**Breakeven and Sensitivity**

The optimistic, most likely, and pessimistic estimates for a given project are shown in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Optimistic | Most Likely | Pessimistic |
| Capital Investment | $90,000 | $100,000 | $120,000 |
| Useful Life | 12 years | 10 years | 6 years |
| Market Value | $30,000 | $20,000 | $0 |
| Net Annual Cash Flow | $35,000 | $30,000 | $20,000 |
| MARR (per year) | 10% | 10% | 10% |

1. What is the Annual Worth (AW) of each of the three cases (optimistic, most likely, pessimistic)?
2. The most critical factors are useful life and net annual cash flow. Complete the table below showing the AW for all combinations of these two factors.

|  |  |  |
| --- | --- | --- |
|  |  | Net Annual Cash Flow |
|  |  | Optimistic | Most Likely | Pessimistic |
| Useful Life | Optimistic |  |  |  |
| Most Likely |  | $14,984 |  |
| Pessimistic |  |  |  |

If there are “N” present “worths” that are positive, then is it appropriate to state that the probability of success is N/9?

 **Probabilistic Risk Analysis**

Complete the table below and select the best alternative for levee improvement to protect the town in the event of a flood. Assume a 30-year life on the problem, the levee project will be financed with bonds that will pay 5% interest, and that the annual worth of the average property damage from a flood that exceeds the levee will cost $100,000,000.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Possible Annual Flood Level (feet) | Probability of Flood Exceeding Levee(p) | Investment to Increase the Levee Height to Protect (I) | Annual Cost of Financing the Rebuild = (I)\*(A/P,5%,30)(C) | Annual Property Damage = $100M X (p)(D) | Expected Total Annual Cost (C) + (D) |
| 500 | 0.005 | $100,000,000 | 6,510,000 |  |  |
| 400 | 0.010 | $70,000,000 |  | 1,000,000 |  |
| 300 | 0.050 | $35,000,000 |  |  | 7,278,500 |
| 200 | 0.100 | $20,000,000 |  |  |  |
| 100 | 0.200 | $10,000,000 |  |  |  |

Which flood is best to protect against (i.e. lowest expected total annual cost)?