Solution to Case Studies, Chapter 8

Sometimes, there is not a definitive answer to a case study exercise. Here are example responses.

ROR ANALYSIS WITH ESTIMATED LIVES THAT VARY

1. PW at 12% is shown in row 29. Select server #2 (n = 8) with the largest PW value.

2. #1 (n = 3) is eliminated. It has i* < MARR = 12%. Perform an incremental analysis of #1 (n = 4) and #2 (n = 5). Column H shows Δi* = 19.5%. Now perform an incremental comparison of #2 for n = 5 and n = 8. This is not necessary since no extra investment is necessary to expand cash flow by three years. The Δi* is infinity. It is obvious: select #2 (n = 8).

3. PW at 2000% > $0.05. Δi* is infinity, as shown in cell K45, where an error for IRR(K4:K44) is indicated.

	A	B	C	D	E	F	G	H	I	J	K
1	MARR =	12%						#2(n=5)-to-#1(n=4)			#2(8)-to-#2(5)
2		#1 (n = 3)	#1 (n = 4)	#2 (n = 5)	#2 (n = 8)	#1(n=4)	#2 (n=5)	Incremental	#2 (n=8)	#2 (n = 8)	Incremental
3	Year	Cash flow	Cash flow	Cash flow	Cash flow	20 yr. CF	20 yr. CF	cash flow	40 yr. CF	40 yr. CF	cash flow
4	0	-100,000	-100,000	-200,000	-200,000	-100,000	-200,000	-100,000	-200,000	-200,000	0
5	1	35,000	35,000	50,000	50,000	35,000	50,000	15,000	50,000	50,000	0
6	2	35,000	35,000	55,000	55,000	35,000	55,000	20,000	55,000	55,000	0
7	3	35,000	35,000	60,000	60,000	35,000	60,000	25,000	60,000	60,000	0
8	4		35,000	65,000	65,000	-65,000	65,000	130,000	65,000	65,000	0
9	5			70,000	70,000	35,000	-130,000	-165,000	-130,000	70,000	200,000
10	6				70,000	35,000	70,000	35,000	70,000	70,000	0
11	7				70,000	35,000	70,000	35,000	70,000	70,000	0
12	8				70,000	-65,000	70,000	135,000	70,000	-130,000	-200,000
13	9					35,000	70,000	35,000	70,000	70,000	0
14	10					35,000	-130,000	-165,000	-130,000	70,000	200,000
15	11					35,000	70,000	35,000	70,000	70,000	0
16	12					-65,000	70,000	135,000	70,000	70,000	0
17	13					35,000	70,000	35,000	70,000	70,000	0
18	14					35,000	70,000	35,000	70,000	70,000	0
19	15					35,000	-130,000	-165,000	-130,000	70,000	200,000
20	16					-65,000	70,000	135,000	70,000	-130,000	-200,000
21	17					35,000	70,000	35,000	70,000	70,000	0
22	18					35,000	70,000	35,000	70,000	70,000	0
23	19					35,000	70,000	35,000	70,000	70,000	0
24	20					35,000	70,000	35,000	-130,000	70,000	200,000
25	Overall i*	2.5%	15.0%	14.3%	25.0%	Δi*		19.5%	70,000	70,000	0
26	Retain or		Retain	Retain	Retain		Retain		70,000	70,000	0
27	Eliminate?	Eliminate				Eliminate			70,000	70,000	0
28									70,000	-130,000	-200,000
29	PW @12%	-15,938	6,307	12,224	107,624				-130,000	70,000	200,000
30	26								70,000	70,000	0
31	27								70,000	70,000	0
42	38								70,000	70,000	0
43	39								70,000	70,000	0
44	40								70,000	70,000	0
45										Δi*	#DIV/0!
46										PW at 3000%	0.01

LCM = 20 years

LCM = 40 years

Some rows hidden

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HOW A NEW ENGINEERING GRADUATE CAN HELP HIS FATHER

1. Cash flows for each option are summarized at top of the spreadsheet. Rows 9-19 show annual estimates for options in increasing order of initial investment: 3, 2, 1, 4, 5.

