

# Cost-Volume-Profit

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# Cost-Volume-Profit

- With Cost-Volume-Profit (CVP) we have more costing terms.
- Variable costs are those costs of direct materials, direct labor, and FOH / MOH.
- Variable costs change with production levels.
- Fixed costs are costs that do not change with production level changes – rent / mortgage, insurance, production employee salaries (not hourly wages), and straight-line depreciation are several examples.

# Cost-Volume-Profit

- In our example company here are some of the values –
- Variable costs per unit are \$2.47,
- Fixed costs are \$46,875.00,
- Sales price per unit is \$17.99
- The relevant range, what we can produce without changing variable or fixed costs significantly is from 2,500 units to 10,000 units.

# Cost-Volume-Profit

- As managerial accountants the question has been posed to us, “What is the benefit to the company of sales levels from 2,500 through 10,000 in 500 unit increments?”
- This is the type of question which demonstrates our need for Microsoft Excel or any other worksheet knowledge.

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- So we build a worksheet and insert a graph to present the answer to the question that goes beyond most textbooks.
- We need:
  - Units sold,
  - Unit variable cost,
  - Extended variable costs for sales levels,
  - Fixed costs,

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- Total costs,
- Average cost per unit based on sales level,
- Total sales revenues based on sales levels,  
and
- Gross profit based on sales level.

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- Our table, populated beyond most textbooks, looks like this.

Units Sold:	Unit Variable Costs:	Extended Variable Cost:	Fixed Costs:	Total Costs:	Average Cost Per Unit:	Total Sales Revenue	Gross Profit:
2,500	\$2.47	\$6,175.00	\$46,875.00	\$53,050.00	\$21.22	\$44,975.00	(\$8,075.00)
3,000	2.47	7,410.00	46,875.00	54,285.00	18.10	53,970.00	(315.00)
3,500	2.47	8,645.00	46,875.00	55,520.00	15.86	62,965.00	7,445.00
4,000	2.47	9,880.00	46,875.00	56,755.00	14.19	71,960.00	15,205.00
4,500	2.47	11,115.00	46,875.00	57,990.00	12.89	80,955.00	22,965.00
5,000	2.47	12,350.00	46,875.00	59,225.00	11.85	89,950.00	30,725.00
5,500	2.47	13,585.00	46,875.00	60,460.00	10.99	98,945.00	38,485.00
6,000	2.47	14,820.00	46,875.00	61,695.00	10.28	107,940.00	46,245.00
6,500	2.47	16,055.00	46,875.00	62,930.00	9.68	116,935.00	54,005.00
7,000	2.47	17,290.00	46,875.00	64,165.00	9.17	125,930.00	61,765.00
7,500	2.47	18,525.00	46,875.00	65,400.00	8.72	134,925.00	69,525.00
8,000	2.47	19,760.00	46,875.00	66,635.00	8.33	143,920.00	77,285.00
8,500	2.47	20,995.00	46,875.00	67,870.00	7.98	152,915.00	85,045.00
9,000	2.47	22,230.00	46,875.00	69,105.00	7.68	161,910.00	92,805.00
9,500	2.47	23,465.00	46,875.00	70,340.00	7.40	170,905.00	100,565.00
10,000	2.47	24,700.00	46,875.00	71,575.00	7.16	179,900.00	108,325.00

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- The formulas in this table take the Units Sold and multiply that by the Unit Variable Cost of \$2.47 to create the Extended Variable Cost value.
- The Total Cost column adds the Extended Variable Cost to Fixed Costs to get Total Costs for the Units Sold.



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- The Average Cost Per Unit is the Total Costs column divided by the Units Sold value. This column is provided to demonstrate the economy of scale or the benefit of distributing fixed costs over a greater number of sold units.
- The Total Sales Revenue column is the Unit Sales Price of \$17.99 multiplied by the Units Sold column.

