not change with reasonable range of sales, the rent is a fixed expense. Other examples are managers' salaries, property insurance, property tax, etc.

Variable Expenses

Variable expenses are the expenses that *change in total as volume changes*. For example, if a retailer purchases a product at a cost of \$11 and sells it for \$20, the \$11 per unit is a variable expense. Another variable expense would be a sales commission of 5% that is given on every sale. In this example, the variable expenses would be \$12 per unit (\$11 + \$1). The \$12 of variable expenses can also be expressed as a percentage of selling price, such as 60% as a result of dividing \$12 by \$20.

Selling Price

In the calculation of the break-even point, the selling price of a product is assumed to be a constant amount per unit. If the selling price is \$20 per unit, the break-even calculation assumes that the selling price will remain \$20 whether 50 units are sold or 50,000 are sold.

Contribution Margin per Unit

Contribution margin per unit = *selling price per unit* minus *the variable expenses per unit*. If the selling price per unit is \$20 and the variable expenses are \$12, the resulting *contribution margin per unit is \$8*.

Contribution Margin Ratio (using the per unit amounts)

Contribution margin ratio (using the per unit amounts) = *contribution margin per unit* divided by *selling price per unit*. If the selling price per unit is \$20 and the variable expenses per unit are \$12, the resulting *contribution margin per unit is \$8*. This means that the *contribution margin ratio is 40%* (\$8 contribution margin/\$20 selling price).

Total Contribution Margin

If a company has *total sales of \$200,000* and *total variable expenses of \$120,000* its total contribution margin is \$80,000.

Contribution Margin Ratio (using totals)

The contribution margin ratio using totals = *total contribution margin* divided by *total sales*. If a company has a total contribution margin of \$80,000 and its total sales were \$200,000, the company's contribution margin ratio is 40% ($\$80,000/\$200,000$).

Break-even Calculations

Here's a recap of the information that we included in the above discussion, definitions, etc. and which we will use in the break-even calculations that follow:

- The company had only one product and its selling price was \$20 per unit
- The total fixed expenses were \$66,000 per year
- The variable expenses were \$12 per unit, which is 60% of the \$20 selling price
- The contribution margin was \$8 per unit, which is 40% of the selling price

Break-even Point in Units (for the year):

$$\begin{aligned} &= \text{Total fixed expenses for the year divided by the contribution margin per unit} \\ &= \$66,000 \text{ divided by } \$8 \text{ per unit} \\ &= \mathbf{8,250 \text{ units}} \end{aligned}$$

Break-even Point in Sales Dollars (for the year):

$$\begin{aligned} &= \text{Total fixed expenses for the year divided by the contribution margin ratio} \\ &= \$66,000 \text{ divided by } 40\% \\ &= \mathbf{\$165,000} \end{aligned}$$

The break-even point in sales dollars for the year could also be calculated taking the break-even point in units of 8,250 and multiplying that amount by the \$20 selling price = \$165,000 per year.

The Mix of Products Sold May Change

The above models have some limitations. For example, a company may actually be selling many different products (and/or services) with a wide range of contribution margins (and a variety of contribution margin ratios). Therefore, the same total number of units sold could result in vastly different profits if the sales mix changes. (*Sales mix* is the varying proportions of high and low margin products that are sold.)

Not All Variable Expenses Are Linear

Another limitation is that many expenses will not change in direct proportion to the change in volume. In other words, if the total variable expenses were graphed according to sales volume, the resulting line would not be straight line. Perhaps the line will curve upward thereby revealing that some expenses may be increasing exponentially instead of increasing at a constant rate.

Fixed Expenses Could Change

Some fixed expenses could increase when a very large change in volume occurs. That is why the definition of fixed expense has a qualifier: The total expense is fixed “*within a relevant range of sales or volume.*” For example, if the volume increases by such a large amount that another supervisor is required, the fixed expense of supervisors will increase. If the increase in volume is so large that it necessitates renting an additional building, the fixed expense of rent will increase.

Selling Prices May Have to Change

A company may find that in order to increase its sales, it will have to reduce its selling prices. This in turn reduces the contribution margin per unit. If the total market for a product increases, competitors may also enter the market and offer lower selling prices in order to attract customers.

Electronic Worksheets

The simple break-even point models were developed prior to *electronic worksheets* and personal computers. Now that these inexpensive tools are available, it makes sense to develop electronic worksheets with more sophistication than the simple break-even models.

With formulas in the electronic worksheet cells, accountants can easily change various assumptions and immediately see the results. In other words, electronic worksheets allow accountants to play “*What if?*” What if the selling price is increased by \$1 per unit? What if the volume is decreased by 4,000 units? What if the fixed expenses are increased by \$8,000 per year?