3.10 Net Present Value. Assume that your firm wants to choose between two project options:

Project A: $500,000 invested today will yield an expected income stream of $150,000 per year for 5 years, starting in Year 1.

Project B: an initial investment of $400,000 is expected to produce this revenue stream: Year 1 = 0, Year 2 = $50,000, Year 3 = $200,000, Year 4 = $300,000, and Year 5 = $200,000.

Assume that a required rate of return for your company is 10% and that inflation is expected to remain steady at 3% for the life of the project. Which is the better investment? Why?

By using the NPV formula shown in the chapter, we can calculate the Net Present Value for each projects and thus decide which one is better:

$$\begin{aligned} NPV_(Proj.A) &= I_o + \sum_{t=1}^{t} \frac{F_t}{(1+r+p_t)^t} \\ &= -500,000 + \sum_{t=1}^{5} \frac{150,000}{(1+0.10+0.03)^t} \\ &= 26,200 \\ NPV_(Proj.B) &= -400,000 + \frac{0}{1.13^1} + \frac{50,000}{1.13^2} + \frac{200,000}{1.13^3} + \frac{300,000}{1.13^4} + \frac{200,000}{1.13^5} \\ &= -400,000 + 0 + 39,160 + 138,659 + 183,993 + 108,589 \\ &= 70,401 \end{aligned}$$

Thus, after comparing two projects, we can see that the revenue brought by the project B is higher, and thus we should choose project B.

11. Projects W, X, Y, and Z are each being screened according to four criteria: potential return on investment, lack of technological risk, environmental "friendliness," and service to community:

- Project W: return, high; lack of risk, medium; environment, medium; service, low.
- Project X: return, medium; lack of risk, high; environment, medium; service, low.
- Project Y: return, medium; lack of risk, medium; environment, high; service, high.
- Project Z: return, medium; lack of risk, medium; environment, high; service, low.

Create a scheme for screening the projects, assuming equal weight for all criteria. Which project comes out best, which worst?

In order to determine which project is the best or the worst, we first define the scoring scheme:

High: 3 Points
Medium: 2 Points
Low: 1 Points

Now we can calculate the score for each investment:

$$\begin{aligned} \textbf{Project W:} &= 3(Return) + 2(Risk) + 2(Environment) + 1(Service) = 8 \\ \textbf{Project x:} &= 2(Return) + 3(Risk) + 2(Environment) + 1(Service) = 8 \\ \textbf{Project Y:} &= 2(Return) + 2(Risk) + 3(Environment) + 3(Service) = 10 \\ \textbf{Project Z:} &= 2(Return) + 2(Risk) + 3(Environment) + 1(Service) = 8 \end{aligned}$$

Thus, from the above results, we can see that the best option is **Project Y**, and all other three project are similarly worse.

12. For the previous four projects, assign scores of high = 3, medium = 2, and low = 1. Assume the criteria are weighted: potential return on investment = 0.3, lack of technological risk = 0.3, environmental "friendliness" = 0.3, and service to community = 0.1. Now which projects come out best and worst?

For this one, we use the similar process, but each creteria is weighted. Thus, we have the following calculations:

Project W:
Return: 3*0.3 = 0.9
Risk: 2*0.3 = 0.6
Environment: 2*0.3 = 0.6
Service: 1*0.1 = 0.1
Total: 0.9+0.6+0.6+0.1 = ***2.2***

Project X:
Return: 2*0.3 = 0.6
Risk: 3*0.3 = 0.9
Environment: 2*0.3 = 0.6
Service: 1*0.1 = 0.1
Total: 0.9+0.6+0.6+0.1 = ***2.2***

Project Y:
Return: 2*0.3 = 0.6
Risk: 2*0.3 = 0.6
Environment: 3*0.3 = 0.9
Service: 3*0.1 = 0.3
Total: 0.6+0.6+0.9+0.3 = ***2.4***

Project Z:
Return: 2*0.3 = 0.6
Risk: 2*0.3 = 0.6
Environment: 3*0.3 = 0.9
Service: 1*0.1 = 0.1
Total: 0.6+0.6+0.9+0.1 = ***2.2***

Thus, again, from the above results, we can see that the best option is still **Project Y**, and all other three are similarly worse.