Break-Even Point (BEP)

BEP

- The Break-Even Point (BEP) is defined as the point of production where revenues equal costs.
- There is no profit and no loss.

BEP

- Increasing the quantity produced beyond the BEP generates a profit. Producing below the BEP generates a loss.

BEP

The formula for BEP in units is:

$$TFC/(P-AVC) = Q$$

BEP

Derivation of the BEP formula

$TR - TC = \Pi = 0$

$TR = TC$

$P*Q = TFC + TVC$

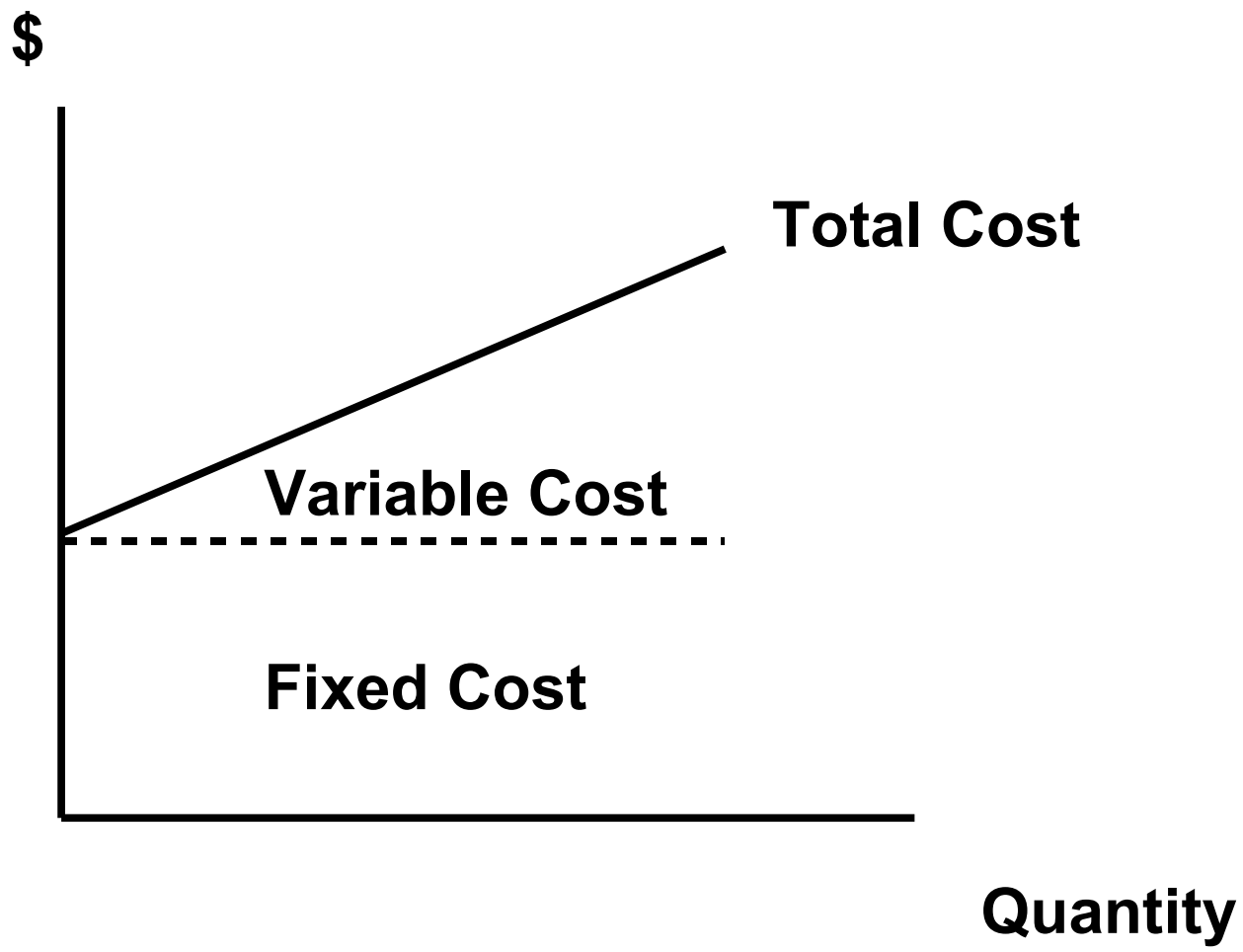
$P*Q = TFC + AVC*Q$

$Q*P - AVC*Q = TFC$

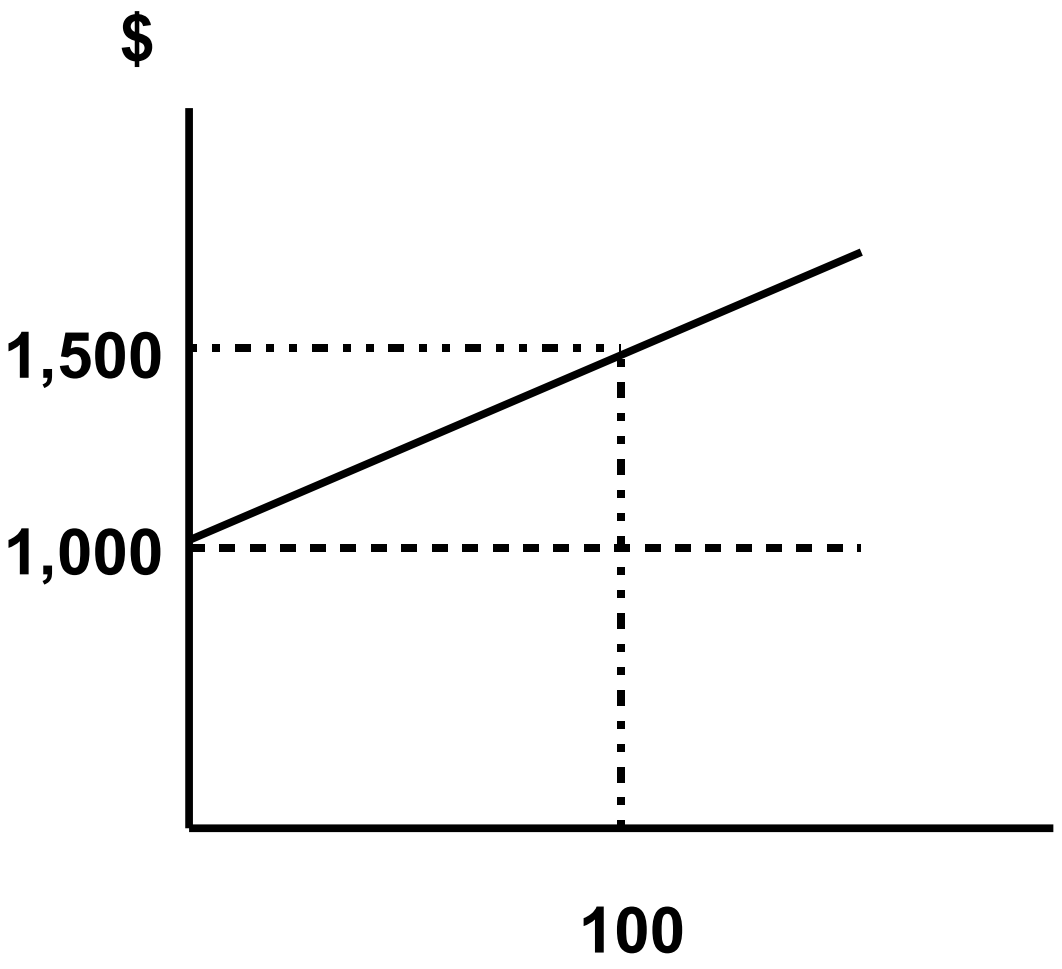
$Q*(P-AVC) = TFC$

$TFC/(P-AVC) = Q$

