

TIE2140 Engineering Economy Solutions to Assignment #5

After-tax $MARR = 5\%$.

3-year capital allowance claim.

(a) Study period = 12 years.

After-tax Cash Flow Analysis for Alternative B over 12 years:

	(a)	(b)	(c) = (a) - (b)	(d) = -t(c)	(e) = (a) + (d)	(f) = (e)/(1+i)^k
EoY	BTCF	Depreciation	Taxable Income	Income Tax CF	ATCF	PW of ATCF
0	-150,000				-150,000.00	-150,000.00
1	-9,600	50,000.00	-59,600.00	10,132.00	532.00	506.67
2	-9,600	50,000.00	-59,600.00	10,132.00	532.00	482.54
3	-9,600	50,000.00	-59,600.00	10,132.00	532.00	459.56
4	-9,600		-9,600.00	1,632.00	-7,968.00	-6,555.29
5	-9,600		-9,600.00	1,632.00	-7,968.00	-6,243.14
6	-9,600		-9,600.00	1,632.00	-7,968.00	-5,945.84
7	-14,400		-14,400.00	2,448.00	-11,952.00	-8,494.06
8	-14,400		-14,400.00	2,448.00	-11,952.00	-8,089.58
9	-14,400		-14,400.00	2,448.00	-11,952.00	-7,704.37
10	-14,400		-14,400.00	2,448.00	-11,952.00	-7,337.49
11	-14,400		-14,400.00	2,448.00	-11,952.00	-6,988.09
12	-14,400		-14,400.00	2,448.00	-11,952.00	-6,655.32
12	24,000		24,000.00	-4,080.00	19,920.00	11,092.20
						- 201,472.22

After-tax $PW(5\%)$ of Alternative $B = - \$ \underline{\underline{201,472.22}}$

After-tax $AW(5\%)$ of Alternative $B = - \$ 201,472.22 [A/P, 5\%, 12]$
 $= - \$ 22,731.19$

Assume that Alternative C is co-terminated at EoY 12
 After-tax Cash Flow Analysis for Alternative C over 12 years:

	(a)	(b)	(c) = (a) - (b)	(d) = -t(c)	(e)=(a) + (d)	(f)=(e)/(1+i)^k
EoY	BTCF	Depreciation	Taxable Income	Income Tax CF	ATCF	PW of ATCF
0	-192,000				-192,000.00	-192,000.00
1	-6,000	64,000.00	-70,000.00	11,900.00	5,900.00	5,619.05
2	-6,000	64,000.00	-70,000.00	11,900.00	5,900.00	5,351.47
3	-6,000	64,000.00	-70,000.00	11,900.00	5,900.00	5,096.64
4	-6,000		-6,000.00	1,020.00	-4,980.00	-4,097.06
5	-6,000		-6,000.00	1,020.00	-4,980.00	-3,901.96
6	-6,000		-6,000.00	1,020.00	-4,980.00	-3,716.15
7	-12,000		-12,000.00	2,040.00	-9,960.00	-7,078.39
8	-12,000		-12,000.00	2,040.00	-9,960.00	-6,741.32
9	-12,000		-12,000.00	2,040.00	-9,960.00	-6,420.30
10	-12,000		-12,000.00	2,040.00	-9,960.00	-6,114.58
11	-12,000		-12,000.00	2,040.00	-9,960.00	-5,823.41
12	-12,000		-12,000.00	2,040.00	-9,960.00	-5,546.10
12	30,000		30,000.00	-5,100.00	24,900.00	13,865.25
						-211,506.85

After-tax $PW(5\%)$ of Alternative C = – \$ **211,506.85**

After-tax $AW(5\%)$ of Alternative C = – \$ 211,506.85 [A/P, 5%, 12]
 = – \$ 23,863.35

Choose Alternative B which has a higher after-tax $PW(5\%)$ over 12 years.

(b) Study period = 18 years.

Assume Alternative B is repeated at EoY 12 and co-terminated at EoY 18.

