

Problem

A firm is planning to create an electric vehicle Gigafactory. This will have either 100 assembly machines (for a small facility) or 250 assembly machines (for a large facility). The current net revenue per machine is £28,000. Next year this will either rise to £37,500 (with a 65% probability) or fall to £11,500 (with a probability of 35%) – and stay there forever after. The variable cost for construction is £170,000/machine plus a fixed cost of £3,200,000 for a small facility or £29,000,000 for a large facility. Assume the factory is built this year and revenues are generated right away. The risk-free rate is 10%. Which facility will the company choose, and how much money will they make (in millions)?

Solution

By using the formula for an infinite geometric series (a = first term, r = ratio, $|r| < 1$):

$$S_{\infty} = \frac{a}{1 - r}$$

100 machines give a PV of:

$$100 * [28,000 - 170,000 + \frac{65\% * £37,500 + 35\% * £11,500}{0.1}] - £3,200,000 = £11,000,000$$

250 machines give a PV of:

$$250 * [28,000 - 170,000 + \frac{65\% * £37,500 + 35\% * £11,500}{0.1}] - £29,000,000 = 6,500,000$$

So, the company will choose the small facility and get £11,000,000 = **£11M**

Answer: 11