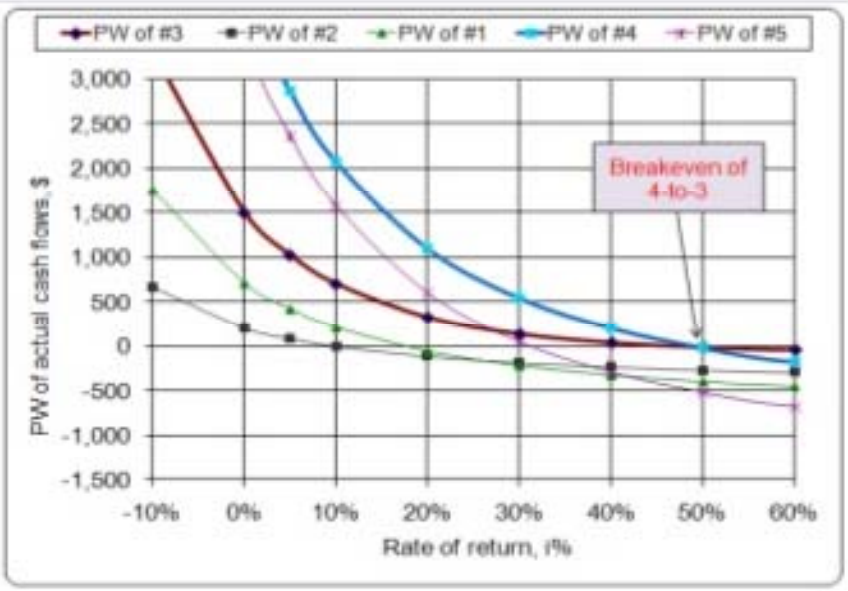
	A	B	C	D	E	F	G	H	I
1	MARR =	25%	ROR, PW, AW analysis			(Cash flows, $1000 units)			
2	Alternative		#3	#2	#1	#4		#5	
3	Initial cost		0	-400	-750	-1,000		-1,500	
4	Est. annual expenses		$-1250;yrs 1-5	$-1400(1-5),-2000(6-10)	$-800+6%/yr	-3,000		-500	
5	Est. annual revenues		$1150 (1-5)	$1400+5%/yr	$1000+4%/yr	3,500		1,000	
6	Sale of business revenue		$500 (5-8)						
7	Life	Year	10	10	10	10		10	
8	Incr. ROR comparison		Actual CF	Actual CF	Actual CF	Actual CF	4-to-3	Actual CF	5-to-4
9	Incremental investment	0	0	-400	-750	-1,000	-1,000	-1,500	-500
10	Incremental cash flow	1	-100	0	200	500	600	500	0
11		2	-100	70	192	500	600	500	0
12		3	-100	144	183	500	600	500	0
13		4	-100	221	172	500	600	500	0
14		5	400	302	160	500	100	500	0
15		6	500	-213	146	500	0	500	0
16		7	500	-124	131	500	0	500	0
17		8	500	-30	113	500	0	500	0
18		9	0	68	93	500	500	500	0
19		10	0	172	72	500	500	500	0
20	Overall i*		46.4%	10.1%	17.4%	49.1%		31.1%	
21	Retain or eliminate?		Retain	Eliminate	Eliminate	Retain		Retain	
22	Incremental i*						49.9%		#NUM!
23	Increment justified?						Yes		No
24	Alternative selected						4		4
25	PW at MARR		215	-152	-146	785		285	-500
26	AW at MARR		60			220		80	
27	Alternative acceptable?		Yes			Yes		Yes	
28	Alternative selected					4			

2. Multiple i* values: Only for option #2; there are 3 sign changes in cash flow and cumulative cash flow series. No values other than 10.1% are found in the 0 to 100% range.

3. Do incremental ROR analysis after removing #1 and #2. See row 22. 4-to-3 comparison yields 49.9%, 5-to-4 has no return because all incremental cash flows are 0 or negative. PW at 25% is $785 for #4, which is the largest PW. Aw is also the largest for #4.

   Conclusion: Select option #4 – trade-out with friend.

4. PW vs. i charts for all 5 options are on the spreadsheet.



Options compared	Approximate breakeven
1 and 2	26%
3 and 5	27
2 and 5	38
1 and 5	42
3 and 4	50

5. Force the breakeven rate of return between options #4 and #3 to be equal to MARR = 25%. Use trial and error or Goal Seek with a target cell of G22 to equal 25% and changing cell of C6 (template at right). Make the values in years 5 through 8 of option #3 equal to the value in cell C6, so they reflect the changes. The answer obtained should be about \$1090, which is actually \$1,090,000 for each of 4 years.

Required minimum selling price is 4(1090,000) = \$4.36 million compared to the current appraised value of \$2 million.