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- The Gross Profit column is the Total Sales Revenues column less the Total Costs column.
- If the company had a desired income from operations was provided it would be added into the fixed costs for ease or, more properly, an additional column would be added.

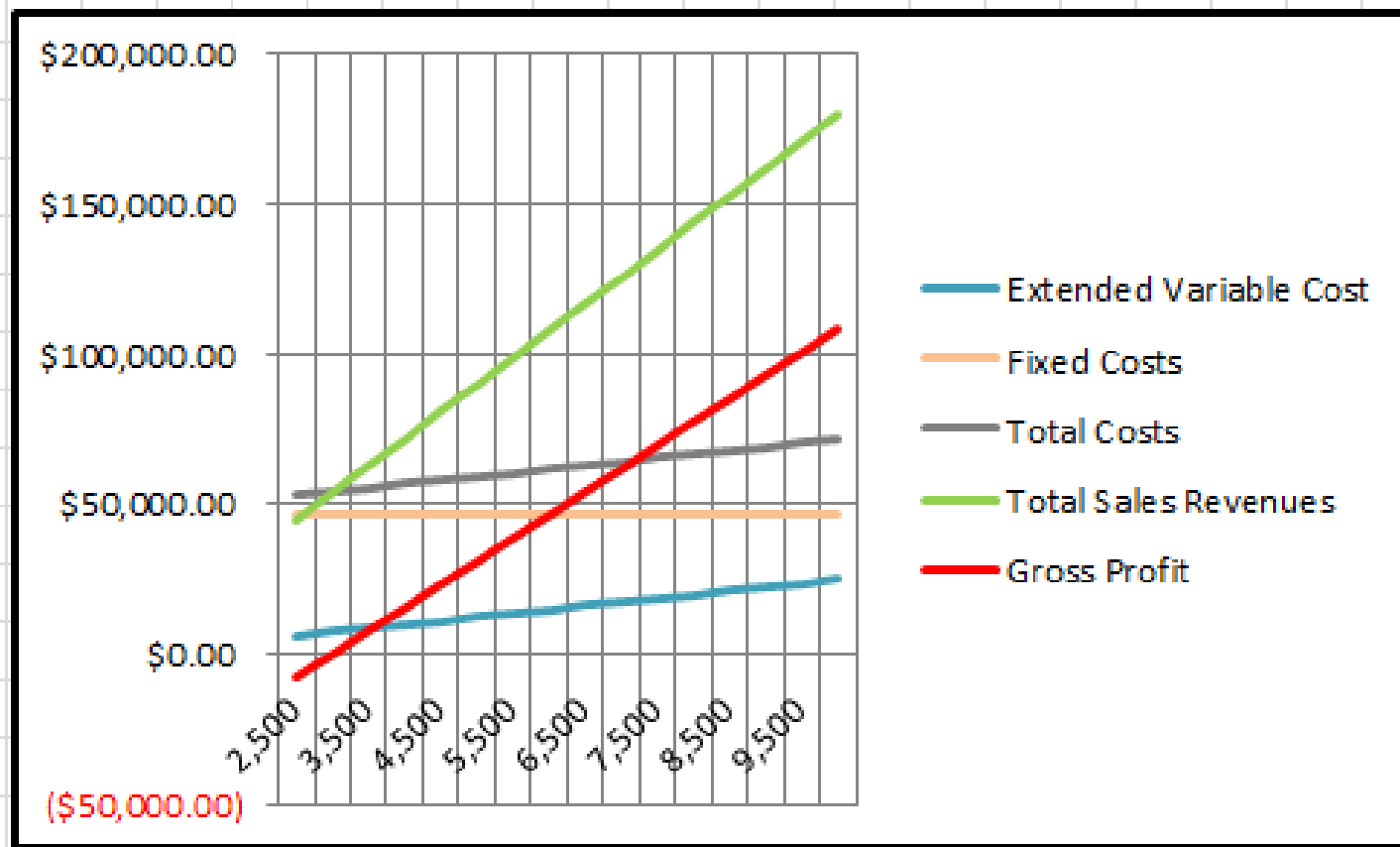
# Cost-Volume-Profit

- From this table, a portion shown here, we know that until we are above the 3,000 unit level we are operating at a loss.

