Break Even point and O.L.

1. A company´s annual fixed costs are €2,000. The variable cost per unit equals its selling price, which is €2. What is the break-even point?

2. A company has a unit margin of €5.
a) Assuming that the manufacturing of 500 physical units produces a loss of €500, calculate the break-even point.
b) Represent graphically the situation of this company assuming that the maximum capacity of the plant is 900 physical units. What is the maximum profit that can be obtained?
c) Calculate the degree of operating leverage of this company for a production andsales volume of 900 physical units and interpret this result.

3. A company manager who wants to market a new product has to choose between two alternative production processes A and B. In both cases the selling price of the product is €20

	Process A	**Process B**
Fixed costs	40,000	20,000
Unit variable costs	13	15

a) Assuming that the expected level of production and sales is 10,000 physical units, decide the most convenient process according to the break-even analysis and the graphic representation.
b) If process B resulted in a higher quality product with a selling price of €25, how would this affect the choice of the most convenient process?
c) If the rise in price of the product obtained with process B (€25) caused a drop in sales from 10,000 to 6,000 physical units, which production process would thecompany choose?

4. Given the following information:
- Selling price: €10.
- Variable cost per unit: €3.
- Fixed costs: €1,000.

a) How many units must be sold to start making a profit?
b) What would the profit be if the company sold 200 units?
c) What is the degree of operating leverage for 200 units sold?
d) Will the degree of operating leverage vary if there is a 50 unit increase in sales?
e) Will the degree of operating leverage vary if there is a 10% rise in price (for 200 units) ?

5. A visit to a company has provided the following information:
- If the company produced and sold 300 physical units, it would make a profit of €56.

- If the company produced and sold 160 physical units, it would make zero profit.
- The company forecasts sales of 500 physical units.

Calculate the company´s fixed costs, the forecast profit, its safety margin and the degree of operating leverage.

6. En las On the financial pages of a Spanish newspaper it was recently announced that a manufacturing company specialized in certain automotive components had sold 100,000 units of its product last year, well above its break-even point, set at 20,000 physical units approximately. What is the degree of operating leverage for this company?

7. We have the following data corresponding to a certain product manufactured by Sumun S.A:
- Unit margin: €10
- Annual sales volume: 2,000 units
- Annual fixed costs: €1,000

Calculate:
a) The break-even point of this product.
b) Its degree of operating leverage.

8. Company ENIR, S.A., a black cigarette manufacturer, has not obtained profits during year 2008. It was established two years before and its maximum production capacity amounts to 11 million packs per year. Analyzing its management, we know that in 2008, the company produced 10 million packs, with financial costs relative to its external financing of €300,000, fixed costs of commercialization and administration of €1,000,000 and other fixed costs of €1,700,000.
The selling price was €1.3 per pack, which was established by the Government, as this is an industry regulated by the State.
For the following year 2009 and, maintaining the same facilities, the company expects an increase of 15% in its fixed costs, as well as a decrease of 1% in the variable cost per unit.
Calculate:
a) The break-even point for year 2009.
b) Considering these plans, is it possible that the company obtains profits? Account for your answer.

SOLUTIONS

1. FC = 2000 €
P = Cvu = 2 €/ud

$$q^* = \frac{CF}{P - Cvu} = \frac{2000}{2-2} = \infty$$

The solution makes no economic sense, as a level of production cannot be achieved ∞; the company will always be in losses, because it will never be able to cover its fixed costs.

