

Solutions to end-of-chapter problems

Chapter 8

8.12	Year	Alternative Q	Alternative P	Q - P
	0	-85,000	-50,000	-35,000
	1	43,000	13,400	29,600
	2	43,000	13,400	29,600
	3	43,000	13,400-50,000+3000	76,600
	4	43,000	13,400	29,600
	5	43,000	13,400	29,600
	6	43,000+8,000	13,400+3,000	34,600
			Sum = +194,600	

$$8.18 \quad 0 = -45,000 + 15,000(P/A, \Delta i^*, 6) + 45,000(P/F, \Delta i^*, 3) + 6000(P/F, \Delta i^*, 6)$$

Solve for i by hand using trial and error or spreadsheet.

$$\text{Hand: Try } i = 40\%: \text{PW} = -45,000 + 15,000(2.1680) + 45,000(0.3644) + 6000(0.1328) \\ = \$4715 \quad (i \text{ too low})$$

$$\text{Try } i = 50\%: \text{PW} = -45,000 + 15,000(1.8244) + 45,000(0.2963) + 6000(0.0878) \\ = \$-3774 \quad (i \text{ too high})$$

By interpolation, $\Delta i^* = 45.6\%$ per year

Spreadsheet:

	A	B	C	D
1	Year	Vinyl	Rubber	Incr CF
2	0	-50,000	-95,000	-45,000
3	1	-100,000	-85,000	15,000
4	2	-100,000	-85,000	15,000
5	3	-145,000	-85,000	60,000
6	4	-100,000	-85,000	15,000
7	5	-100,000	-85,000	15,000
8	6	-95,000	-74,000	21,000
9				
10	Δi^* using IRR function			45.2%
**				

By IRR function, $\Delta i^* = 45.2\%$ per year

Conclusion: Since $\Delta i^* > \text{MARR} = 21\%$, select the fiber-impregnated rubber alternative.

$$= \$25,000$$

8.21 (a) Construct tabulation to get incremental cash flow.

Year	Cash flows, \$1000		Incremental
	Type Fe	Type Ai	cash flow, \$1000 (Ai - Fe)
0	-150	-280	-130
1	-92	-74	18
2	-92 + 30 - 150	-74	138
3	-92	-74	18
4	-92 + 30	-74 + 70	58

