

How to Calculate an Experience Curve

In its simplest form, the experience curve (EC) represents the relationship between cost and volume when accumulated volume has doubled. The slope of the experience curve when accumulated volume has doubled equals 2^α . This formula implies that, each time the accumulated volume in units of the product doubles, costs drop by $1-2^\alpha$.

$$EC = 1 - 2^\alpha, \text{ where } \alpha = (\log C_2 - \log C_1) / (\log AV_2 - \log AV_1)$$

Where C_1 = Total costs less raw material costs per unit of output in real dollars in period 1

C_2 = Total costs less raw material cost per unit of output in real dollars in period 2

AV_1 = Accumulated volume in period 1

AV_2 = Accumulated volume in period 2

Converting nominal or current dollars to real dollars:

$$\text{Real dollars} = (\text{Nominal Dollars} / \text{Price Deflator}) \times 100$$

Calculating accumulated volumes: Add annual volume and take a cumulative total each year

<u>Year</u>	<u>Annual Data</u>	<u>Accumulated Data</u>
1996	12	12
1997	14	26
1998	10	36
1999	15	51
2000	20	71

Example: Computer Corporation of America produced .1 million units in 1990, its first year of production. Its accumulated annual production since 1990 reached 10 million units in 1999 (i.e., the sum of annual production since 1990). Its value-added costs (i.e., total costs less raw material costs) were \$2,500 per PC in 1990 and \$300 per PC in 1999 in constant 1990 dollars. The firm's selling price of a PC in 1990 was \$3000 and \$400 in 1999 in constant 1990 dollars. Estimate the firm's experience curves based on costs and prices.

$$EC_{\text{cost}} = 1 - 2^{\{(\log \$300 - \log \$2,500) / (\log 10,000,000 - \log 100,000)\}} = 1 - 2^{\{(2.4771-3.3979)/(7.000-5.000)\}} = 1 - 2^{-.4604} = -.3759 \text{ (Whenever output doubles, costs per unit of production fall by 37.59\%)}$$

$$EC_{\text{price}} = 1 - 2^{\{(\log \$400 - \log \$3000) / (\log 10,000,000 - \log 100,000)\}} = 1 - 2^{\{(2.6021-3.4771)/2.000\}} = 1 - 2^{-.4375} = -.3543 \text{ (Whenever output doubles, constant dollar prices fall by 35.43\%)}$$

Implication: These curves are useful for projecting both costs and selling prices for commodity-type industries in which economies of scale are important.¹

¹Real dollar costs and prices are calculated by dividing the actual dollar figures by a price index for that year such as the implicit price deflator for gross domestic product. To convert the \$400 selling price expressed in constant 1990 dollars to 1999 dollars, multiply \$400 by the 1999 implicit price deflator.