Chapter 13 Homework Soltions

13.2 (a) Doubleday: $T_e = 9.2 + (1\text{-}0.092)(34) = 40.07\%$
TI (in millions) = 2.8 + 0.9 – 1.4 – 0.85 = \$1.45

Merritt-Douglas: $T_e = 7.5 + (1\text{-}0.075)(34) = 38.95\%$
TI (in millions) = 4.7 + 0.25 – 3.1 – 0.97 = \$0.88

(b) Use the average federal tax rate of 34%, not the total effective rate T_e.

Doubleday: Federal tax estimate = 1,450,000(0.34) = \$493,000
Merritt-Douglas: Federal tax estimate = 880,000(0.34) = \$299,200

(c) Doubleday: Taxes = 113,900 + 0.34(1,450,000 – 335,000)
= \$493,000
Percent of revenue = 493,000/3.7 million = 13.3%

Merritt-Douglas: Taxes = 113,900 + 0.34(880,000 – 335,000)
= \$299,200
Percent of revenue = 299,200/4.95 million = 6.0%

	Doubleday	M-D
T_e	40.07%	38.95%
TI	\$1,450,000	\$880,000
Tax estimate	\$493,000	\$299,200
Tax (table)	\$493,000	\$299,200
% revenue	13.3%	6.0%

13.3 (a) $T_e = 9.8 + (1 – 0.098)(31\%) = 37.76\%$
TI = 4.9 – 2.1 – 1.4 = \$1.4 million
Tax estimate = 1.4 million(0.3776) = \$528,640

(b) 528,640/4.9 million = 10.8%

13.4 (a) TI = 320,000 – 149,000 – 95,000 = \$76,000

(b) Use Table 13-1
Taxes = 13,750 + 0.34(76,000-75,000)
= \$14,090

(c) $T_e = 10.5 + (1 – 0.105)(18.5 = 27.06\%$
Tax estimate = 76,000(0.2706) = \$20,566
Percent of GI = 20,566/320,000
= 6.43%

13.9 Estimate before-tax MARR by Equation [13.9]. Tabulate CFBT; calculate AW.

Before-tax MARR = 10%/(1-0.35) = 15.4%. (All $ values are in $1000 units.)

Year	GI	E	P and S	CFBT
0			$-1900	$-1900
1	$800	$-100		700
2	950	-150		800
3	600	-200		400
4	300	-250	700	750

PW = -1900 + 700(P/F,15.4%,1) + … + 750(P/F,15.4%,4)
= -1900 + 700(0.867) + 800(0.751) + 400(0.651) + 750(0.564)
= $-9
AW = -9(A/P,15.4%,4) = -9(0.3531)
= $-3

Equipment *is (marginally) not* justified using CFBT values.

13.10 Determine MACRS depreciation, taxes and CFAT. Assume negative tax will increase CFAT and AW.(All $ values are in $1000 units.)

TI = GI – E - Depr
CFAT = CFBT - taxes

Year	GI	E	P and S	CFBT	Depr	TI	Taxes	CFAT
0			$-1900	$-1900				$-1900
1	$800	$-100		700	$633	$ 67	$23	677
2	950	-150		800	845	-45	-16	816
3	600	-200		400	281	119	42	358
4	300	-250	700	750	141	-91	-32	782

13.11 Determine AW of CFAT at 10%.

AW = [-1900 + 677(P/F,10%,1) + … + 782(P/F,10%,4)](A/P,10%,4)
= [-1900 + 677(0.9091) + 816(0.8264) + 358(0.7513)
+ 782(0.6830)](0.31547)
= 192(0.31547)
= $61

Equipment *is* justified using CFAT values.

13.12 CFBT approximation: Determine before-tax i* = 15.1%. PW relation is

$$0 = -1900 + 700(P/F,i,1) + 800(P/F,i,2) + 400(P/F,i,3) + 750(P/F,i,4)$$

After-tax estimated ROR is from Equation [13.8].

$$15.1(1-0.35) = 9.8\%$$

CFAT ROR: Determine after-tax i* = 14.7%, which is considerably higher than the 9.8% approximation from the CFBT values. PW relation is

$$0 = -1900 + 677(P/F,i,1) + 816(P/F,i,2) + 358(P/F,i,3) + 782(P/F,i,4)$$

Spreadsheet solution for 13.9 to 13.12 follows.