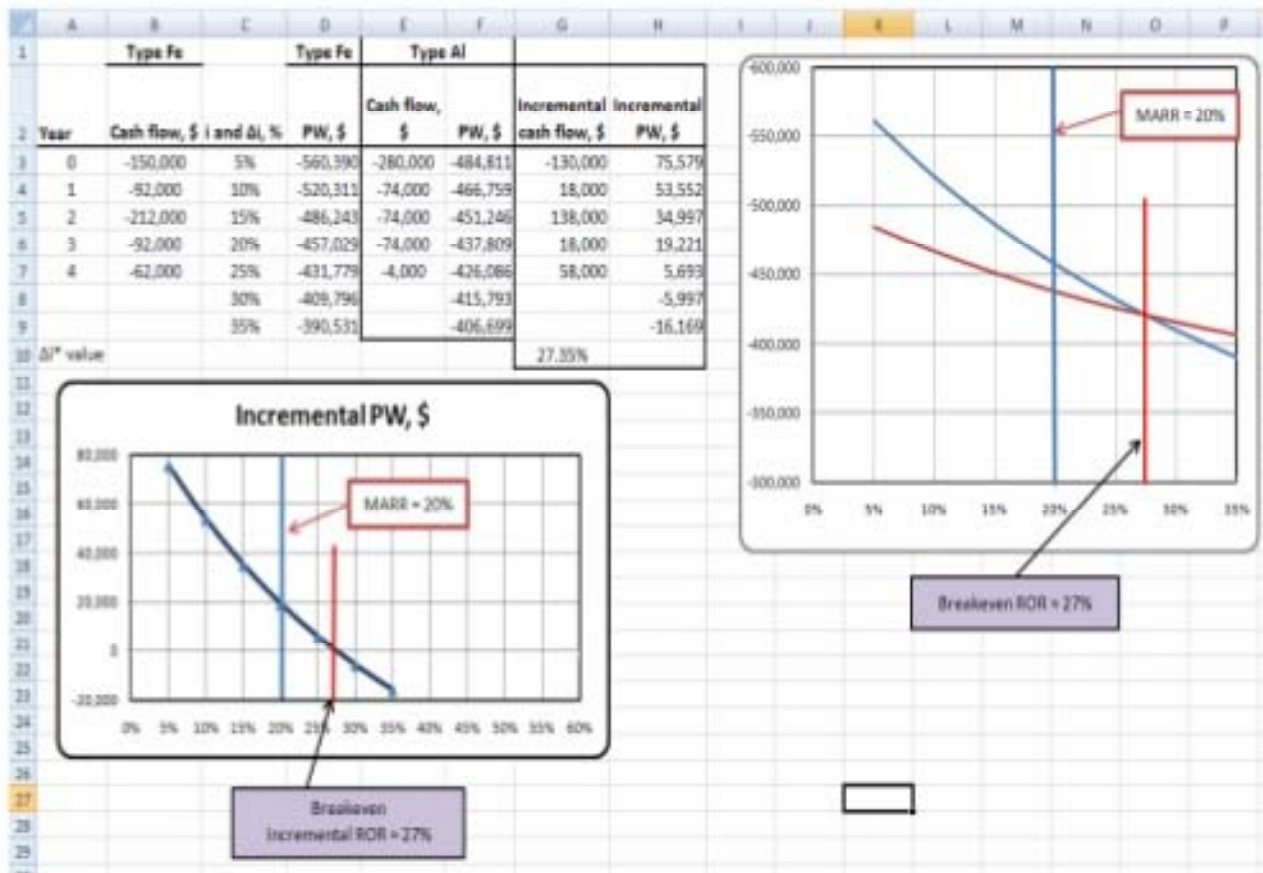
$$0 = -130 + 18(P/A, \Delta i^*, 4) + 120(P/F, \Delta i^*, 2) + 40(P/F, \Delta i^*, 4)$$

Spreadsheet: Enter incremental cash flows and use IRR function to display

$$\Delta i^* = 27.3\%$$

Since 27.3% > MARR = 20%; select type AI (spreadsheet)

(b) and (c) Plots are developed using i and Δi values. Decision is the same to select AI.



8.25 Find ROR for incremental cash flow over LCM of 4 years.

$$0 = -31,000(A/P, \Delta i^*, 4) - 5,000 + 40,000(P/F, \Delta i^*, 2)(A/P, \Delta i^*, 4) + 18,000(A/F, \Delta i^*, 4)$$

Solve for Δi^* by trial and error or spreadsheet

$$\Delta i^* = 8.0\% \quad (\text{spreadsheet})$$

$$\Delta i^* < \text{MARR} = 18\%; \text{ select DBB valves}$$

8.27 (a) He used overall i^* values rather than incremental i^* values.

(b) Determine Δi^* and compare to each MARR.

	A	B	C	D	E	F	G	H
1		Alternative A			Alternative B			Incremental
2	Year	Revenue, \$	Costs, \$	NCF, \$	Revenue, \$	Costs, \$	NCF, \$	NCF, \$
3	0		-40,000	-40,000		-85,000	-85,000	-45,000
4	1	22,000	-5,500	16,500	45,000	-15,000	30,000	13,500
5	2	22,000	-5,500	16,500	45,000	-15,000	30,000	13,500
6	3	22,000	-5,500	16,500	45,000	-15,000	30,000	13,500
7	4	22,000	-5,500	16,500	45,000	-15,000	30,000	13,500
8	5	22,000	-5,500	16,500	45,000	-15,000	30,000	13,500
9	6	22,000	-5,500	16,500	65,000	-15,000	50,000	33,500
10	i^* and Δi^*			34.2%			29.2%	25.1%

$$\text{MARR} = 30\%: \Delta i^* = 25.1\% < \text{MARR}; \text{ select A}$$

$$\text{MARR} = 20\%: \Delta i^* = 25.1\% > \text{MARR}; \text{ select B}$$

(c) Ranking inconsistency occurs for revenue alternative comparison when the MARR is set lower than Δi^* . At MARR = 20%, this occurs and A is incorrectly selected if overall ROR values are used as the basis of selection.