BEP
Graphical Analysis

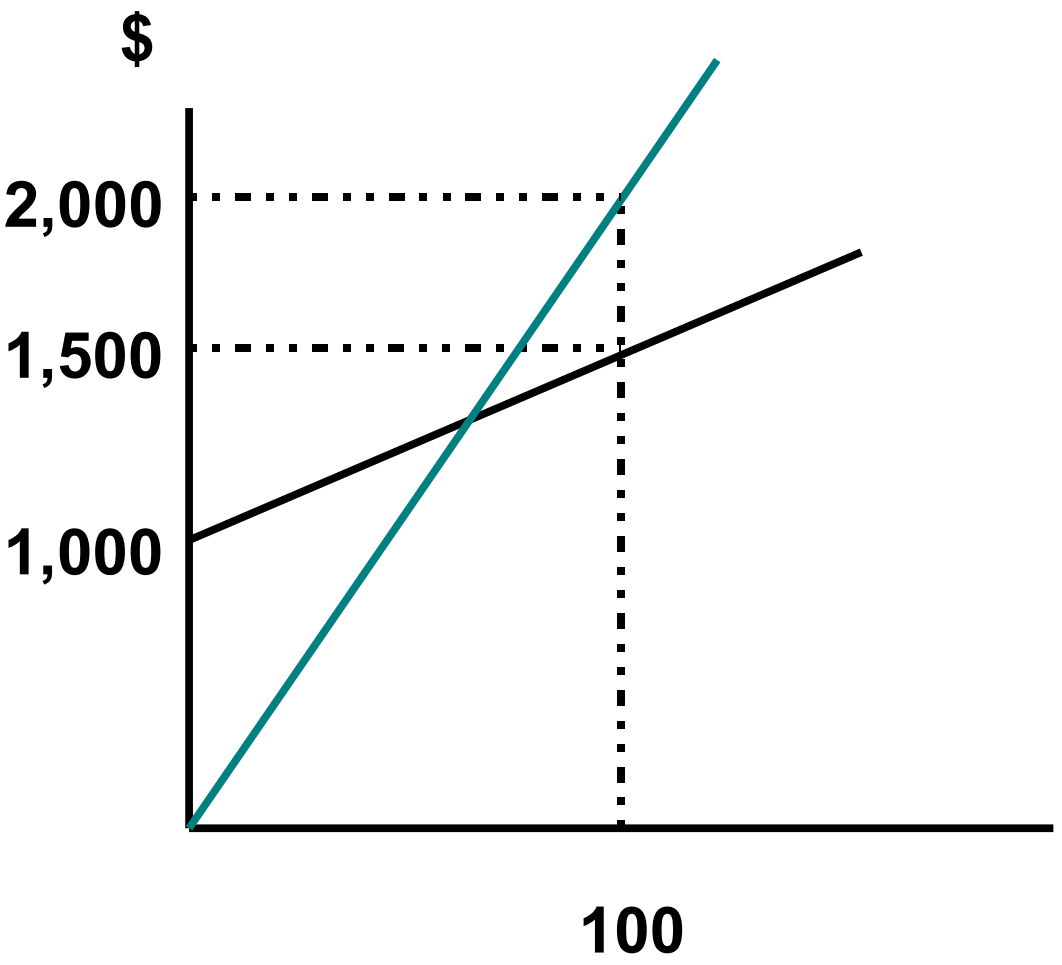


BEP
Graphical Analysis



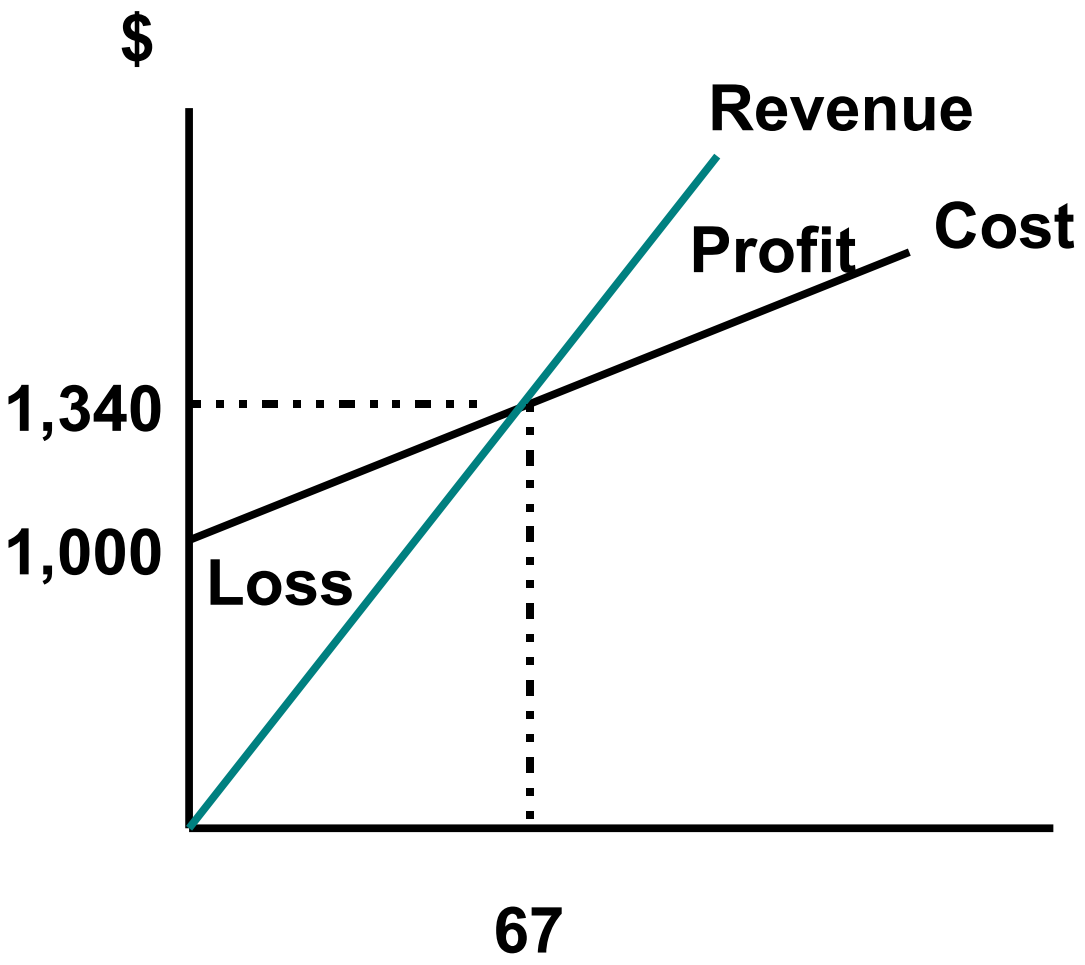
- Let's say that this firm has a fixed cost of $1,000.
- Average variable costs are $5.
- Then at a quantity of 100, Total Costs = $1,000 + $5*100 = $1,500