Units Sold:	Unit Variable Costs:	Extended Variable Cost:	Fixed Costs:	Total Costs:	Average Cost Per Unit:	Total Sales Revenue	Gross Profit:
2,500	\$2.47	\$6,175.00	\$46,875.00	\$53,050.00	\$21.22	\$44,975.00	(\$8,075.00)
3,000	2.47	7,410.00	46,875.00	54,285.00	18.10	53,970.00	(315.00)
3,500	2.47	8,645.00	46,875.00	55,520.00	15.86	62,965.00	7,445.00
4,000	2.47	9,880.00	46,875.00	56,755.00	14.19	71,960.00	15,205.00
4,500	2.47	11,115.00	46,875.00	57,990.00	12.89	80,955.00	22,965.00

# Cost-Volume-Profit

- Our Microsoft Excel graph looks like this.



# Cost-Volume-Profit

- In accordance with presentation standards, the Y axis, the vertical axis, is usually dollars and the X axis, the horizontal axis is usually units.
- The intersection of X and Y is \$0.00 and 0 units.

# Cost-Volume-Profit

- The pretty lines tell us what we want to know but they do not expose detail.
- The lines are properly labeled and indicate that Gross Profit will be a loss below the 3,500 unit sales level, which the table confirms.
- Breakeven, where sales revenues cover fixed and variable costs, occur at approximately 3,400 units, the green line, Total Sales Revenues, crossing the gray line of Total Costs. Just above \$50,000.

# Cost-Volume-Profit

- This selected view of the table data shows that as units sold increases the average cost decreases.
- This is known as economy of scale, the fixed costs of \$46,875 are spread over more units as sales increase.

Units Sold:	Average Cost Per Unit:	Total Sales Revenue	Gross Profit:
2,500	\$21.22	\$44,975.00	(\$8,075.00)
3,000	18.10	53,970.00	(315.00)
3,500	15.86	62,965.00	7,445.00
4,000	14.19	71,960.00	15,205.00
4,500	12.89	80,955.00	22,965.00
5,000	11.85	89,950.00	30,725.00
5,500	10.99	98,945.00	38,485.00
6,000	10.28	107,940.00	46,245.00
6,500	9.68	116,935.00	54,005.00
7,000	9.17	125,930.00	61,765.00
7,500	8.72	134,925.00	69,525.00
8,000	8.33	143,920.00	77,285.00
8,500	7.98	152,915.00	85,045.00
9,000	7.68	161,910.00	92,805.00
9,500	7.40	170,905.00	100,565.00
10,000	7.16	179,900.00	108,325.00

# Cost-Volume-Profit

- This is a select view of the table with Target Net Income added.