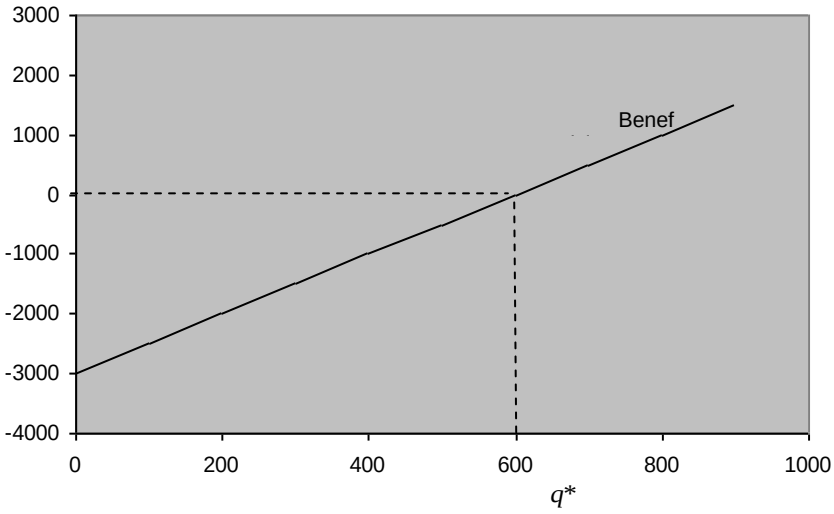
2. m = 5 €/u

a) $q = 500 \Rightarrow B^o = -500$

$$B^o = q \times m - CF \Rightarrow -500 = 500 \times 5 - CF \Rightarrow CF = 3.000\,€$$

$$q^* = \frac{CF}{m} = \frac{3.000}{5} = 600\,uds$$

b) $Max(B^o) = \max(q) \times m - CF = 900 \times 5 - 3.000 = 1.500\,€$



c) $AO_{q=900} = \frac{q \times m}{q \times m - CF} = \frac{900 \times 5}{900 \times 5 - 3.000} = \frac{4.500}{1.500} = 3$

Since the company is at full capacity, and cannot increase sales, you can only think of a decrease in sales. In this sense, AO = 3 means that for every 1% that sales decrease from 900 units, the profit will be reduced by 3%.

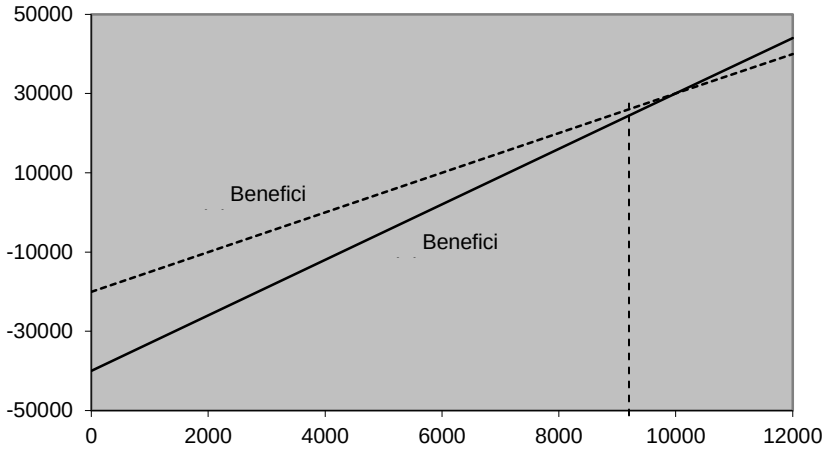
3.

	Process A	Process B
Costes fijos	40.000	20.000
Variable Cost unit	13	15

P = 20 €/u

a) q = 10.000 us

$$B(A) = (p - Cvu) \times q - CF = (20 - 13) \times 10.000 - 40.000 = 30.000 €$$
$$B(B) = (p - Cvu) \times q - CF = (20 - 15) \times 10.000 - 20.000 = 30.000 €$$



For q = 10,000 units, it is indifferent to use one process or another from the point of view of profitability, because you get the same benefit. But which takes the most risk? We see it with the calculation of operating leverage.

$$AO(A)_{q=10000} = \frac{q \times m}{q \times m - CF} = \frac{10.000 \times 7}{10.000 \times 7 - 40.000} = \frac{70.000}{30.000} = 2{,}33$$

$$AO(B)_{q=10000} = \frac{q \times m}{q \times m - CF} = \frac{10.000 \times 5}{10.000 \times 5 - 20.000} = \frac{50.000}{30.000} = 1{,}66$$

With this calculation it is seen that for q = 10,000 units, although with both processes the profit is the same, A is a more risky production system than B. We could also see that A has a lower break-even point than B, therefore, being at a production level of 10,000 units, this value is farther from the break-even point in B than in A and therefore B assumes less risk (lower AO).

b) Process B (for q = 10,000) would be chosen, because it would increase the unit margin by 5% and therefore increase the total profit, while the profit of process A would remain constant. In addition, by increasing the unit margin, the break-even point also decreases and therefore operational leverage also decreases.