BEP
Graphical Analysis



- Let's add some additional information, price is $20 per unit.
- At 100 units the Total Revenue = $2,000 = $20 * 100
- Profit = $500 = $2,000 - 1,500

BEP
Graphical Analysis



•Note any volume to the right (left) of break-even produces a profit (loss).

BEP

There a couple of key assumptions in using BEP formulas.

- The main assumption is that price and the average variable cost remain constant as quantity changes.
- Another assumption is that the firm can sell all that it produces. This implies the firms knows the demand curve.

BEP

- The BEP is useful in determining financial feasibility.
- Another use of the BEP is in what-if analysis.

BEP

- Profitability can easily be incorporated into the formula. Often times it is called Cost(C)-Volume(V)-Profit(P) Analysis (C-V-P).

BEP

Example 1:

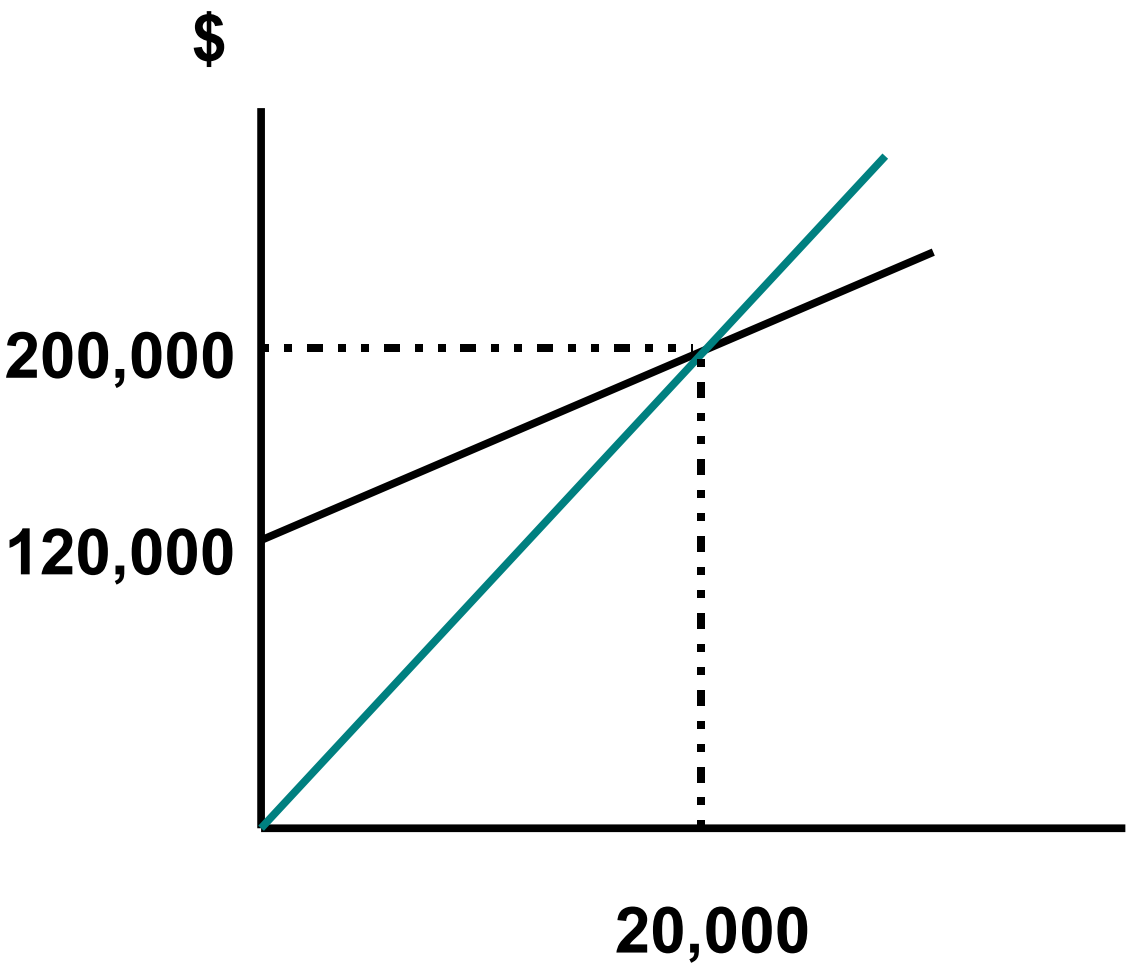
- Let's say that the price is $10, average variable cost of $4 and a fixed cost of $120,000. How many units must be produced to break-even?

