CHAPTER 8:
ESTIMATING CASH FLOWS

8-1
a. Straight line depreciation = ($15 - $3)/10 = $1.20
Annual Tax Savings from Depreciation = $ 1.2 (0.4) = $0.48
Present Value of Tax Savings from Depreciation = $ 0.48 (PVA, 12%, 10 years) = $2.71

b: Present Value from Double Declining Balance Depreciation

Year	Depr	Nominal Tax savings	PV	Double-declining Depreciation	Year-end book value	Nominal Tax saving	PV
0					15.000		
1	1.200	0.480	0.429	3.000	12.000	1.200	1.071
2	1.200	0.480	0.383	2.400	9.600	0.960	0.765
3	1.200	0.480	0.342	1.920	7.680	0.768	0.547
4	1.200	0.480	0.305	1.536	6.144	0.614	0.390
5	1.200	0.480	0.272	1.229	4.915	0.492	0.279
6	1.200	0.480	0.243	0.983	3.932	0.393	0.199
7	1.200	0.480	0.217	0.786	3.146	0.315	0.142
8	1.200	0.480	0.194	0.146	3.000	0.058	0.024
9	1.200	0.480	0.173	0.000	3.000	0.000	0.000
10	1.200	0.480	0.155	0.000	3.000	0.000	0.000
		4.800	2.712			4.800	3.418

The present value is $3.418 m.

c. Double declining balance depreciation provides a higher tax benefit because it provides more tax benefits earlier in the process.

8-2
a: With Salvage = $ 0.5 mil

b:

Year	**ACRS Rate**	**Depreciation**	**Tax Benefit**	**PV of Tax Benefit**
1	20%	$0.40	$0.16	$0.15
2	32%	$0.64	$0.26	$0.21
3	19.20%	$0.38	$0.15	$0.12

4	11.50%	$0.23	$0.09	$0.06
5	11.50%	$0.23	$0.09	$0.06
6	5.80%	$0.12	$0.05	$0.03

Present Value of Tax Benefits from Depreciation = $0.62

c. Tax Benefits from Expensing Asset Immediately = $2.5 (0.4) = $1 million:
Additional tax benefit from immediate expensing = $ 1 million - $0.62 million = $ 0.38 million

8-3

In problem 1, if salvage value is ignored,
PV of Tax Savings from Straight line Depreciation = $1.5 (PVA,12%,10 years) = $3.39
PV of Capital Gains Taxes on Salvage = $3 (0.2)/1.12^10 = $0.19
PV of Tax Savings from Ignoring Salvage = $3.20
(This is $ 49,000 higher than the PV with salvage considered.)

In problem 2, if salvage value is ignored,

Year	**ACRS Rate**	**Depreciation**	**Tax Benefit**	**PV of Tax Benefit**
1	20%	$0.50	$0.20	$0.18
2	32%	$0.80	$0.32	$0.26
3	19.20%	$0.48	$0.19	$0.14
4	11.50%	$0.29	$0.12	$0.08
5	11.50%	$0.29	$0.12	$0.07
6	5.80%	$0.15	$0.06	$0.03

Present Value of Tax Benefits from Depreciation = $0.77
Capital Gains Taxes from Salvage value = $0.5*0.2/1.1^5 = $0.06
Present value of Tax Savings from Ignoring Salvage = $0.71

8-4

a. The Straight-line method provides the higher nominal tax savings.
b. The straight line method also provides a higher present value of tax benefits.

Year	Depr.	Tax rate	Nominal Tax savings	PV	Double-declining Depreciation	Nominal Tax saving	PV
0.000							
1.000	2.000	0.200	0.400	0.357	4.000	0.800	0.71
2.000	2.000	0.250	0.500	0.399	2.400	0.600	0.48
3.000	2.000	0.300	0.600	0.427	1.440	0.432	0.31
4.000	2.000	0.350	0.700	0.445	1.08	0.302	0.24
5.000	2.000	0.400	0.800	0.454	1.08	0.518	0.25
			3.000	2.082		2.653	1.99

I switched to straight line depreciation in the last two years.

8-5

a. Expected Operating Cash Flows

Revenues	$5.00
COGS (without depreciation)	$1.50
Depreciation	$2.00
EBIT	$1.50
EBIT (1-t)	$0.90
+ Depreciation	$2.00
ATCF	$2.90

b. NPV of Project = $10 million + $2.90 (PVA,11%,5 years) million = $0.72 million

c. PV of Tax benefits from Depreciation = $2 (0.4) (PVA,11%,5 years) million = $2.96 million

d. NPV of Project if the firm is losing money for first 3 years

Year	1	2	3	4	5
Revenues	$5.00	$5.00	$5.00	$5.00	$5.00
COGS	$1.50	$1.50	$1.50	$1.50	$1.50
Depreciation	$2.00	$2.00	$2.00	$2.00	$2.00
EBIT	$1.50	$1.50	$1.50	$1.50	$1.50
-Taxes	$-	$-	$-	$2.40	$0.60
EBIT (1-t)	$1.50	$1.50	$1.50	$(0.90)	$0.90
+ Depreciation	$2.00	$2.00	$2.00	$2.00	$2.00
ATCF	$3.50	$3.50	$3.50	$1.10	$2.90
PV of ATCF	$3.15	$2.84	$2.56	$0.72	$1.72

