

Problem Set 2:
Discounting and Alternative Investment Criteria

Part A: Glass Bottle Unit

The Grsk Group of Industries envisages adding yet another product to their diversified portfolio. Ms. Reem Grsk, Head of the Consultancy Group, has identified glass bottles as a product that will be in high demand in the near future. There are two alternative strategies for investment in glass bottles. The group could either purchase a sick unit and rehabilitate it or set up an entirely new unit. The estimated project life is 11 years.

Alternative A: Making a sick unit viable

The Grsk group has identified an available sick glass-bottle plant. It can be made viable with a few modifications. The expected cash outflows and inflows from this alternative are as follows:

Table 1
(Figures in NPs in Thousands)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12
Outflows	103	80	32.5	37	42	45	46.5	48	48	48	48	44.5	
Inflows			63	68	72	75	78	80	80	80	80	75	22

Alternative B: A New Unit

If a new unit is to be set up, the expected cash outflows and inflows are as follows:

Table 2
(Figures in NPs in Thousands)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12
Outflows	145	130	36.5	38	39	39.5	40	42	42	42.5	42.5	43	
Inflows			72	78	80	82	88	92	93	95	97	98	27.5

In either case, a loan will have to be taken from the Grsk Financial Services Ltd., a fully owned company of the Grsk Group which will charge a low rate of interest of only 6%.

To make a decision, Ms. Grsk has to calculate the NPV of the two alternatives. She is however not certain whether the discount rate to be used is 8% or 10%.

The Assignment:

- 1) If Ms. Grsk evaluates these alternatives using the two discount rates, which alternative would she prefer in each case? Why? Briefly explain the logic of your answer from basic principles of discounting. Show your calculations using discount factors. (Check your answers with the NPV function of the spreadsheet.)
- 2) One of Ms. Grsk's subordinates is of the view that it is more meaningful to compare the net future values of both alternatives at the end of year 12, as this is the year in which all the benefits and costs would have been realized. Although Ms. Grsk does not subscribe to this point of view, she agrees to evaluate the alternatives on this criterion using a discount rate of 8%. Which project would Ms. Grsk choose? Again, please show your calculations using discount factors.
- 3) Another of Ms. Grsk's subordinates argues that the project choice might differ depending on the year in which you calculated the net present (future) value. He suggests that the net future value should be calculated in year 2 when production starts. Calculate the net future value for both projects in year 2 using an 8% discount rate. Do you agree with Ms. Grsk's subordinate? Please explain.
- 4) What is the relationship (if any) between evaluating the project return as of year 0, year 2, and year 12 for the two projects? (compare using the 8% discount rate).

Part B: Project Selection

Mr. Samer Shammah is a fresh engineering graduate who has come into a large legacy. He would like to invest these funds in the best possible manner. Based on certain market studies, his consultant has shortlisted four projects. The first project is for Injection Moulding, the second is for Film Capacitors. The third is for Steel Pipes and the fourth one is for Computer Software. The four options are mutually exclusive, i.e. only one of the four can be implemented. The opportunity cost of funds is 15.00%. Mr. Shammah has been advised to evaluate these projects using the following four investment criteria:

- a) Net Present Value (NPV)
- b) Internal Rate of Return (IRR)
- c) Ratio of net benefits to investment costs, and
- d) Ratio of gross benefits to total costs.

Mr. Shammah's consultant has constructed the following net cash flows (benefit minus cost) for the four projects (Table III). Year zero represents the year of investment.

Table III
(NPs. in Thousands)

Year	0	1	2	3	4	5
Injection Moulding	-3.25	2.75	2.60	2.70	2.55	0
Film Capacitors	-11.25	1.15	1.20	1.25	2.40	8.25
Steel Pipes	-10.00	2.00	2.25	2.25	2.25	2.60
Software Unit	-3.50	-2.00	4.00	3.60	6.00	1.75

The operating costs of these projects have been estimated as follows (Table IV). These figures have already been taken into account in constructing the net cash flows of Table III.

Table IV
(NPs. in Thousands)

Year	0	1	2	3	4	5
Injection Moulding		5.00	5.50	6.00	6.50	0
Film Capacitors		2.80	2.90	3.00	3.20	3.40
Steel Pipes		1.00	1.05	1.15	1.25	1.25
Software Unit		2.00	2.25	2.50	3.20	3.75

The Assignment

- 1) Please rank the four projects using each of the four investment criteria mentioned above.
- 2) Which project would you choose? Why?

In your answers to the above questions, clearly identify and discuss the merits (or demerits) of each of the different investment criteria.

PART C

Evaluation of Projects with Different Lengths of Life

Mr. Pedro Lopez is a progressive farmer and owns a farm house in “Los Pozos”. He is looking at two alternative ways of farm irrigation. One option is to draw water from a nearby canal through a pop-up sprinkler system by constructing an underground network of polyurethane pipes. The other option is to install a shallow tubewell which will also generate revenues through sale of water to the neighboring farms. The sprinkler system has a life of five years while the tubewell life is seven years. Each project is repeatable. The estimated net cash flows (benefit minus cost) are as below:

(NPs. in Thousands)

Year	0	1	2	3	4	5	6
Sprinkler	-0.50	0.45	0.45	0.45	0.45	-	-
Tubewell	-1.10	0.50	0.55	0.60	0.50	0.40	0.30

The two projects are strict alternatives. Due to future contingencies, it will not be possible to repeat either of the projects more than once. When a project is repeated, the construction period in either case is one year. It is assumed that reinvestment cannot occur in the terminating year of the previous project’s life, but only in the year following termination.

The opportunity cost of funds is assumed at 10%.

The Assignment:

What investment strategy will you recommend to Mr. Lopez? While comparing, be sure that the strategies have the same length of time and the result should not be sensitive to which project is adjusted. The analysis should, therefore, be carried out twice; by adjusting the first project and then adjusting the second.