

IE 342 Study Set 3

Fall 2016

Do not submit your solutions as they will not be graded!

- 1) If a project costs \$100,000 and is expected to return \$25,000 annually, how long does it take to recover the initial investment? What would be the discounted payback period at $i = 15\%$?
- 2) Consider the following cash flows in table below:

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			

- a) Calculate the (conventional) payback period for each project.
 - b) Determine whether it is meaningful to calculate a payback period for project D.
 - c) Assuming that $i = 12\%$, calculate the discounted payback period for each project.
- 3) Consider the investment projects all of which have a four-year investment life in the table below. Compute the net present worth of each project at $i = 10\%$.

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

- 4) FootballComm LLC is a manufacturer of devices for football coaches and their coaching staff that enables them to communicate with each other during a game through wireless system. Currently, the company purchases all of its headsets from a China-based supplier, but they have experienced a significant decrease in overall headset quality. To correct the problem, the company is considering

producing their own headsets in-house. The company estimates that the transition will take place over 12 months. The system is expected to have an eight-year service life. Savings and expenditures are given below:

Investment:	
Building (now)	\$500,000
Equipment and Facilities (first year)	\$2,200,000
Annual savings in materials and quality inspection	\$5,000,000
Incremental annual expenses	\$1,500,000
Incremental annual income taxes	\$800,000
Economic Service Life	8 years
Net salvage value	\$1,500,000

If the firm's MARR is 15%, use the NPW method to calculate the economic worth of producing the headsets in house.

- 5) Which of the following investment options will maximize your future wealth at the end of 20 years? Assume any funds that remain invested will earn a nominal rate of 12% compounded monthly.
- Deposit \$5,000 now
 - Deposit \$80 at the end of each month for the first 10 years
 - Deposit \$50 at the end of each month for 20 years
 - Deposit a lump sum in the amount of \$15,000 at the end of year 10
- 6) Consider the following investment projects using the information in table below:
- Compute the future worth at the end of life for each project at $i=12\%$.
 - Determine the acceptability of each project.

n	Project's Cash Flow				
	A	B	C	D	E
0	-\$2200	-\$4500	-\$3200	-\$5400	-\$7200
1	-500	1500	1200	1500	2500
2	900	-4000	0	1000	2800
3	1500	5000	4000	3000	3500
4	3200	6000	7000	3000	-
5	-700	3000	2000	2400	-

- 7) Consider the project balances for a typical investment project with a service life of five years, as shown in the table below.
- Determine the interest rate used in the project balance calculation, and compute the present worth of this project at the computed interest rate.
 - Construct the original cash flows of the project and the terminal balance, and fill in the Xs in the table.

n	A _n	Project Balance
0	-\$3000	-\$3000
1	X	-2700
2	1470	-1500
3	X	0
4	X	-300
5	600	X

- 8) A group of concerned citizens has established a trust fund that pays 5% interest, compounded monthly, to preserve a historical building by providing annual maintenance funds of \$80,000 forever. Compute the capitalized equivalent amount for these building maintenance expenses.
- 9) A newly constructed bridge costs \$15,000,000. The same bridge is estimated to need renovation every 15 years at a cost of \$3,000,000. Annual repairs and maintenance are estimated to be \$1,000,000 a year.
- If the interest rate is 5%, determine the capitalized cost of bridge.
 - Suppose that in (a), the bridge must be renovated every 20 years, not every 15 years. What is the capitalized cost of the bridge?
 - Repeat (a) and (b) with an interest rate of 10%. What can you say about the effect of interest on the results?
- 10) Consider the cash flows in the 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%.
 - Repeat part (a), using the NFW criterion.
 - 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?
- 11) An electric motor is rated at 10 horsepower (HP) and costs \$1200. Its full-load efficiency is specified to be 85%. A newly designed high-efficiency motor of the same size has an efficiency of 90%, but it costs \$1600. It is estimated that the motors will operate at a rated 10 HP output for 2000 hours a year, and the cost of energy will be \$0.09 per kilowatt-hour. Each motor is expected to have a 15-year life. At the end of 15 years, the first motor will have a salvage value of \$50 and the second motor will have a salvage value of \$100. Consider the MARR to be 8%. (Note: 1HP=0.7457 kW.)
- Use the NPW criterion to determine which motor should be installed.
 - In part (a), what if the motors operated 1,000 hours a year instead of 2,000 hours a year? Would the motor you chose in part (a) still be the best choice?

12) A mall with two levels is under construction. The plan is to install only 9 escalators at the start, although the ultimate design calls for 16. The question arises as to whether to provide necessary facilities (stair supports, wiring conduits, motor foundations etc.) that would permit the installation of the additional escalators at the mere cost of their purchase and installation or to defer investment in these facilities until the escalators need to be installed.

Option A. Provide these facilities now for all 7 future escalators at \$300,000.

Option B. Defer the investment in the facility as needed. Install 2 more escalators in two years, 3 more in five years, and the last 2 in eight years. The installation of these facilities at the time they are required is estimated to cost \$140,000 in year 2, \$160,000 in year 5, and \$180,000 in year 8.

Additional annual expenses are estimated at \$7,000 for each escalator facility installed. Assume that these costs begin one year subsequent to the actual addition. At an interest rate of 12%, compare the net present worth of each option over eight years.