

IE 342 17-18 Spring Semester

Study Set 4

Please do not submit your answers as they will not be graded!!

- 1) Consider the investment projects below, all of which have a four year investment life:

| Project's Cash Flow (\$) |          |          |          |          |
|--------------------------|----------|----------|----------|----------|
| n                        | A        | B        | C        | D        |
| 0                        | -\$3,500 | -\$6,500 | -\$2,800 | -\$4,300 |
| 1                        | 0        | 1,600    | -1,800   | -1,000   |
| 2                        | 0        | 1,800    | -900     | 1,900    |
| 3                        | 0        | 1,500    | 2,500    | 2,300    |
| 4                        | 4,200    | 2,200    | 3,500    | 1,500    |

Compute the net present worth of each project at  $i=10\%$ . Which project would you select? (Based on NPW criterion).

- 2) Consider the following cash flows:

| Project's Cash Flow (\$) |          |          |          |          |
|--------------------------|----------|----------|----------|----------|
| n                        | A        | B        | C        | D        |
| 0                        | -\$3,200 | -\$5,000 | -\$8,000 | -\$4,000 |
| 1                        | 600      | 1,500    | 2,000    | 5,000    |
| 2                        | 600      | 2,000    | 2,000    | 2,500    |
| 3                        | 600      | 500      | 2,000    | -3,000   |
| 4                        | 600      | 500      | 5,000    | -1,000   |
| 5                        | 600      | 500      | 5,000    | 1,500    |
| 6                        | 600      | 1,500    |          | 2,000    |
| 7                        | 600      |          |          | 2,500    |
| 8                        | 600      |          |          |          |

- Calculate the (conventional) payback period for each project.
- Determine whether it is meaningful to calculate a payback period for project D.
- Assuming that  $i=10\%$ , calculate the discounted payback period for each project.

- 3) Travis Wenzel has \$2,000 to invest. Usually, he would deposit the money in his savings account, which earns 6% interest compounded monthly. However, he is considering three alternative investment opportunities:

**Option 1:** Purchasing a bond for \$2,000. The bond has a face value of \$2,000 and pays \$100 every six months for three years, after which time the bond matures.

**Option 2:** Buying and holding a stock that grows 11% per year for three years.

**Option 3:** Making a personal loan of \$2,000 to a friend and receiving \$150 per year for three years.

Determine the equivalent annual cash flows for each option, and select the best option.

4) Consider the cash flows in table below for the following investment projects.

| Project's Cash Flow (\$) |          |          |          |          |        |
|--------------------------|----------|----------|----------|----------|--------|
| n                        | A        | B        | C        | D        | E      |
| 0                        | -\$1,800 | -\$1,500 | -\$4,000 | -\$1,400 | -1,500 |
| 1                        | 1,150    | 1,200    | 1,500    | -450     | -500   |
| 2                        | 700      | 700      | X        | -450     | -500   |
| 3                        | 200      | 700      | 1,800    | -450     | -500   |
| 4                        | 200      | 100      | X        | -450     | -500   |

- Suppose projects A and B are mutually exclusive. On the basis of the NPW criterion, which project would be selected? Assume that MARR=15%
- Find the minimum value of X that makes project C acceptable, still using MARR=15%?
- Would you accept project D at  $i=18\%$ ?
- Assume that projects D and E are mutually exclusive. On the basis of the NPW criterion, which project would you select?

5) The owner of a business is considering investing \$55,000 in new equipment. He estimates that the net cash flows will be \$5,000 during the first year, but will increase by \$2,500 per year the next year and each year thereafter. The equipment is estimated to have a 10-year service life and a net salvage value of \$6,000 at that time. The firm's interest rate is 12%.

- Determine the annual capital cost (ownership cost) for the equipment.
- Determine the equivalent annual savings (revenues).
- Determine whether this is a wise investment.

6) Consider the two mutually exclusive investments projects in table below, which have unequal service lives.

| Project's Cash Flow |           |               |           |               |
|---------------------|-----------|---------------|-----------|---------------|
| Year                | A         |               | B         |               |
|                     | Cash Flow | Salvage Value | Cash Flow | Salvage Value |
| 0                   | -\$35,000 |               | -\$22,000 |               |
| 1                   | -\$3,000  |               | -\$2,500  |               |
| 2                   | -\$3,000  |               | -\$2,500  |               |
| 3                   | -\$3,000  |               | -\$2,500  | \$4,500       |
| 4                   | -\$3,000  |               |           |               |
| 5                   | -\$3,000  | \$2,500       |           |               |

Both projects A and B will be available (or can be repeated) with the same costs and salvage values. Assuming an infinite planning horizon:

- On the basis of the NPW criterion, which project is a better choice at MARR = 15% ?
- On the basis Annual Worth Analysis, which project is a better choice at MARR = 15% ?

a) Assuming an infinite planning horizon, which project is a better choice at MARR=12%?

**7)** Two methods of carrying away surface runoff water from a new subdivision are being evaluated.

**Method A:** Dig a ditch. The first cost would be \$60,000 and \$25,000 of redigging and shaping would be required at 5-year intervals forever.

**Method B:** Lay concrete pipe. The first cost would be \$150,000 and a replacement would be required at 50-year intervals at a net cost of \$180,000 forever.

At  $i=12\%$ , which method is the better one?