FIN 301 Homework Solution Ch8

Chapter 8: Using Discounted Cash-Flow Analysis to Make Investment Decisions

1. Net income = ($74 – $42 – $10) – [0.35 × ($74 – $42 – $10)]
   = $22 – $7.7 = $14.3 million
   - revenues – cash expenses – taxes paid = $74 – $42 – $7.7 = $24.3 million
   - after-tax profit + depreciation = $14.3 + $10 = $24.3 million
   - (revenues – cash expenses) × (1 – tax rate) + (depreciation × tax rate)
     = ($32 × 0.65) + ($10 × 0.35) = $24.3 million

2. a. ΔNWC = ΔAccounts Receivable + ΔInventory – ΔAccounts Payable
   = – €10,000 + €10,000 – €25,000 = – €25,000

   b. Cash flow = €3,600,000 – €2,400,000 + €25,000 = €1,225,000

4.

Revenue	$160,000
Rental costs	30,000
Variable costs	50,000
Depreciation	10,000
Pretax profit	70,000
Taxes (35%)	24,500
Net income	$45,500

5. a. net income + depreciation = $45,500 + $10,000 = $55,500

   b. revenue – rental costs – variable costs – taxes
   = $160,000 – $30,000 – $50,000 – $24,500 = $55,500

   c. [(revenue – rental costs – variable costs) × (1–0.35)] + (depreciation × 0.35)
   = [($160,000 – $30,000 – $50,000) × 0.65] + ($10,000 × 0.35)
   = $52,000 + $3,500 = $55,500

6. a.

Year	MACRS(%)	Depreciation	Book value (end of year)
1	20.00	$8,000	$32,000
2	32.00	12,800	19,200
3	19.20	7,680	11,520
4	11.52	4,608	6,912
5	11.52	4,608	2,304
6	5.76	2,304	0

b. If the machine is sold for $22,000 after 3 years, sales price exceeds book value by:

$22,000 – $11,520 = $10,480

After-tax proceeds are: $22,000 – (0.35 × $10,480) = $18,332

7. Change in working capital = ΔAccounts receivable – ΔAccounts payable

= ($4500 – $1200) – ($300 – $700) = $3,700

Cash flow = $16,000 – $9,000 – $3,700 = $3,300

8. a. In the following table, we compute the impact on operating cash flows by summing the value of the depreciation tax shield (depreciation × tax rate) plus the net-of-tax improvement in operating income [$20,000 × (1 – tax rate)]. Although the MACRS depreciation schedule extends out to 4 years, the project will be terminated when the machine is sold after 3 years, so we need to examine cash flows for only 3 years.

MACRS	Depreciation	Depreciation × 0.035	ΔOperating income × (1 – 0.35)	Contribution to operating cash flow
0.3333	$13,332	$4,666.20	$13,000	$17,666.20
0.4445	17,780	6,223.00	13,000	19,223.00
0.1481	5,942	2,073.40	13,000	15,073.40
0.0741				

b. Total cash flow = Operating cash flow + cash flow associated with investments

At time 0, the cash flow from the investment is: –$40,000
When the grill is sold at the end of year 3, its book value will be $2,964, so the sale price, net of tax, will be:

$$\$10{,}000 - [0.35 \times (\$10{,}000 - \$2{,}964)] = \$7{,}537.40$$

Therefore, total cash flows are:

Time	Cash Flow
0	–$40,000.00
1	17,666.20
2	19,223.00
3	22,610.80 [= 15,073.40 + 7,537.40]

c. The net present value of this cash flow stream, at a discount rate of 12 percent, is $7,191.77, which is positive. So the grill should be purchased.

10.

