

1. (10 marks) Cirrique Corporation is considering an opportunity that requires an initial investment of \$255,000. The net profit will be \$87,500 in year one, \$100,000 in year two, and then \$77,500 in year three. The salvage value is expected to be \$50,000. Cirrique uses a 12.96 percent rate of return for minimum acceptance of such opportunities. Cirrique's managers focus on the value that would be added to the company and would be reflected in share prices immediately if the opportunity is accepted.

a. (4 marks) Calculate the benefit-cost ratio of the opportunity.

$$BCR = \frac{PV(+ve\ CFs)}{PV(-ve\ CFs)}$$

$$BCR = \frac{npv(12.96, 0, \{87.5, 100, 77.5 + 50\})}{255}$$

$$BCR = 0.957996$$

BCR < 1 ∴ do not accept

Year	
0	-255
1	87
2	100
3	77.5 + 50

4/4

b. (6 marks) Make a recommendation to Cirrique Corporation regarding the opportunity and state the basis for your recommendation. Use an appropriate technique, considering the focus of the managers.

since the BCR is < 1 then this investment should not be accepted.

for value added calculate NPV:

$$npv = npv(12.96, -255, \{87.5, 100, 77.5 + 50\}) * 1000$$

$$= -10711.01$$

npv is the present value added to the company,

since NPV < 0, company wealth decreases so the project should not be accepted.

2. (8 marks) Quirbble Limited is considering an investment in new technology that will return \$94K, \$122K, and \$86K, consecutively, in the three years following the initial outlay of \$176K. The firm uses a minimum acceptable rate of return of 12½ percent, a financing rate of nine percent, and a reinvesting rate of 12.30 percent.
- 5 a. (5 marks) Use the internal rate of return to make a recommendation to Quirbble Limited regarding the investment and clearly state the basis for your recommendation.

$$\text{MARR} = 12.5\%$$

$$\text{IRR} = \text{irr}(-176, \{94, 122, 86\})$$

$$\text{IRR} = 33.084\%$$

Year	CF
0	-176
1	94
2	122
3	86

since $\text{IRR} > \text{MARR}$ accept the investment

- 3 b. (3 marks) The managers of Quirbble Limited require that a more appropriate rate of return be calculated when the internal rate of return is not reasonably close to the minimum acceptable rate of return. Calculate a more appropriate rate of return.

calculate MIRR:

$$(1+i)^3 = \frac{\text{FV}(\text{+ve CFs @ } 12.30\%)}{\text{PV}(\text{-ve CFs @ } 12.30\%)}$$

$$(1+i)^3 = \frac{\text{NPV}(12.30, 0, \{94, 122, 86\}) \cdot (1.1230)^3}{176} \rightarrow (1+i)^3 = 1.926306$$

$$i = 24.733\%$$

still $\text{MIRR} > \text{MARR} \rightarrow$ accept.

3. (13 marks) Querulous Winery Incorporated wants to purchase a fermentation system. They are considering three candidate systems, summarized in the table following.

System	Acquisition Cost	Annual net profit	Salvage value
CS	\$90,000	\$33,000	\$24,300
PG	\$60,000	\$25,200	\$12,900
SGM	\$75,000	\$30,000	\$18,000

All three systems have a useful lifetime of four years. The managers of Querulous Winery need a choice table in order to make a decision. Formulate a table that states which system should be selected, if any, for various levels of the cost of capital or minimum acceptable rate of return. Provide documentation showing how you calculated all the values specified in the table. [Use space on the following page, if necessary.]

NPVs @ 0% :

$$\begin{aligned} \text{npv}_{\text{CS}} &= \text{npv}(0, -90, \{33, 33+24.3\}, \{3, 13\}) * 1000 \\ &= \$ 66,300.00 \end{aligned}$$

$$\begin{aligned} \text{npv}_{\text{PG}} &= \text{npv}(0, -60, \{25.2, 25.2+12.9\}, \{3, 13\}) * 1000 \\ &= \$ 53,700.00 \end{aligned}$$

$$\begin{aligned} \text{npv}_{\text{SGM}} &= \text{npv}(0, -75, \{30, 30+18\}, \{3, 13\}) * 1000 \\ &= \$ 63,000.00 \end{aligned}$$

IRRs :

$$\begin{aligned} \text{irr}_{\text{CS}} &= \text{irr} \{ -90, \{33, 33+24.3\}, \{3, 13\} \} \\ &= 23.785\% \end{aligned}$$