NPV of Project = - $10 million + $11 million = $1 million

8-6

a. Unlevered beta (Nuk-Nuk) = 1.3/(1+(1-0.6)0.5) = 1
Unlevered beta (Gerber) = 1.5/(1+ (1-0.5)1.00) = 1
This project has no debt. So the appropriate beta = 1.00
Appropriate discount rate =11.5 + 1.0 (5.5) = 17.0%

b	Revenues	30,000
	Expenses	12,000
	Garage cost	2,000
	BTCF	16,000

Taxes	4,400	= (16,000-5,000)*0.4
ATCF	11,600	

Alternatively, you could consider the garaging cost separately as an opportunity cost, in which case ATCF = 13,600
If you considered working capital increase in year 1, the ATCF in year 1 alone = 4,600
(Note that since working capital stays at 7,500, there are no working capital changes after the initial year.)

c. NPV = 57,500 + 11,600 (PVA,17%,10 years) + 6,000(PF,17%,10 years) = $(2,212)

8-7
Cost of the new facility =100,000
- Capital gains from sale of facility (10,000 = (100,000-60,000)*0.25)
- Cost of new facility (40,000)
- Depreciation lost on old facility (14,746.961 = (6,000*0.4*(PVA,10%,10)))
+ Depreciation gained on new facility(9,831.3074 = (4,000*0.4*(PVA,10%,10)))
= Opportunity cost = 45,084.346

8-8
a: Initial Investment = 50,000

Annual Cash flow

Revenues	250,000
Rent	48,000
Salary Expenses	120,000
Depreciation	5,000
Taxable Income	77,000
Tax	30,800
Net Income	46,200
+ Depreciation	5,000
ATCF	51,200

b. NPV of Project = -50,000 + 51,200 (PVA,15%, 10 years) = $206,961
IRR of Project = 102.31%

8-9
PV of rental revenues = 100,000* 0.6 *(PVA,15%,10) = $301,126
(The depreciation is not an incremental factor because you will get it anyway)

8-10
Initial Investment = - 500,000 - 50,000 + 50,000 = -500,000
ATCF per year = 1,000,000 - 500,000 - 200,000 - .5 (300,000 -110,000) = $205,000
(I have assumed that the entire $550,000 is depreciable)
NPV of this project = -500,000 + 205,000*(AF,10%,5 years) = $277,111
NPV of investment banking job = 75,000*.5*(Af,10%,5 years) = $142,155

Take the investment! Alternatively, you can show the investment banking job as an opportunity cost in the analysis.
Remember that the interest you could have made on the CD should not be considered as an explicit opportunity cost. It is already taken into account through discounting.

8.11
The annual cashflows are

	1	2	3	4	5
Revenues	600000.00	679800.00	770213.40	872651.78	988714.47
Software specialists	250000.00	257500.00	265225.00	273181.75	281377.20
Rent	50000.00	51500.00	53045.00	54636.35	56275.44
Depreciation	20000.00	20000.00	20000.00	20000.00	20000.00
Marketing and selling costs	100000.00	103000.00	106090.00	109272.70	112550.88
Cost of materials	120000.00	135960.00	154042.68	174530.36	197742.89
Pre tax Income	60000.00	111840.00	171810.72	241030.63	320768.05
After tax income	36000.00	67104.00	103086.43	144618.38	192460.83
+ Depreciation	20000.00	20000.00	20000.00	20000.00	20000.00
Change in WC	-7980.00	-9041.34	-10243.84	-11606.27	98,871.45
ATCF	48020.00	78062.66	112842.59	153012.11	311,332.28
Working Capital	60000.00	67980.00	77021.34	87265.18	98871.45

Working capital is fully salvaged in the last year.
There is an initial investment of 100,000 plus an initial outlay of $60,000 for working capital. Taking these into account, the NPV = $ 299,325
The project has a positive NPV and should be accepted.

8-12

Year	**Potential sales**	**Lost sales**	**Lost profits**	**PV lost profits**
1	27,500	0	$0	$0
2	30,250	250	$9,000	$7,438
3	33,275	3,275	$117,900	$88,580
4	36,603	6,603	$237,690	$162,345
5	40,263	10,263	$369,459	$229,405
6	44,289	14,289	$514,405	$290,368
7	48,718	18,718	$673,845	$345,789
8	50,000	20,000	$720,000	$335,885
9	50,000	20,000	$720,000	$305,350
10	50,000	20,000	$720,000	$277,591

OPPORTUNITY COST **$2,042,753**

8-13

a. There is no cost the first three years. The after-tax salary paid in last two years is an opportunity. cost = 80,000*0.6/1.1^4 + 80000*0.6/1.1^5 = $62,589

b. The opportunity cost is the difference in PV of investing in year 4 instead of year 8 = 250,000/1.1^4 - 250,000/1.1^8 = $54,126

c. The present value of after-tax rental payments over five years is the opportunity cost = 3000*0.6(PVA,10%,5 years) = $6,823

d. After-tax cash flow = (400,000-160,000) - (240,000-100,000)*0.4 = $184,000

e. NPV = -500,000 -62,589 - 54,126 - 6,823 + 184,000(1-(.1.1)^-5)/.1 = $73,967

8-14

a. Initial investment = 10 million (Distribution system) + 1 million (WC) = 11 million

b.

