September 13, 2013 Kelvin Delgado

 TCET 4140 Daniela Vladutescu

**Homework #2 Ch2**

2-11. A large, profitable commercial airline company flies 737-type aircraft, each with a maximum seating capacity of 132 passengers. Company literature states that the economic breakeven point with these aircraft is 62 passengers.

1. **Draw a conceptual graph to show total revenue and total costs that this company is experiencing.**



D’1 is the breakeven pint

b. **Identify three types of fixed costs that the airline should carefully examine to lower its breakeven point. Explain your reasoning.**

One fixed cost may be interest costs on borrowed capital; this can be lowered by pay off borrowed capital. Insurance costs are another fixed costs that maybe lowered by getting quotes from other insurances. The last fixed cost is corporate/administrative overhead; by lowering overhead cost the airline will be able to breakeven with fewer passengers.

 c. **Identify three types of variable costs that can possibly be reduced to lower the breakeven point. Why did you select these cost items?** Fuel, labor, and flight crew are variable cost that be varied to lower breakeven.

2-12. A company produces circuit boards used to update outdated computer equipment. The fixed cost is $42,000 per month, and the variable cost is $53 per circuit board. The selling price per unit is p = $150 − 0.02D. Maximum output of the plant is 4,000 units per

Month.

1. **Determine optimum demand for this product.**

$$D^{\*}=\frac{a-cv}{2b}=\frac{\$150-\$53}{2(0.02)}=2425 units per month$$

1. **What is the maximum profit per month?**

[$150*(*2,425*)* − 0.02*(*2,425*)^*2] − [$42,000 + $53*(*2,425*)*] = $75,612.50

1. **At what volume does breakeven occur?**

−*bD*2 + *(a* − *cv)D* − *CF* = 0

−0.02*D^*2 + *(*$150 − $53*)D* − $42,000 = 0

−0.02*D^*2 + 97*D* − 42,000 = 0

1. **What is the company’s range of profitable demand?**

$$D^{' }=\frac{-97 \pm [(97)\^2 - 4(-0.02)(-42,000)]\^0.5}{2(-0.02)}$$

$$D^{'1}=\frac{-97 + 77.8}{-0.04}=480.62 units per month.$$

$$D^{'2}=\frac{-97- 77.8}{-0.04}=4,370.00 units per month.$$

2-13. A local defense contractor is considering the production of fireworks as a way to reduce dependence on the military. The variable cost per unit is $40. The fixed cost that can be allocated to the production of fireworks is negligible. The price charged per unit will be determined by the equation p = $180 − (5)D, where D represents demand in units sold per week.

1. **What is the optimum number of units the defense contractor should produce in order to maximize profit per week?**

$$D^{\*}=\frac{a-cv}{2b}=\frac{\$180-\$40}{2(5)}=14 units per week$$

1. **What is the profit if the optimum numbers of units are produced?**

[$180(14) − 5(14)^2] − [$40(14)] = $980.00

2-14. A large wood products company is negotiating a contract to sell plywood overseas. The fixed cost that can be allocated to the production of plywood is $900,000 per month. The variable cost per thousand board feet is $131.50. The price charged will be determined by

p = $600 − (0.05)D per 1,000 board feet.

1. **For this situation determine the optimal monthly sales volume for this product and calculate the profit (or loss) at the optimal volume.**

$$D^{\*}=\frac{a-cv}{2b}=\frac{\$600-\$131.50}{2(0.05)}=4685 units per month$$

[$600*(*4685*)* − 0.05*(*4685*)^*2] − [$900,000+ $131.50*(*4685*)*] = -$197,461.25

1. **What is domain of profitable demand during a month?**

$$D^{' }=\frac{-468.50 \pm [(468.50)\^2 - 4(-0.05)(-900,000)]\^0.5}{2(-0.05)}$$

$$D^{'1}=\frac{-468.50 + 198.73}{-0.04}=6,744.25 units per month.$$

$$D^{'2}=\frac{-97- 198.73}{-0.04}=7,393.25 units per month.$$

2-15. A company produces and sells a consumer product and is able to control the demand for the product by varying the selling price. The approximate relationship between price and demand is p = $38 + 2,700/D − 5,000/D2, for D > 1, where p is the price per unit in dollars and D is the demand per month. The company is seeking to maximize its profit. The fixed cost is $1,000 per month and the variable cost (cv) is $40 per unit.

1. **What is the number of units that should be produced and sold each month to maximize profit?**

 Profit = Revenue – CT

 Profit = (38 + 2700/D – 5000/D2 )D – (1000 + 40D)

 = 38D + 2700 – 5000/D – 1000 – 40D

 = 1700 – 2D – 5000/D

 dp/dD = -2 + 5000/D2

 dp/dD = 0, -2 + 5000/D2 = 0

$$ \sqrt{D^{2}}=\sqrt{2500}=D=50$$

1. **Show that your answer to Part (a) maximizes profit.**

Profit=-2D-5000/D+1700=-2\*50-5000/50+1700=150

Price=38+2700/D-5000/D^2=90

2-16. An electric power plant uses solid waste for fuel in the production of electricity. The cost Y in dollars per hour to produce electricity is Y = 12 + 0.3X + 0.27X^2, where X is in megawatts. Revenue in dollars per hour from the sale of electricity is 15X−0.2X^2. Find the value of X that gives maximum profit.

Y = 12 + 0.3X + 0.27X2 = CT

Revenue = 15X - 0.2X2

Profit = Revenue – CT

 = (15X – 0.2X2) – (12 + 0.3X + 0.27X2)

 = 15X - 0.2X2 – 12 – 0.3X – 0.27X2

 = -0.47X2 +14.7X – 12

 d(Profit)/dD = 0

 - 0.94X + 14.7 = 0 then

 X = 15.6

2-17. The annual fixed costs for a plant are $100,000 and the variable costs are $140,000 at 70% utilization of available capacity, with net sales of $280,000. **What is the breakeven point in units of production if the selling price per unit is $40?**

FC = $100000, VC = $140000

Sale = $280000/ year

P = $40

D’ = CF(p – cv)

VC = cv\*D then cv = VC/D

D = $280000/40 = 7000 units/year

cv = VC/D = 140000/7000 = 20

then D’ = 100000/(40-20)

D’ =5000 units