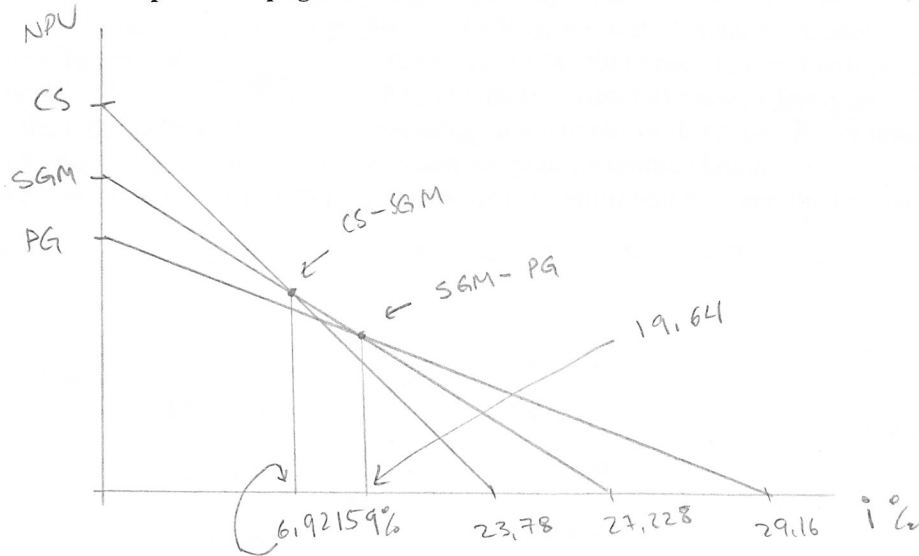
$$\begin{aligned} \text{irr}_{\text{PG}} &= \text{irr} \{ -60, \{25.2, 25.2+12.9\}, \{3, 13\} \} \\ &= 29.16\% \end{aligned}$$

$$\begin{aligned} \text{irr}_{\text{SGM}} &= \text{irr} \{ -75, \{30, 30+18\}, \{3, 13\} \} \\ &= 27.228\% \end{aligned}$$

continued on next page



3. Continued from the previous page



solver CS - SGM:

$$0 = \text{npv}(X, -90, \{33, 33 + 24.3\}, \{3, 13\}) - \text{npv}(X, -75, \{30, 30 + 18\}, \{3, 13\})$$

$$X = 6.92159\%$$

solver SGM - PG

$$0 = \text{npv}(X, -75, \{30, 30 + 18\}, \{3, 13\}) - \text{npv}(X, -60, \{25.2, 25.2 + 12.9\}, \{3, 13\})$$

$$X = 19.64\%$$

Choice table: Choice

0 - 6.92159% → CS ✓

6.92159% - 19.64% → SGM ✓

19.64% - 29.16% → PG ✓

29.16% - ∞ → none ✓

4. (9 marks) Viqtor Corporation needs to purchase new vehicles. The firm is considering two models. Model J costs \$102,000 to purchase and will produce \$22,500 in net profit annually. Model J can be sold for \$13,200 after a useful lifetime of seven years. Model K costs \$78,000 to purchase and will produce \$21,200 in net profit annually. Model K can be sold for \$15,600 after a useful lifetime of five years. The firm uses 8.81 percent as the required rate of return for analyzing acquisitions of this type. Recommend one of the two models to Viqtor Corporation and state the basis for your recommendation. For two bonus marks, determine the rate of return at which Viqtor Corporation would be indifferent between the two models.

use EACF since analysis period is not specified:

	J	K	
cost	102 000	78 000	MARR = 8.81%
profit	22 500	21 200	
salvage	13 200	15 600	
N (life)	7	5	

$$EACF_J = \frac{npv(8.81, -102, \{22.5, 22.5 + 13.2\}, \{6.1\}) * 1000}{\left(\frac{1 - (1.0881)^{-7}}{0.0881}\right)}$$

$$EACF_J = \$ 3805.69$$

$$EACF_K = \frac{npv(8.81, -78, \{21.2, 21.2 + 15.6\}, \{4.1\}) * 1000}{\left(\frac{1 - (1.0881)^{-5}}{0.0881}\right)}$$

$$EACF_K = \$ 3862.08$$

Since $EACF_K > EACF_J \rightarrow$ choose model K because it provides greater annual profit

Bonus: Solver:

$$0 = npv(x, -102, \{22.5, 22.5 + 13.2\}, \{6.1\}) * 1000 \cdot \frac{\left(\frac{x}{100}\right)}{1 - \left(1 + \frac{x}{100}\right)^{-7}}$$

$$+ npv(x, -78, \{21.2, 21.2 + 15.6\}, \{4.1\}) * 1000 \cdot \frac{\frac{x}{100}}{1 - \left(1 + \frac{x}{100}\right)^{-5}}$$

$X = 8.434\%$ at this rate of return indifferent.