Chapter 9

9-1

We assume that revenues and selling & administrative expenses will increase at the rate of inflation.

Year	*Revenue*	*COGS*	*Depreciation*	*S&A*	*Taxable Income*	*After-tax Operating Income*
1	$20.60	$12.36	$1.00	$2.06	$5.18	$3.11
2	$21.22	$12.73	$1.00	$2.12	$5.37	$3.22
3	$21.85	$13.11	$1.00	$2.19	$5.56	$3.33
4	$22.51	$13.51	$1.00	$2.25	$5.75	$3.45
5	$23.19	$13.91	$1.00	$2.32	$5.96	$3.57

Revenues: Based upon average revenue at existing stores: 4700/235 = 20 million.
S&A: Based upon Selling and Administrative expense per store

9-2

Year	*After-tax Operating Income*	*Depreciation*	*Investment in Working Capital*	*Non-incremental S& A expenses (1-t)*	*Initial Investment*	*Incremental Cashflow*
0			$1.65		$10.00	($11.65)
1	$3.11	$1.00	$0.05	$0.62		$4.68
2	$3.22	$1.00	$0.05	$0.64		$4.80
3	$3.33	$1.00	$0.05	$0.66		$4.94
4	$3.45	$1.00	$0.05	$0.68		$5.07
5	$3.57	$1.00	($1.85)	$0.70		$7.12

We added back the portion of the S&A expenses that are fixed (and thus not incremental) in after-tax terms. At the end of the fifth year, we have salvaged working capital investments at book value.

9-3

Net Income each year = $(5 – 0.07*25)(1-0.4) = $1.95m.

9-4

The after tax cashflows to equity equal $1.95m in net income plus depreciation of $5m., or $6.95m./ per year.

9-5

a. The after-tax operating cash flow is computed as

Revenues	$	5.00
COGS (w/o depr.)	$	1.50
Depreciation	$	2.00
EBIT	$	1.50
EBIT (1-t)	$	0.90
+ Depreciation	$	2.00
ATCF	$	2.90

b. Using the annuity formula, we have $\frac{2.9}{0.11}\left(1-\frac{1}{1.11^5}\right) = 10.72$ as the present value of the operating cash-flows. Deducting the initial investment of $10m., we get an NPV of $0.72m.

c. The yearly increment to cashflow due to depreciation is the savings in taxes, which is 2(0.4) – 0.8m. The PV of this flow = $2.96m.

9-6

a. Depreciation = 50000/10 = 5000 per year.
Revenues = 15000 x 2 = 30000
Manufacturing Costs = 0.8(15000) = 12000
Hence annual after-tax operating income = (30000 – 12000 – 5000)(1-0.4) = 7800 per year.

b. The yearly after-tax operating cash flow equals:
(Revenues – Manufacturing Costs – Depreciation)(1-tax rate) + Depreciation = $12,800 per year. Assuming that inventory expenses must be incurred at the beginning of the period, there would be, in addition, an outflow (for working capital and equipment) of 0.25(30000) + 50000 = $57500 when the project is initiated, and an inflow of 0.80(0.25)(30000) = $6000 when the inventory is liquidated at the end of the period.

c. The money spent researching the project would be shown as an accounting expense, but it would not be considered for purposes of computing the incremental cashflows because it is a sunk cost.

9-7

With an interest rate of 7%, the annual interest expense would have been 25000(0.07) = $1750. Hence the net income per year would be 7800 – (1-0.4)(1750) = $6750. Cashflows to equity would be 6750 + 5000 = 11,750 each year, with an outflow of 0.25(30000) + 25000 = $32500 when the project is initiated, and an outflow of 25000 - 6000 = $19,000 at the end of the period.

9-8

a., b. The annual after-tax cashflows from the project are:

Revenues	500 x 500 =	250000
Cost of instructors	24000 x 5	-120000
Rent		-48000
Depreciation	50000/10	-5000
Earnings before taxes		77,000
After-tax Income	77000(1-0.4)	46200
Depreciation		+5000
After-tax cashflow		51,200

c. The time-weighted cashflows are computed for year *t* by multiplying the cashflow for that period by $(1.15)^{-t}$. These are shown below:

Year	Flow	Time-weighted flow
1	51200	44521.74
2	51200	38714.56
3	51200	33664.83
4	51200	29273.77
5	51200	25455.45
6	51200	22135.17
7	51200	19247.98
8	51200	16737.37
9	51200	14554.24
10	51200	12655.86

9-9

The annual cashflows are

Revenues	1m. bottles at $1 each	$1,000,000
Variable costs	1m. bottles at 50 cents each	$500,000
Fixed costs		$200,000
Depreciation	550,000/5	$110,000
Before-tax Income		$190,000
After tax income	190000(1-0.50)	$95,000
Depreciation		$110,000
Total after-tax cashflow		$205,000

Outflows at the beginning for the initial investment would be $500,000 less the 10% investment tax credit of $50,000 for a net of $450,000.