In this way process B would have greater profit and less operational leverage than process A.

c) P = 25 €/ud
q = 6.000 uds

$$B(B) = (P - Cvu) \times q - CF = (25 - 15) \times 6.000 - 20.000 = 40.000 > 30.000$$

Process B would still be preferred.

4. P = 10 €/ud
Cvu = 3 €/ud
CF = 1000 €

a) $$q^* = \frac{CF}{p - Cvu} = \frac{1000}{10 - 3} \approx 143 uds$$

b) $$B = (p - Cvu) \times q - CF = 7 \times 200 - 1000 = 400 €$$

c) $$\underset{q=200}{AO} = \frac{m \times q}{m \times q - CF} = \frac{7 \times 200}{7 \times 200 - 1000} = \frac{1.400}{400} = 3{,}5$$

d) $$\underset{q=250}{AO} = \frac{m \times q}{m \times q - CF} = \frac{7 \times 250}{7 \times 250 - 1000} = \frac{1750}{750} = 2{,}33$$

AO decreases, logically because the level of production has moved away from the break-equilibrium point.

e) $$\underset{\substack{q=200 \\ p=11}}{AO} = \frac{m \times q}{m \times q - CF} = \frac{8 \times 200}{8 \times 200 - 1000} = \frac{1600}{600} = 2{,}66$$

El AO disminuye. Al haberse variado el precio ha variado el punto de equilibrio.

5.

$q = 300 \Rightarrow B^o = 56$

$q = 160 \Rightarrow B^o = 0$

$q = 500$ uds

Unitary margin:

$$B^o(300) - B^o(160) = (300 - 160) \times m \Rightarrow 56 = 140m \Rightarrow m = 0{,}4 €/ud$$

Fixed costs:

$$B = m \times q - CF \Rightarrow 0{,}4 \times 160 - CF = 0 \Rightarrow CF = 64 €$$

Forecast Profit (q = 500):

$$B = m \times q - CF \Rightarrow 0{,}4 \times 500 - 64 = 136 €$$

$$MS = q - q^* = 500 - 160 = 340 uds$$

$$AO = \frac{m \times q}{m \times q - CF} = \frac{0{,}4 \times 500}{0{,}4 \times 500 - 64} = 1{,}47$$

6. q = 100.000 us.
q* = 20.000 us.

As we know:

$$AO = \frac{(p - CV) \times q}{(p - CV) \times q - CF} = \frac{q}{q - \frac{CF}{(p - CV)}}$$

We know that the expression of the breakeven is:

$$q^* = \frac{CF}{P - CV}$$

Replacing the data provided in the statement:

$$AO = \frac{100.000}{100.000 - 20000} = 1{,}25$$

7. m = 10 €/ud
q = 2.000 uds.
CF = 1.000 €

a) As we know:

$$q^*(A) = \frac{CF}{P - Cvu} = \frac{1.000}{10} = 100\,uds$$

b) Aplicando la fórmula del apalancamiento operativo:

$$AO(B)_{q=2000} = \frac{m \times q}{m \times q - CF} = \frac{10 \times 2000}{10 \times 2000 - 1000} = \frac{20000}{19000} = 1{,}05$$

8.

a. In order to calculate the solution we have to calculate the cost structure of 2008, on which we are told that there are variations in the 2009.

As we are told that the profit is zero, we can say that I-C=0 at 2008, therefore if we take the values that give us we get:

q= 10.000.000 uds
Pv = 1,3 €/ud
CF = 300.000 + 1.700.000 + 1.000.000 = 3.000.000 €

iIf we clear en I – CF – CV = 0 we get:

10.000.000 · 1,3 – 3.000.000 – (10.000.000 · Cvu) = 0

And clearing we know that Cvu = 1,0 €/ud

On the same formula we would vary the expense data for the year 2009:
15% increase in CF means CF = 3.450.000 €
Decrease in Cvu by a 1% implica Cvu = 0.99 €

1,3 q – 3.450.000 – 0,99 q = 0

where

q= 11.129.032 units and it is the breakeven point

b. I couldn't make a profit with these plans because making 11,129,032 bottles is impossible, given that the maximum production volume is 11,000,000.