	A	B	C	D	E	F	G	H	I	J
1	AT MARR =	10%		BT MARR =	15.38%	=10%/(1-0.35)				
2	Problem				13.9					Prob 13.10
3	Year	GI	E	P and S	CFBT	Depr	TI	Taxes	CFAT	
4	0			-1900	-1900				-1900	
5	1	800	-100		700	633	67	23	677	
6	2	950	-150		800	845	-45	-16	816	
7	3	600	-200		400	281	119	42	358	
8	4	300	-250	700	750	141	-91	-32	782	
9	AW				-$3				$61	
10				Prob 13.9	No				Yes	Prob 13.11
11	Actual ROR				15.1%				14.7%	
12	Approx ROR								9.8%	
13									= E11*(1-0.35)	
14					Prob 13.12					
15										

13.17 (a) When the asset is salvaged for $100,000 after 5 years, there will be a capital gain, since MACRS will depreciate it to zero after 4 years.

(b) TI will increase by the depreciation recapture of $100,000

$$DR = SP - BV = 100{,}000 - 0 = \$100{,}000$$

Taxes will increase by $TI(T_e) = 100{,}000T_e$

13.28 Find after-tax PW of costs over *4-year study period*. DR is involved on the defender trade.

Defender

SL depreciation is (45,000-5000)/8 = $5000

Annual tax = $(-E - Depr)(T_e)$
= (-7000 – 5000)(0.35)
= $-4200 (savings)

CFAT = CFBT – taxes
= -7000 – (-4200)
= $-2800

PW_D = -35,000 + 5000(P/F,12%,4) – 2800(P/A,12%,4)
= -35,000 + 5000(0.6355) – 2800(3.0373)
= $-40,327

Challenger

MACRS depreciation over n = 5, but only 4 years apply

Defender trade depreciation recapture must be included.
Defender BV_3 = 45,000 – 3(5000) = $30,000
SP = $35,000
DR = SP – BV = 5,000
Tax on DR = 5,000(0.35) = $1750

Challenger first cost = -24,000 - 1750 = $-25,750
MACRS depreciation is based on $24,000 first cost

Year	Exp	P and S	Rate	Depr	TI	Taxes	CFAT
0		-25,750					-25,750
1	-8000		0.3333	8,000	-16,000	-5,600	-2,400
2	-8000		0.4445	10,668	-18,668	-6,534	-1,466
3	-8000		0.1481	3,554	-11,554	-4,044	-3,956
4	-8000	0	0.0741	1,778	-9,778	-3,422	-4,578

PW_C = -25,750 – 2400(P/F,12%,1) - … - 4578(P/F,12%,4)
= $-34,787

Select the challenger with a lower PW of cost. Spreadsheet solution follows

	A	B	C	D	E	F	G
1	DEFENDER						
2	Year	AOC	P and S	Depr	TI	Taxes	CFAT
3	0		-35,000				-35,000
4	1	-7,000		5,000	-12,000	-4,200	-2,800
5	2	-7,000		5,000	-12,000	-4,200	-2,800
6	3	-7,000		5,000	-12,000	-4,200	-2,800
7	4	-7,000	5,000	5,000	-12,000	-4,200	2,200
8	PW						-40,327
9							
10	CHALLENGER						
11	Year	AOC	P and S	DEPR	TI	Taxes	CFAT
12	0		-25,750				-25,750
13	1	-8,000		8,000	-16,000	-5,600	-2,400
14	2	-8,000		10,667	-18,667	-6,533	-1,467
15	3	-8,000		3,556	-11,556	-4,044	-3,956
16	4	-8,000	0	1,778	-9,778	-3,422	-4,578
17	PW						-34,787
18							
19	DR = 35000-(45000 - 3(5000)) = 5000						
20	DR tax = 5000(0.35) = 1750						
21	First cost relation is:						
22	= -24000 - 0.35*(35000-(45000-3*(5000)))						
23							

13.31 (a) Amanda: debt Charlotte: equity

(b) Find FW at end of year.

Amanda: i = 18/12 = 1.5% per month

FW = 2000(F/P,1.5%,12)

= 2000(1.1956)

= $2391.20

Charlotte: effective i = 8% per year

FW = 2000(F/P,8%,1)

= 2000(1.08)

= $2160

13.32 (a) Equity
(b) Debt
(c) Equity
(d) Debt
(e) Equity

13.36 (a) MARR = WACC + 4%. Total equity and debt fund is $15 million.

Equity WACC = retained earnings fraction(cost) + stock fraction (cost)
= 4/15(7.4%) + 6/15(4.8%)
= 3.893%

Debt WACC = 5/15(9.8%)
= 3.267%

WACC = 3.893 + 3.267 = 7.16%
MARR = 7.16 + 4.0 = 11.16%

(b) Debt capital gets a tax break; equity does not. From Equation [13.16]

After-tax cost of debt = 9.8%(1-0.32) = 6.664%

After-tax WACC = equity cost + debt cost
= 4/15(7.4%) + 6/15(4.8%) + 5/15(6.664%)
= 6.11%

After-tax MARR = 6.11 + 4.0 = 10.11%