9-10
If 60% of the initial investment of 550000 was borrowed at 7.5%, interest expenses annually would be $24,750; these would reduce cashflows to equity by 24750(1-0.5) = $12,375 a year, or $192,625. Outflows at the beginning would be only 0.4(550000) = $220,000, but $330,000 would have to be repaid at the end.
9-11
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
Net 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
Working Capital	60000.00	67980.00	77021.34	87265.18	98871.45
Change in WC	-7980.00	-9041.34	-10243.84	-11606.27	11606.27
Cash Flows	48020.00	78062.66	112842.59	153012.11	224067.10
Discounted (Time-weighted) cashflows	42875	62231.1	80319.1	97242	127142

There is an initial investment of 100,000 plus an initial outlay of $60,000 for working capital. Taking these into account, the NPV = 249808.85
The project has a positive NPV and should be accepted.

9-12
a. The initial investment is $10 m. + additional working capital at the beginning of 0.10(10,000,000) = $1m; hence total initial investment = $11m.
b.

		Current level	New level	Increment
Revenue	$100m.(.10)	10,000,000	20,000,000	$10,000,000
Fixed Costs		2,000,000	2,000,000	0
Variable Costs		4,000,000	8,000,000	4,000,000
Advertising			1,000,000	1,000,000
Depreciation			1,000,000	1,000,000
Before-tax income				4,000,000
After-tax income				2,400,000
Depreciation				1,000,000
After-tax Operating Cashflow				3,400,000

At the end of the 10 years, the working capital of $1 million will be recouped

9-13

a. If $5m. of the $10m. required are borrowed, the equityholders will need to initially put in $5m. plus the $1m. necessary for beginning working capital, i.e. $6 million in all.

b. In this case, the after-tax cashflows would have to be reduced by $5(0.08)(1-0.4) = $240,000, for a net cashflow of 3,400,000 – 240,000 = 3,160,000 a year. The cashflow at the end of the project would be -$5m. (loan repayment) + $1 million(working capital recoupment) = $4. m.

9-14

a. Cash flow at time zero is the sum of the installation cost of $10m. and the change in working capital. Existing working capital = $5m. (0.50) = $2.5m. New working capital requirements are $8m. (0.25) = $2m. Hence there will be a reduction of $0.5m., and the net cash flow at time zero = $9.5m.

b.

Annual flow	Existing system	New system
Operating cost after-tax	-0.9	-0.3
Reduction in taxes due to Depreciation (Annual Depr. 0f $1m. x Tax rate)		0.4
Profits after tax [Profit margin x (1-Tax rate)]	1.5	2.4
	0.6	2.5

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.

9-15

a. Using straight line depreciation, the depreciation each year = (15-3)/10 = $1.2 m. At a tax rate of 40%, this results in a tax saving of $0.48m. a year, for a total nominal value of $4.8 m. The present value can be computed using the annuity formula:

$\frac{0.48}{.12}\left(1-\frac{1}{1.12^{10}}\right) = \$2.712m.$

b., c. Using double-declining balance depreciation, the nominal value does not change. However, the depreciation is higher in earlier years, and the present value increases.

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.

9-16

In problem 15, if salvage value is ignored, the PV of Tax Savings from Straight line Depreciation = $ 1.5 (PVA,12%,10 years)(0.4) = $3.39.
The PV of the Capital Gains Taxes on Salvage = 3 (0.2)/1.12^{10} = 0.19.
Hence the PV of the tax savings from ignoring salvage = 3.39 - 0.19 = $3.20. This is 0.488m. higher than the PV with salvage considered (3.2 - 2.712)

9-17

a. The straight line approach would yield the higher nominal tax savings.
b. The Double-declining method 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	0.508
2.000	2.000	0.250	0.500	0.399	2.400	0.600	0.457
3.000	2.000	0.300	0.600	0.427	1.440	0.432	0.367
4.000	2.000	0.350	0.700	0.445	1.080	0.378	0.240
5.000	2.000	0.400	0.800	0.454	1.080	0.432	0.245
			3.000	2.082		2.653	1.99

In the double declining balance method, I switched to straight line in year 4, because it gives me higher depreciation. If you stay with double declining balance all the way through, you would claim a higher depreciation in the fifth year (0.864 in year 4 and 1.296 in year 5), and the present value of tax benefits would be higher.