Revenue	$120,000
Variable costs	40,000
Fixed costs	15,000
Depreciation	40,000
Pretax profit	25,000
Taxes (35%)	8,750
Net income	16,250
Depreciation	40,000
Operating cash flow	$ 56,250

11. The cash flow used to evaluate the investment in the new chip is:

Incremental Cash Flow = Cash Flow With Project – Cash Flow Without Project

In this situation, Cash Flow is equal to Operating Cash Flow. Assuming revenues and expenses are all in cash:

Cash Flow Without Project = Revenues – Cash Expenses =

$(10{,}000{,}000 \times T\$90) - (10{,}000{,}000 \times T\$27) = T\$630{,}000{,}000$

Cash Flow With Project = Revenues – Cash Expenses =

(12,000,000 × T$120) + (3,000,000 × T$90) ─ (12,000,000 × T$33) – (3,000,000 × T$27)

= T$1,233,000,000

Incremental Cash Flow = T$1,233,000,000 – T$630,000,000 = T$603,000,000

If competition from competitors will reduce demand for the old chip, even if Taiwan Computing's new chip is not introduced, then the reduced level of demand for the old chip (3 million units) should be used in calculating the cash flow without the project. The calculations should be modified as follows:

Cash Flow Without Project = Revenues – Cash Expenses =

(3,000,000 × T$90) ─ (3,000,000 × T$27) = T$189,000,000

Cash Flow With Project = Revenues – Cash Expenses =

(12,000,000 × T$120) + (3,000,000 × T$90) ─ (12,000,000 × T$33) – (3,000,000 × T$27)

= T$1,233,000,000

Incremental Cash Flow = T$1,233,000,000 – T$189,000,000 = T$1,044,000,000

12. a. If the office space would have remained unused in the absence of the proposed project, then the incremental cash outflow from allocating the space to the project is effectively zero. The incremental cost of the space used should be based on the cash flow given up by allocating the space to this project rather than some other use.

    b. One reasonable approach would be to assess a cost to the space equal to the rental income that the firm could earn if it allowed another firm to use the space. This is the opportunity cost of the space.

13. Cash flow = net income + depreciation – increase in NWC

= €1,200,000 + €350,000 – (€100,000 + €120,000) = €1,330,000

14. In considering an expansion of the facility, FerroReal should include the following in project cash flows:

    a. The market value of the land.

    c. Construction of a new road to the site to allow truck access.

    f. Tax savings from future depreciation of the facility.

    h. The increase in real estate taxes resulting from construction of the facility.

15. NWC_{2006} = \$32 + \$25 – \$12 = \$45 million

NWC_{2007} = \$36 + \$30 – \$26 = \$40 million

Net working capital has decreased by \$5 million.

16. Using the seven-year ACRS depreciation schedule, after five years the machinery will be written down to 22.30% of its original value:

0.2230 × \$10 million = \$2.230 million

If the machinery is sold for \$4.5 million, the sale generates a taxable gain of: \$2.270 million

This increases the firm's tax bill by: 0.35 × \$2.270 = \$0.7945 million

Thus: total cash flow = \$4.5 – \$0.7945 = \$3.7055 million

17. Depreciation expense per year = \$40/5 = \$8 million

Book value of old equipment = \$40 – (3 × \$8) = \$16 million

After-tax cash flow = \$18 – [0.35 × (\$18 – \$16)] = \$17.3 million

18. a. All values should be interpreted as incremental results from making the purchase.

Earnings before depreciation	\$1,500
Depreciation	1,000
Taxable income	500
Taxes	200
Net income	300
+ Depreciation	1,000
Operating CF	\$1,300 in years 1–6

Net cash flow at time 0 is: –\$6,000 + [\$2,000 × (1 – 0.40)] = –\$4,800

b. NPV = –\$4,800 + [\$1,300 × annuity factor(16%, 6 years)]

$$= -\$4{,}800 + \$1{,}300 \times \left[\frac{1}{0.16} - \frac{1}{0.16 \times (1.16)^6} \right] = -\$9.84$$

c. Incremental CF in each year (using depreciation tax shield approach) is:

$[\$1{,}500 \times (1 - 0.40)] + (\text{depreciation} \times 0.40)$

Year	Depreciation	CF
0	n/a	–$4,800.00
1	$1,200.00	1,380.00
2	1,920.00	1,668.00
3	1,152.00	1,360.80
4	691.20	1,176.48
5	691.20	1,176.48
6	345.60	1,038.24

$$\text{NPV} = -\$4{,}800 + \frac{\$1{,}380}{1.16} + \frac{\$1{,}668}{1.16^2} + \frac{\$1{,}360.80}{1.16^3} + \frac{\$1{,}176.48}{1.16^4} + \frac{\$1{,}176.48}{1.16^5} + \frac{\$1{,}038.24}{1.16^6} = \$137.09$$

19. If the firm uses straight-line depreciation, the present value of the cost of buying, net of the annual depreciation tax shield (which equals $\$1{,}000 \times 0.40 = \$400$), is:

$\$6{,}000 - [\$400 \times \text{annuity factor}(16\%, 6 \text{ years})] =$

$$\$6{,}000 - \$400 \times \left[\frac{1}{0.16} - \frac{1}{0.16 \times (1.16)^6} \right] = \$4{,}526.11$$

The equivalent annual cost (EAC) is therefore determined by:

$C \times \text{annuity factor}(16\%, 6 \text{ years}) = \$4{,}526.11$

$$C \times \left[\frac{1}{0.16} - \frac{1}{0.16 \times (1.16)^6} \right] = \$4{,}526.11$$

$C \times 3.68474 = \$4{,}526.11 \Rightarrow C = \text{EAC} = \$1{,}228.34$

Note: this is the equivalent annual cost of the new washer, and does not include any of the washer's benefits.

21. a. Working capital = 20% × \$40,000 = \$8,000

Initial investment = \$45,000 + \$8,000 = \$53,000

b.

All figures in thousands of dollars

Year	Revenues	Expenses	Working Capital	Depreciation	Cash Flow*
1	40	16	6	11.25	20.9
2	30	12	4	11.25	17.3
3	20	8	2	11.25	13.7
4	10	4	0	11.25	10.1

*Cash flow = [(revenues – expenses) × (1 – 0.40)] + (depreciation × 0.40)
+ \$2,000 (decrease in working capital from previous year)

c. $$\text{NPV} = -\$53{,}000 + \frac{\$20{,}900}{1.12} + \frac{\$17{,}300}{1.12^2} + \frac{\$13{,}700}{1.12^3} + \frac{\$10{,}100}{1.12^4} = -\$4{,}377.71$$

d. To compute IRR, use trial-and-error or a financial calculator to solve for r in the following equation:

$$\frac{\$20{,}900}{1+r} + \frac{\$17{,}300}{(1+r)^2} + \frac{\$13{,}700}{(1+r)^3} + \frac{\$10{,}100}{(1+r)^4} = \$53{,}000 \Rightarrow \text{IRR} = 7.50\%$$

23. Find the equivalent annual cost of each alternative:

	Quick and Dirty	Do-It-Right
Operating costs	\$ 1 million	\$ 1 million
Investment	\$10 million	\$12 million
Project life	5 years	8 years
Annual depreciation	\$ 2 million	\$ 1.5 million
Depreciation tax shield	\$0.700 million	\$0.525 million
PV(Depreciation tax shield) *	\$2.523 million	\$2.608 million
Net capital cost **	\$7.477 million	\$9.392 million
EAC of net capital cost *	\$2.074 million	\$1.891 million

* annuity discounted at 12%; number of years = project life
** Investment – PV(Depreciation tax shield)

The present value of the depreciation tax shield for each alternative is computed as follows:

$$\text{PV} = \$0.700 \text{ million} \times \left[\frac{1}{0.12} - \frac{1}{0.12 \times (1.12)^5} \right] = \$2.523 \text{ million}$$

$$\text{PV} = \$0.525 \text{ million} \times \left[\frac{1}{0.12} - \frac{1}{0.12 \times (1.12)^8} \right] = \$2.608 \text{ million}$$

