Chapter 16

Estimating Cash Flows

16-1

A small community outside of Atlanta Georgia is planning to construct a new fire station. As currently planned it will have 7,000 square-feet under roof. The area cost factor is 86% of the 144-city average. The estimated cost per square foot for a typical 3,500 square facility is \$98. Based on economies of scale a size adjustment factor of 95% can be used. Estimate the cost of the construction. Assume a cost growth factor of 1.364.

Solution

Estimated cost = 98(7,000)(.95)(.86)(1.364)
= \$764,470

16-2

In 2000 a new 21-kW power substation was built in Gibson county Tennessee for 1.4 million dollars. Weakley county, a neighboring county, is planning on building a similar though smaller substation in 2003. An 18-kW substation is planned for Weakley county. The inflation rate between 2001 and 2003 has averaged 1.5% per year. If the capacity exponent is .85 for this type of facility what is the estimated cost of construction?

Solution

Cost of the 21-kW substation in 2003 dollars = $1,400,000(1.015)^3$ = \$1,463,950

$C_x = C_k(S_x/S_k)^n$

$C_{21} = C_{18}(18/21)^{.85}$ = 1,463,950(.8772)
= \$1,284,177

16-3

The time required to produce the first gizmo is 1500 blips. Determine the time required to produce the 450th gizmo if the learning-curve coefficient is .85.

Solution

$T_i = T_1\Theta^{(\ln i/\ln 2)}$

$T_{450} = 1500(.85)^{(\ln 450/\ln 2)}$ = 358.1 blips

16-4

Four operations are required to produce a certain product produced by ABC Manufacturing. Using information presented in the table below, determine the labor cost of producing the 1000 piece.

	Time required for 1st piece	Learning curve coefficient	Labor cost per hour
Operation 1	1 hour 15 minutes	.90	\$ 8.50
Operation 2	2 hours	.82	12.00
Operation 3	2 hours 45 minutes	.98	7.75
Operation 4	4 hours 10 minutes	.74	10.50

Solution

$T_i = T_1\Theta^{(\ln i/\ln 2)}$

Operation 1

$T_{1000} = 75(.90)^{(\ln 1000/\ln 2)} = 26.25$ minutes
Cost = 26.25/60 x 8.50 = \$3.72

Operation 2

$T_{1000} = 120(.82)^{(\ln 1000/\ln 2)} = 16.61$ minutes
Cost = 16.61/60 x 12.00 = \$3.32

Operation 3

$T_{1000} = 165(.98)^{(\ln 1000/\ln 2)} = 134.91$ minutes
Cost = 134.91/60 x 7.75 = \$17.43

Operation 4

$T_{1000} = 250(.74)^{(\ln 1000/\ln 2)} = 12.44$ minutes
Cost = 12.44/60 x 10.50 = \$2.18

Total cost = 3.72 + 3.32 + 17.43 + 2.18 = \$26.65

16-5

Turbo Tire has developed a new tire that it believes will be very competitive in the market place. It expects that the tire will be a solid seller for the next several years. The marketing department estimates that the upper limit in the demand will be 800,000 tires. Initially the tires will be sold for \$56.00 each and after 2 years the price will increase by \$8.00 each year until the price reaches

\$80.00. The cost of production for each tire is estimated to be \$32.00 the first year and will increase by \$4.00 each year. Assume that a Pearl curve with a = 6,000 and b = 4 applies. What will be the expected demand for the next 5 years? What are the expected revenues (gross and net) for the same period?

Solution

$D = L/(1 + ae^{-bt}) = 800{,}000/(1 + 6{,}000e^{-4t})$

Year	1	2	3	4	5
Demand	7,214	265,536	771,556	799,460	799,990
Revenue	\$403,984	14,870,016	49,379,584	57,561,120	63,999,200
Cost	\$230,848	9,562,896	30,862,240	35,176,240	38,399,520
Net Revenue	\$173,136	5,307,120	18,517,344	22,384,880	25,599,680

16-6

American Petroleum (AP) recently completed construction on a large refinery in Texas. The final construction cost was \$17,500,000. The refinery covers a total of 340 acres. The Expansion and Acquisition Department at AP is currently working on plans for a new refinery for the panhandle of Oklahoma. The anticipated size is approximately 260 acres. If the capacity exponent is .67 for this type of facility what is the estimated cost of construction?

Solution

$C_x = C_k(S_x/S_k)^n$

$$C_{260} = C_{340}(260/340)^{.67} = 17{,}500{,}00(.83549)$$
$$= \$14{,}621{,}075$$

16-7

A new training program at Arid Industries is intended to lower the learning curve coefficient of a certain molding operation that currently costs \$95.50/hour. The current coefficient is .87 and the program hopes to lower the coefficient by 10%. Assuming the time to mold the first product is 8 hours. What cost savings can be realized when the 2000th piece is produced if the program is successful?

Solution

$T_i = T_1\Theta^{(\ln i/\ln 2)}$

Without the training program:

$T_{2000} = 8(.87)^{(\ln 2000/\ln 2)} = 1.74$ hours

With the training program:

$T_{2000} = 8(.783)^{(ln\ 2000/ln\ 2)} = .547$ hours

Cost savings = (1.74 - .547)(95.50) = $113.93

16-8

The following data is has been provided by XYZ Manufacturing concerning one of their most popular products. Estimate the selling price per unit.

Labor	= 12.8 hours at $18.75/hour
Factory overhead	= 92% of labor
Material costs	= $65.10
Packing cost	= 10% of materials
Sales commission	= 10% of selling price
Profit	= 22% of selling price

Solution

Labor Cost	=	12.8 x 18.75	= $240.00
Factory overhead	=	92% of labor	= 220.80
Material cost	=		= 65.10
Packing Cost	=	10% of material costs	= 6.51
			$532.41

Let X be the selling price

$$0.10X + 0.22X + 532.41 = X$$
$$0.68X = 532.41$$
$$X = 532.41/0.68 = \$782.96$$