Chapter 16

Obtaining and Estimating Cash Flows

16.2 Cost Viewpoints

Ex. The total cost TC and total revenue TR functions with respect to the annual production are given by the expression

$$TC(x) = 1000 + 2x, \quad TR(x) = 6x - 0.001x^2$$

,where x is the number of units sold per year , and the selling price in $.

Determine the following:

1. Over what range of production is the profit possible?

2. The value of x that maximizes profit.

3. The maximum profit for a year.

4. The fixed cost per year.

5. The average cost of producing 2000 units.

6. The marginal cost at the production level of 2000 units.

Solution

1.

$$TR = TC \rightarrow TP = 0$$

$$TR - TC = 0$$

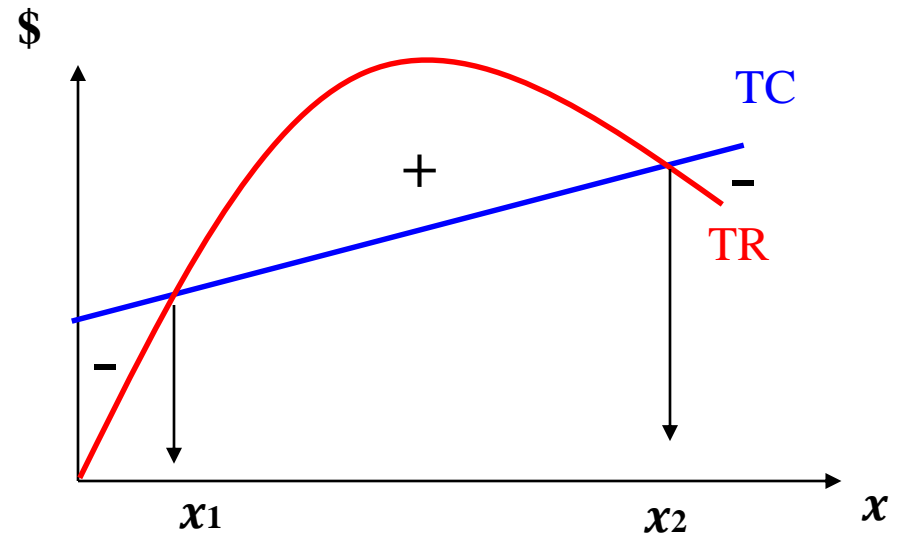$$6x - 0.001x^2 - 1000 - 2x = 0$$

$$4x - 0.001x^2 - 1000 = 0$$

$$-0.001x^2 + 4x - 1000 = 0$$

$$ax^2 + bx + c = 0$$

$$x_1 = 267.949 \ unit/year$$

$$x_2 = 3732.05 \ unit/year$$

$$so, \qquad 267.949 < x < 3732.05$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solution

2. $TP(x) = -0.001x^2 + 4x - 1000$

$$\frac{d\,TP(x)}{dx} = 0 \qquad -0.002x + 4 = 0 \quad \rightarrow \quad x = 2000\ units/year$$

3. $TP(2000) = -0.001(2000)^2 + 4(2000) - 1000$

     $TP(2000) = \$3000$

4. $FC = \$1000$

5. $AC(x) = \dfrac{TC(x)}{x} = \dfrac{1000 + 2x}{x} = \dfrac{1000 + 2x}{x}$

     $AC(2000) = \dfrac{TC(2000)}{2000} = \dfrac{1000 + 2(2000)}{2000} = \$2.5$

6. $MC(x) = \dfrac{d\,TC(x)}{dx} = \dfrac{d}{dx}[1000 + 2x] = \$2$

     $or\ MC = TC(2001) - TC(2000) = \$2\,.$

Ex. Two machines are being considered for a project investment. The variable cost and the annual fixed cost are shown in the following table:

Machine	Fixed Cost, SR	Variable Cost, SR
A	3600	10.5
B	4275	8.25

1. What is the number of units/year for break-even between two machines ?

2. If the estimated number of units/year is 1000 ,what the annual savings are estimated if machine (B) is used instead of machine (A).
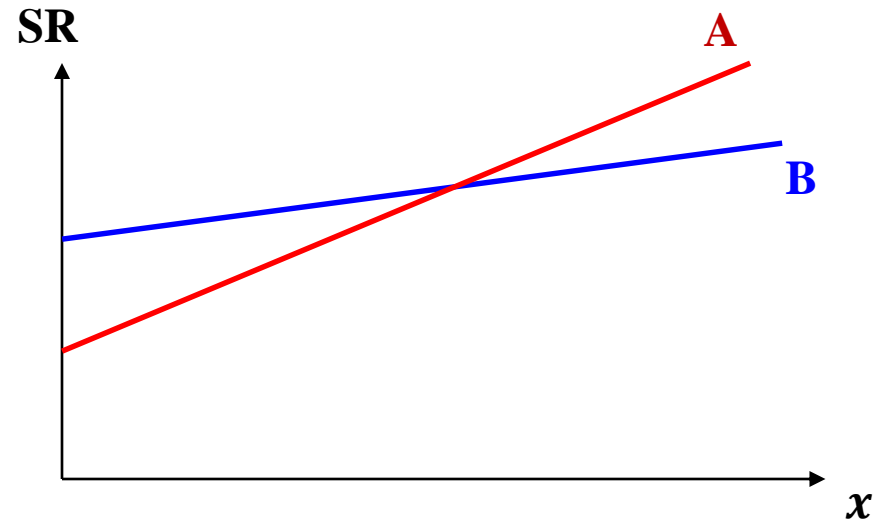
Solution

1.

$$TC(x)_A = 3600 + 10.5x$$

$$TC(x)_B = 4275 + 8.25x$$

$$TC(x)_A = TC(x)_B$$

$$3600 + 10.5x = 4275 + 8.25x$$

$$\rightarrow x = 300$$

SR axis — line A (red), line B (blue), x axis

2.

$$TC(1000)_A = 3600 + 10.5(1000) = 14100 \; SR$$

$$TC(1000)_B = 4275 + 8.25(1000) = 12525 \; SR$$

The estimated annual savings are 1575 SR