Incremental Revenues	10,000,000
Variable costs (40%)	4,000,000
Advertising Costs	1,000,000
BTCF	5,000,000
Taxes	1,600,000 (= (5,000,000-1,000,000)*0.4)
ATCF	**3,400,000**

c. NPV = -11,000,000 + 3,400,000 (PVA,10 years,8%) + 1,000,000 (PF, 10 years, 8%) = $12,277,470

8-15

a.

	Year	**Old Product**	**New Product**	**Excess/Shortfall**	
	1	50.00	30.00	20.00	
	2	52.50	33.00	14.50	
	3	55.13	36.30	8.58	
	4	57.88	39.93	2.19	
In year 5	5	60.78	43.92	-4.70	OUT OF CAPACITY
	6	63.81	48.32	-12.13	
	7	67.00	53.15	-20.15	
	8	70.36	58.46	-28.82	
	9	73.87	64.31	-38.18	
	10	77.57	70.74	-48.30	

b. Contribution margin for 1% of capacity for OLD = (100-50)/50 = $1.00
for NEW = (80-44)/30 = $1.20

You will lose less cutting back on old product.

Year	Lost Capacity	$BT loss (m)	$AT loss (m)	PV (loss)
5	-4.7	$(4.70)	$(2.82)	$(1.75)
6	-12.13	$(12.13)	$(7.28)	$(4.11)
7	-20.15	$(20.15)	$(12.09)	$(6.20)
8	-28.82	$(28.82)	$(17.29)	$(8.07)
9	-38.18	$(38.18)	$(22.91)	$(9.72)
10	-48.3	$(48.30)	$(28.98)	$(11.17)

Total opportunity cost = $(41.02)

c. PV of Building facility in year 5 = $31.05
PV of depreciation benefits on this building
= 2 million * 0.4 *(PVA, 10%, 25) * (PF, 10%, 5) = $4.51

Year in which you would have run out of capacity without new product = YEAR 14 (14.206699)
(Remember that growth rate on old product is 5%)
PV of building facility in year 14 = $13.17
PV of depreciation benefits on this building = 2 million * 0.4 *(PVA, 10%, 25) * (PF, 10%, 14)
= $1.91
Net opportunity cost = (PV of Building in year 5 - PV of Depreciation on this building)
- (PV of Building in year 14
- PV of Depreciation on this building)
= (31.05 - 4.51) - (13.17 - 1.91) = $15.28

8-16
a. Working capital without computer : 0.5*5,000,0000 = $2,500,000
Working Capital with computer: 0.25 * 8,000,000 = $2,000,000
Decrease in Working Capital with computer = $500,000
Cash flow in year 0 = -10,000,000 + 500000 = $9,500,000
(The initial investment is $10 million.)

b. After-tax Cash flow Each Year

	wo/Computer	w/Computer	Incremental CF
Revenues	5,000,000	8,000,000	3,000,000
COGS	2,500,000	4,000,000	1,500,000
Selling Expenses	1,500,000	500,000	-1,000,000
Gross Profit	1,000,000	3,500,000	2,500,000
Depreciation	0	1,000,000	1,000,000
Taxable Income	1,000,000	2,500,000	1,500,000
Tax	400,000	1,000,000	600,000
Net Income	600,000	1,500,000	900,000
+ Depreciation	0	1,000,000	1,000,000
ATCF	600,000	2,500,000	1,900,000

c. The NPV of this project = $\frac{2.5-0.6}{.08}\left(1-\frac{1}{1.08^{10}}\right)-9.5 = 3.249$m.

{Since this project requires an investment in working capital at the beginning, a reasonable argument can be made that that cash inflow should be reversed in year 5 – working capital increased by $ 0.5 million . If this is done, the net present value of this project will be only $ 3.017 million.]

8-17

a.

The net combined after-tax cash flow generated by this project = 20*(1-60%) + 15*(1-50%) + 10*(1-40%) + 5*(1-40%) + 3*(1-35%) = $26.45 millions

b.

The weighted marginal tax rate = 1 - 26.45 / (20 + 15 + 10 + 5 + 3) = 50.09%

8-18

Year	After-tax Cash Flows	Present Value of After-tax Cash Flows
0	-$120 million	-$120 million
1	7.5	6.696
2	14	11.161
3	35	24.912
4	35	22.243
5	60	34.046

NPV = $-20.942 million and the project should be rejected.