The equivalent annual cost (EAC) for each alternative is computed as follows:

$$\text{C} \times \left[\frac{1}{0.12} - \frac{1}{0.12 \times (1.12)^5} \right] = \$7.477 \text{ million} \Rightarrow \text{C} = \text{EAC} = \$2.074 \text{ million}$$

$$\text{C} \times \left[\frac{1}{0.12} - \frac{1}{0.12 \times (1.12)^8} \right] = \$9.392 \text{ million} \Rightarrow \text{C} = \text{EAC} = \$1.891 \text{ million}$$

Since the operating costs are the same, then Do-It-Right is preferred because it has the lower EAC.

24. The present value of the cost of buying is 150 million pesos less the present value of the depreciation tax shield. The depreciation tax shield is computed as follows:

Depreciation tax shield = depreciation × tax rate = 30 million pesos × 0.30 = 9 million pesos

The depreciation tax shield is an annuity of 9 million pesos per year for five years. The present value of the depreciation tax shield is:

9 million pesos × annuity factor(9%, 5 years) =

$$9 \text{ million pesos} \times \left[\frac{1}{0.09} - \frac{1}{0.09 \times (1.09)^5} \right] = 35.01 \text{ million pesos}$$

Therefore, the present value of the cost of buying is:

150 million pesos – 35.01 million pesos = 114.99 million pesos

[Note that we assume here that the excavators have zero salvage value; otherwise, the present value of the salvage value would be deducted in arriving at the present value of the cost of buying.]

The annual after-tax cost of leasing is:

35 million pesos × (1 – 0.30) = 24.50 million pesos

The present value of the cost of leasing (assuming that lease payments are made at the end of each year) is:

24.5 million pesos × annuity factor(9%, 5 years) =

$$24.5 \text{ million pesos} \times \left[\frac{1}{0.09} - \frac{1}{0.09 \times (1.09)^5} \right] = 95.30 \text{ million pesos}$$

Leasing is less expensive.

25.

All figures in thousands

	0	1	2	3	4
Net working capital	$176	$240	$112	$40	$ 0
Investment in NWC	176	64	−128	−72	−40
Investment in plant & equipment	200	0	0	0	0
Cash flow from investment activity	−$376	−$64	+$128	+$72	+$40

All figures in thousands

	0	1	2	3	4
Revenue		$880.00	$1200.00	$560.00	$200.00
Cost		550.00	750.00	350.00	125.00
Depreciation		66.66	88.90	29.62	14.82
Pretax profit		263.34	361.10	180.38	60.18
Taxes		92.17	126.39	63.13	21.06
Net income		171.17	234.71	117.25	39.12
Depreciation		66.66	88.90	29.62	14.82
Operating cash flow		$237.83	$323.61	$146.87	$ 53.94
Total cash flow	−$376.00	$173.83	$451.61	$218.87	$ 93.94

$$\text{NPV} = -\$376 + \frac{\$173.83}{1.20} + \frac{\$451.61}{1.20^2} + \frac{\$218.87}{1.20^3} + \frac{\$93.94}{1.20^4} = \$254.440 \text{ or } \$254{,}440$$

26. All figures are on an incremental basis:

Labor savings	$125,000
– Operating Cost	35,000
– Depreciation	90,000
EBIT	0
– Taxes	0
Net income	0
+ Depreciation	90,000
Operating cash flow	$90,000

NPV = – $1,000,000 + [$90,000 × annuity factor(8%, 10 years)] + [$100,000/$(1.08)^{10}$]

$$= -\$1{,}000{,}000 + \$90{,}000 \times \left[\frac{1}{0.08} - \frac{1}{0.08 \times (1.08)^{10}}\right] + \frac{\$100{,}000}{(1.08)^{10}} = -\$349{,}773.33$$