FIN104 Tutorial Questions - Week 8

1. **IRR/NPV. If the opportunity cost of capital is 11%, which of these projects is worth pursuing? (CH8.Q1)**

Year	Project A	Project B
0	–$200	–$200
1	80	100
2	80	100
3	80	100
4	80	

Answer:

NPV_A = –$200 + [$80 × annuity factor (11%, 4 periods)]

$$= -\$200 + \$80 \times \left[\frac{1}{0.11} - \frac{1}{0.11 \times (1.11)^4}\right] = \$48.20$$

NPV_B = –$200 + [$100 × annuity factor (11%, 3 periods)]

$$= -\$200 + \$100 \times \left[\frac{1}{0.11} - \frac{1}{0.11 \times (1.11)^3}\right] = \$44.37$$

Both projects are worth pursuing.

2. **Mutually Exclusive Investments. Suppose that you can choose only one of these projects. Which would you choose? The discount rate is still 11%. (CH8.Q2)**

Answer:

Choose Project A, the project with the higher NPV.

3. Payback and NPV. Here are the expected cash flows for three projects: (CH8.Q29)

		Cash Flows (dollars)				
Project	Year:	0	1	2	3	4
A		−5,000	+1,000	+1,000	+3,000	0
B		−1,000	0	+1,000	+2,000	+3,000
C		−5,000	+1,000	+1,000	+3,000	+5,000

a. What is the payback period on each of the projects?

b. If you use the payback rule with a cutoff period of 2 years, which projects will you accept?

c. If you use a cutoff period of 3 years, which projects will you accept?

d. If the opportunity cost of capital is 10%, which projects have positive NPVs?

e. "Payback gives too much weight to cash flows that occur after the cutoff date." True or false?

Answers:

a.

Project	Payback
A	3 years
B	2 years
C	3 years

b. Only Project B satisfies the 2-year payback criterion.

c. All three projects satisfy a 3-year payback criterion.

d. $$NPV_A = -\$5{,}000 + \frac{\$1{,}000}{1.10} + \frac{\$1{,}000}{(1.10)^2} + \frac{\$3{,}000}{(1.10)^3} = -\$1{,}010.52$$

$$\text{NPV}_\text{B} = -\$1{,}000 + \frac{\$1{,}000}{(1.10)^2} + \frac{\$2{,}000}{(1.10)^3} + \frac{\$3{,}000}{(1.10)^4} = \$3{,}378.12$$

$$\text{NPV}_\text{C} = -\$5{,}000 + \frac{\$1{,}000}{1.10} + \frac{\$1{,}000}{(1.10)^2} + \frac{\$3{,}000}{(1.10)^3} + \frac{\$5{,}000}{(1.10)^4} = \$2{,}404.55$$

Projects B and C have positive NPV.

e. False. Payback gives *no* weight to cash flows after the cutoff date.

4. Equivalent Annual Annuity. A firm can lease a truck for 4 years at a cost of $30,000 annually. It can instead buy a truck at a cost of $80,000, with annual maintenance expenses of $10,000. The truck will be sold at the end of 4 years for $20,000. (CH8.Q33)

a. What is the equivalent annual cost of buying and maintaining the truck if the discount rate is10%?

b. Which is the better option: leasing or buying?

Answer:

Leasing is the better option.

PV of costs

= \$80,000 + [\$10,000 × annuity factor (10%, 4 years)] – [\$20,000/$(1.10)^4$]

$$= \$80{,}000 + \$10{,}000 \times \left[\frac{1}{0.10} - \frac{1}{0.10 \times (1.10)^4}\right] - \frac{\$20{,}000}{(1.10)^4}$$

= \$80,000 + \$31,698.65 – \$13,660.27

= \$98,038.38

The equivalent annual cost is the payment with the same present value. Solve the following equation for C:

$$C \times \left[\frac{1}{0.10} - \frac{1}{0.10 \times (1.10)^4}\right] = \$98{,}038.38 \Rightarrow C = \text{EAC} = \$30{,}928.25$$

Using a financial calculator, enter n = 4; i = 10; FV = 0; PV = (–) 98,038.38; compute PMT.

If you can lease instead for \$30,000, then this is the less costly option.

You can also compare the PV of the lease costs to the total PV of buying:

$30,000 × annuity factor (10%, 4 years) =

$$\$30{,}000 \times \left[\frac{1}{0.10} - \frac{1}{0.10 \times (1.10)^4} \right] = \$95{,}095.96$$

The PV of the lease costs is less than the PV of the costs when buying the truck.

5. **Replacement Decision. You are operating an old machine that is expected to produce a cash inflow of $5,000 in each of the next 3 years before it fails. You can replace it now with a new machine that costs $20,000 but is much more efficient and will provide a cash flow of $10,000 a year for 4 years. Should you replace your equipment now? The discount rate is 15%. (CH8.Q36)**

Answer:

The equivalent annual cost of the new machine is the 4-year annuity with present value equal to $20,000:

$$C \times \left[\frac{1}{0.15} - \frac{1}{0.15 \times (1.15)^4} \right] = \$20{,}000$$

$C \times$ annuity factor (15%, 4 years) = $20,000

$C \times 2.85498 = \$20{,}000 \Rightarrow C$ = EAC = $7,005.30

This can be interpreted as the extra yearly charge that should be attributed to the purchase of the new machine spread over its life. It does not yet pay to replace the equipment since the incremental cash flow provided by the new machine is:

$10,000 – $5,000 = $5,000

This is less than the equivalent annual cost of the new machine.