Units Sold:	Extended Variable Cost:	Fixed Costs:	Total Costs:	Total Sales Revenue	Gross Profit:	Income from Operations:	Income (Loss) from Operations:
2,500	\$6,175.00	\$46,875.00	\$53,050.00	\$44,975.00	(\$8,075.00)	\$20,000.00	(\$28,075.00)
3,000	7,410.00	46,875.00	54,285.00	53,970.00	(315.00)	\$20,000.00	(\$20,315.00)
3,500	8,645.00	46,875.00	55,520.00	62,965.00	7,445.00	\$20,000.00	(\$12,555.00)
4,000	9,880.00	46,875.00	56,755.00	71,960.00	15,205.00	\$20,000.00	(\$4,795.00)
4,500	11,115.00	46,875.00	57,990.00	80,955.00	22,965.00	\$20,000.00	\$2,965.00
5,000	12,350.00	46,875.00	59,225.00	89,950.00	30,725.00	\$20,000.00	\$10,725.00
5,500	13,585.00	46,875.00	60,460.00	98,945.00	38,485.00	\$20,000.00	\$18,485.00
6,000	14,820.00	46,875.00	61,695.00	107,940.00	46,245.00	\$20,000.00	\$26,245.00
6,500	16,055.00	46,875.00	62,930.00	116,935.00	54,005.00	\$20,000.00	\$34,005.00
7,000	17,290.00	46,875.00	64,165.00	125,930.00	61,765.00	\$20,000.00	\$41,765.00
7,500	18,525.00	46,875.00	65,400.00	134,925.00	69,525.00	\$20,000.00	\$49,525.00
8,000	19,760.00	46,875.00	66,635.00	143,920.00	77,285.00	\$20,000.00	\$57,285.00
8,500	20,995.00	46,875.00	67,870.00	152,915.00	85,045.00	\$20,000.00	\$65,045.00
9,000	22,230.00	46,875.00	69,105.00	161,910.00	92,805.00	\$20,000.00	\$72,805.00
9,500	23,465.00	46,875.00	70,340.00	170,905.00	100,565.00	\$20,000.00	\$80,565.00
10,000	24,700.00	46,875.00	71,575.00	179,900.00	108,325.00	\$20,000.00	\$88,325.00



# Cost-Volume-Profit

- With a Target Income from Operations of \$20,000 the company is not in the desired range until almost 4,500 units are sold.

Units Sold:	Extended Variable Cost:	Fixed Costs:	Total Costs:	Total Sales Revenue	Gross Profit:	Income from Operations:	Income (Loss) from Operations:
2,500	\$6,175.00	\$46,875.00	\$53,050.00	\$44,975.00	(\$8,075.00)	\$20,000.00	(\$28,075.00)
3,000	7,410.00	46,875.00	54,285.00	53,970.00	(315.00)	\$20,000.00	(\$20,315.00)
3,500	8,645.00	46,875.00	55,520.00	62,965.00	7,445.00	\$20,000.00	(\$12,555.00)
4,000	9,880.00	46,875.00	56,755.00	71,960.00	15,205.00	\$20,000.00	(\$4,795.00)
4,500	11,115.00	46,875.00	57,990.00	80,955.00	22,965.00	\$20,000.00	\$2,965.00
5,000	12,350.00	46,875.00	59,225.00	89,950.00	30,725.00	\$20,000.00	\$10,725.00

# Cost-Volume-Profit

- The complete table is shown here.

Units Sold:	Unit Variable Costs:	Extended Variable Cost:	Fixed Costs:	Total Costs:	Average Cost Per Unit:	Total Sales Revenue	Gross Profit:	Income from Operations:	Income (Loss) from Operations:
2,500	\$2.47	\$6,175.00	\$46,875.00	\$53,050.00	\$21.22	\$44,975.00	(\$8,075.00)	\$20,000.00	(\$28,075.00)
3,000	2.47	7,410.00	46,875.00	54,285.00	18.10	53,970.00	(315.00)	\$20,000.00	(\$20,315.00)
3,500	2.47	8,645.00	46,875.00	55,520.00	15.86	62,965.00	7,445.00	\$20,000.00	(\$12,555.00)
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9,500	2.47	23,465.00	46,875.00	70,340.00	7.40	170,905.00	100,565.00	\$20,000.00	\$80,565.00
10,000	2.47	24,700.00	46,875.00	71,575.00	7.16	179,900.00	108,325.00	\$20,000.00	\$88,325.00

# Cost-Volume-Profit

- Cost-Volume-Profit is a math exercise of addition, subtraction, multiplication, and division.
- It is best handled by workbooks that can graph the results.
- However, as shown, the graphs have impact, the tables have detail.
- Neither stands alone.

# Cost-Volume-Profit

- There are Cost-Volume-Profit templates in several of my reference files.

# Cost-Volume-Profit

The end.