

Review Question: Equivalent Annual Annuity

- 1) The EAA tools can be applied to projects with net benefits instead of just net costs. So instead of trying to minimize the Equivalent Annual cost (like the example in class), you are trying to maximize the Equivalent Annual benefit. Try the following question:

Your company is considering the following 2 projects:

	Year 0	1	2	3
A	-40	30	50	10
B	-50	40	50	

The discount rate is 8%. What are the NPV's of the two projects?

$$NPV_A = -40 + \frac{30}{1.08} + \frac{50}{(1.08)^2} + \frac{10}{(1.08)^3} = 38.58$$

$$NPV_B = -50 + \frac{40}{1.08} + \frac{50}{(1.08)^2} = 29.90$$

If you are going to repeat either A or B forever, which one is better?

For EAA(A):

$$38.58 = EAA_A \left(\frac{1}{0.08} - \frac{1}{0.08(1.08)^3} \right)$$
$$EAA_A = 14.97$$

For EAA(B):

$$29.90 = EAA_B \left(\frac{1}{0.08} - \frac{1}{0.08(1.08)^2} \right)$$
$$EAA_B = 16.77$$

Investment B is better, as it has the higher EAA.

Review Question: Real Options

You are in charge of new product development and you are trying to decide whether to roll out a new product. It will cost \$1 billion to set-up the fabrication unit and to manufacture the first batch of the product. There is a 70% chance that the product will be a hit and a 30% chance that the product will flop.

If the product is a hit, you will get revenues with a PV of \$3 billion.

If the product is a flop, you will get revenues with a PV of only \$100 million.

You can (if you want) spend \$20 million to test market the product, which will tell you for sure if the product will be a hit (70% chance) or a flop (30% chance).

Use a decision tree to show the expected NPV if you go ahead without test marketing and the expected NPV if you test market first. How does test marketing add value even though it costs money?

Without test-marketing:

Today	PV of future CFs
	\$3 B (with probability = 70%)
-\$1 B	\$0.1 B (with probability = 30%)

$$E(\text{CF}) = (0.70)(3\text{B}) + (0.30)(0.1\text{ B}) = 2.13\text{B}$$

$$\text{NPV} = -1\text{B} + 2.13\text{B} = 1.13\text{B}$$

With test marketing:

Today	PV of future CFs
	- 1B + 3B = 2B (with probability = 70%)
-0.02B	-1B + 0.1B = -0.9B (with probability = 30%)

Obviously, if we test-market the product and find that it will be a flop, then we don't invest (we wouldn't invest 1B to get 0.1B back). So the CFs are:

Today

PV of future CFs

-0.02B

- 1B + 3B = 2B (with probability = 70%)

0 (with probability = 30%)

$$\mathbf{E(CF) = (0.70)(2B) + (0.30)(0) = 1.4B}$$

$$\mathbf{NPV = -0.02B + 1.4B = 1.38B}$$

So it is a better financial decision to test-market, as the NPV is \$250 million higher than not test-marketing.