BEP

Answer:

- $120,000/(10-4) = 20,000 units

BEP
Graphical Analysis



- At a price of $10, sales must be $200,000 for break-even.

BEP

Example 2:

- Let's expand example 1 by incorporating a profit of $18,000. Now how many units must be produced and sold?

BEP

Answer:

- Since the profit is stated as a fixed amount, it is added to the numerator.
- (120,000 + 18,000)/(10-4) = 23,000 units.

BEP

Example 3:

- Suppose we add an advertising cost of $24,000, now how many units must be sold?

BEP

Answer:

- ($120,000 + 18,000 + 24,000) / (10 - 4) = 27,000 units.

BEP

Example 4:

- Many firms need to earn a net profit margin as a percentage. Let's say the target profitability for this firm is 20%. Given the advertising and other costs, how many units does this firm need to produce and sell?

BEP

Answer:

- ($120,000 + 24,000) / (10 - 4 - 2) = 36,000 units

BEP

Example 5:

- Let's expand on this concept further, let's say that advertising is set as a percentage of sales and that percentage will be 20%. How many units must be sold?

BEP

Answer:

- ($120,000) / (10 - 4 - 2 - 2) = 60,000 units

BEP

Up until now we assumed that there is only one product being sold. Can we modify this formula to handle more than one product? Yes, retailers do this all of the time.

BEP

- First, we need to introduce the concept of the contribution margin. The contribution margin is Price minus Average Variable Cost (CM = P - AVC).
- Next, we make it a percentage by dividing by price CM% = CM / P. (Note that AVC% = 1-CM %)
- Finally, FC / CM% = BEP in Sales Dollars.

BEP

Example 6:

- Our retail shop, Gadgets & Gizmos (G&G), has $120,000 of fixed costs annually. Prices and the cost of purchase (which is the AVC) vary for each product line. However, G&G expects a Markup On Retail (MOR) of 60%. What is the break-even point in dollar sales?

BEP

Answer:

- $120,000 / .6 = $200,000.

BEP

Example 7:

- Obviously, G&G would like to make a profit and the target Return On Sales (ROS) is 20%. Recall that ROS is Net Income / Sales. How much must G&G sell in dollar amount?

BEP

Answer:

- The adjustment to the formula is simple, subtract the ROS from CM%. In our case, 60% - 20% = 40%. So $120,000 / 40% = $300,000.

BEP

Let's prove this case.

Sales	$300,000	
FC	120,000	
VC	120,000	(40% * $300,000)
NI	60,000	
ROS%	20%	

BEP

- As an interesting exercise and application, suppose we need to calculate a break-even price?
- Let's say that we sell gizmos. It costs us $10 to acquire a gizmo. Our fixed costs are $15,000. We can make only 500 gizmos.
- What price should we charge?

BEP

- Set up the formula as before:
- 500 = 15,000 / (P – 10)
- Note the P for the unknown variable.
- Solve for P.
- (P-10)*500 = 15,000
- (P-10) = 15,000/500 = 30
- P – 10 = 30, therefore, P = 40.

BEP

- BEP is the most used analytical technique in business.
- Adapt it to circumstances, it will serve you well.

The End