After-tax Cash Flow Analysis for Alternative B over 18 years:

	(a)	(b)	(c) = (a) - (b)	(d) = -t(c)	(e) = (a) + (d)	(f) = (e) / (1+i)^k
EoY	BTCF	Depreciation	Taxable Income	Income Tax CF	ATCF	PW of ATCF
0	-150,000				-150,000.00	-150,000.00
1	-9,600	50,000.00	-59,600.00	10,132.00	532.00	506.67
2	-9,600	50,000.00	-59,600.00	10,132.00	532.00	482.54
3	-9,600	50,000.00	-59,600.00	10,132.00	532.00	459.56
4	-9,600		-9,600.00	1,632.00	-7,968.00	-6,555.29
5	-9,600		-9,600.00	1,632.00	-7,968.00	-6,243.14
6	-9,600		-9,600.00	1,632.00	-7,968.00	-5,945.84
7	-14,400		-14,400.00	2,448.00	-11,952.00	-8,494.06
8	-14,400		-14,400.00	2,448.00	-11,952.00	-8,089.58
9	-14,400		-14,400.00	2,448.00	-11,952.00	-7,704.37
10	-14,400		-14,400.00	2,448.00	-11,952.00	-7,337.49
11	-14,400		-14,400.00	2,448.00	-11,952.00	-6,988.09
12	-14,400		-14,400.00	2,448.00	-11,952.00	-6,655.32
12	24,000		24,000.00	-4,080.00	19,920.00	11,092.20
12	-150,000				-150,000.00	-83,525.61
13	-9,600	50,000.00	-59,600.00	10,132.00	532.00	282.13
14	-9,600	50,000.00	-59,600.00	10,132.00	532.00	268.70
15	-9,600	50,000.00	-59,600.00	10,132.00	532.00	255.90
16	-9,600		-9,600.00	1,632.00	-7,968.00	-3,650.23
17	-9,600		-9,600.00	1,632.00	-7,968.00	-3,476.41
18	-9,600		-9,600.00	1,632.00	-7,968.00	-3,310.87
18	48,000		48,000.00	-8,160.00	39,840.00	16,554.34
						-278,074.27

After-tax $PW(5\%)$ of Alternative B over 18 years = - \$ **278,074.27**

After-tax $AW(5\%)$ of Alternative B over 18 years = - \$278,074.27 [A/P, 5%, 18]
 = - \$ 23,788.20

After-tax Cash Flow Analysis for Alternative C over 18 years:

	(a)	(b)	(c) = (a) - (b)	(d) = -t (c)	(e)=(a) + (d)	(f)=(e)/(1+i)^k
EoY	BTCF	Depreciation	Taxable Income	Income Tax CF	ATCF	PW of ATCF
0	-192,000				-192,000.00	-192,000.00
1	-6,000	64,000.00	-70,000.00	11,900.00	5,900.00	5,619.05
2	-6,000	64,000.00	-70,000.00	11,900.00	5,900.00	5,351.47
3	-6,000	64,000.00	-70,000.00	11,900.00	5,900.00	5,096.64
4	-6,000		-6,000.00	1,020.00	-4,980.00	-4,097.06
5	-6,000		-6,000.00	1,020.00	-4,980.00	-3,901.96
6	-6,000		-6,000.00	1,020.00	-4,980.00	-3,716.15
7	-12,000		-12,000.00	2,040.00	-9,960.00	-7,078.39
8	-12,000		-12,000.00	2,040.00	-9,960.00	-6,741.32
9	-12,000		-12,000.00	2,040.00	-9,960.00	-6,420.30
10	-12,000		-12,000.00	2,040.00	-9,960.00	-6,114.58
11	-12,000		-12,000.00	2,040.00	-9,960.00	-5,823.41
12	-12,000		-12,000.00	2,040.00	-9,960.00	-5,546.10
13	-18,000		-18,000.00	3,060.00	-14,940.00	-7,923.00
14	-18,000		-18,000.00	3,060.00	-14,940.00	-7,545.72
15	-18,000		-18,000.00	3,060.00	-14,940.00	-7,186.40
16	-18,000		-18,000.00	3,060.00	-14,940.00	-6,844.19
17	-18,000		-18,000.00	3,060.00	-14,940.00	-6,518.27
18	-18,000		-18,000.00	3,060.00	-14,940.00	-6,207.88
18	18,000		18,000.00	-3,060.00	14,940.00	6,207.88
						-261,389.67

After-tax $PW(5\%)$ of Alternative C over 18 years = – \$ **261,389.67**

After-tax $AW(5\%)$ of Alternative C over 18 years = – \$ 261,389.67 [$A/P, 5\%, 18$]
 = – \$ 22,360.90

Choose Alternative C which has a higher after-tax $PW(5\%)$ over 18 years.