Chapter 15 Capital-Budgeting Decision

Methods of Financing

15.1

(a) Equity Financing:

Let X denote the number of shares to be sold. The total flotation cost would be

$$(0.06)(\$25)X = \$1.5X$$

To net \$10 million,

$$20X - 1.5X = \$10,000,000$$
$$23.5X = \$10,000,000$$
$$X = 425,532 \text{ shares}$$

Flotation cost = \$1.5(425,532) = \$638,298

(b) Equity Financing:

$$\text{Flotation cost} = \frac{\$10,000,000}{1-0.019} - \$10,000,000 = \$193,680$$

Number of bond = \$10,193,680 / \$1,000 = 10,194 units

Annual interest = (10,194) (\$1,000) (0.12) = \$1,223,280

15.2

(a) Equal repayment of the principal:

n	Repayment		Loan Balance
	Interest	Principal	
0			\$300,000
1	\$36,000	\$50,000	\$250,000
2	\$30,000	\$50,000	\$200,000
3	\$24,000	\$50,000	\$150,000
4	\$18,000	\$50,000	\$100,000
5	\$12,000	\$50,000	\$50,000
6	\$6,000	\$50,000	\$0

(b) Equal repayment of the interest:

n	Repayment		Loan Balance
	Interest	Principal	
0			\$300,000

1	$36,000	$0	$300,000
2	$36,000	$0	$300,000
3	$36,000	$0	$3000,000
4	$36,000	$0	$300,000
5	$36,000	$0	$300,000
6	$36,000	$300,000	$0

(c) Equal annual installment:

$$A = \$300,000(A/P,12\%,6) = \$72,968$$

n	Repayment		Loan Balance
	Interest	Principal	
0			$300,000
1	$36,000	$36,968	$263,032
2	$31,564	$41,404	$221,628
3	$26,595	$46,372	$175,256
4	$21,031	$51,937	$123,319
5	$14,798	$58,169	$65,150
6	$7,818	$65,150	$0

15.3

(a) Equity Financing

Income Statement	0	1	2	3	4
Revenue		$100,000	$100,000	$100,000	$100,000
Expenses					
Depreciation		$40,000	$64,000	$38,400	$11,520
Taxable Income		$60,000	$36,000	$61,600	$88,480
Income Taxes		$21,000	$12,600	$21,560	$30,968
Net Income		$39,000	$23,400	$40,040	$57,512
Cash Flow Statement					
Cash from operation					
Net Income		$39,000	$23,400	$40,040	$57,512
Depreciation		$40,000	$64,000	$38,400	$11,520
Investment/Salvage	($200,000)				$30,000
Gains Tax					$5,628
Net cash flow	($200,000)	$79,000	$87,400	$78,440	$104,660
PW(10%) =	$74,467				
AE(10%) =	$23,492				

(b) Debt Financing

Income Statement (Bank A)	0	1	2	3	4
Revenue		$100,000	$100,000	$100,000	$100,000
Expenses					
Depreciation		$40,000	$64,000	$38,400	$11,520
Interest		$20,000	$15,000	$10,000	$5,000
Taxable Income		$40,000	$21,000	$51,600	$83,480
Income Taxes		$14,000	$7,350	$18,060	$29,218
Net Income		$26,000	$13,650	$33,540	$54,262
Cash Flow Statement					
Cash from operation					
Net Income		$26,000	$13,650	$33,540	$54,262
Depreciation		$40,000	$64,000	$38,400	$11,520
Investment/Salvage	($200,000)				$30,000
Gains Tax				$5,628	$5,628
Loan Repayment	$200,000	($50,000)	($50,000)	($50,000)	($50,000)
Net cash flow	$0	$16,000	$27,650	$21,940	$51,410
PW(10%) =	$88,994				
AE(10%) =	$28,075				

Income Statement (Bank B)	0	1	2	3	4
Revenue		$100,000	$100,000	$100,000	$100,000
Expenses					
Depreciation		$40,000	$64,000	$38,400	$11,520
Interest		$20,000	$16,724	$13,121	$9,157
Taxable Income		$40,000	$19,276	$48,479	$79,323
Income Taxes		$14,000	$6,747	$16,968	$27,763
Net Income		$26,000	$12,529	$31,511	$51,560
Cash Flow Statement					
Cash from operation					
Net Income		$26,000	$12,529	$31,511	$51,560
Depreciation		$40,000	$64,000	$38,400	$11,520
Investment/Salvage	($200,000)				$30,000
Gains Tax				$5,628	$5,628
Loan Repayment	$200,000	($32,759)	($36,035)	($39,638)	($90,038)
Net cash flow	$0	$33,241	$40,494	$30,273	$8,670
PW(10%) =	$92,352				
AE(10%) =	$29,134				

Comments: The project terminates after 4 years where the bank financing from Bank B extends over 5 years. Since the bank financing is related to the proposed project, any unpaid future expenses after the project must be charged against the revenue from the proposed project. This adjustment is shown under the prepayment in the amount of $46,436 which is the equivalent cost in year 4 for the future expense in the amount of $51,080 at the firm's MARR. Therefore the loan repayment in year 4 should be ($43,602) + ($46,436) = ($90,036).

(c) Best course of action: Adopt Bank B's repayment plan

15.4

(a) The total flotation costs to raise $65 million:

- Common stock:

$$\text{Amount of common stock} = (\$65,000,000)(0.45)$$
$$= \$29,250,000$$
$$\text{Flotation cost} = \frac{\$29,250,000}{1-0.046} - \$29,250,000 = \$1,410,377$$

- Preferred stock:

$$\text{Amount of preferred stock} = (\$65,000,000)(0.10)$$
$$= \$6,500,000$$
$$\text{Flotation cost} = \frac{\$6,500,000}{1-0.081} - \$6,500,000 = \$572,905$$

- Bond:

$$\text{Amount of bond} = (\$65,000,000)(0.45)$$
$$= \$29,250,000$$
$$\text{Flotation cost} = \frac{\$29,250,000}{1-0.014} - \$29,250,000 = \$425,314$$

$\therefore$ Total flotation costs = $2,398,596

(b) Number of shares or (bonds) to be sold to raise $65 million:

- Common stock:

$$X_S(1-0.046)(\$32) = \$29,250,000$$
$$X_S = 958,137 \text{ shares}$$

- Preferred stock:

$$X_P(1-0.046)(\$55) = \$6,500,000$$
$$X_P = 128,598 \text{ shares}$$

- Bond:

$$X_B(1-0.014)(\$980) = \$29,250,000$$
$$X_B = 30,271 \text{ units}$$

(c) Cash requirement to meet financing costs:

- Common stock:

$$\text{Annual cash dividends} = (\$2/\text{share})(958{,}137\,\text{shares})$$
$$= \$1,916,274$$

- Preferred stock:

$$\text{Annual cash dividends} = (0.06)(\$15/\text{share})(128{,}598\,\text{shares})$$
$$= \$115,738$$

- Bond:

$$\text{Borrowing amount} = (30,271)(\$1,000)$$
$$= \$30,271,000$$
$$\text{Annual interest} = (\$30{,}271{,}000)(0.12) = \$3{,}632{,}520$$

$\therefore$ Total annual cash requirement = \$5,664,532

Cost of Capital

15.5 After-tax cost of debt:

(a)
$$(0.12)(1-0.25) = 0.09 \text{ or } 9\%$$

(b)
$$(0.14)(1-0.34) = 0.0924 \text{ or } 9.24\%$$

(c)
$$(0.15)(1-0.40) = 0.09 \text{ or } 9\%$$

15.6 In the absence of bond maturity date, we need to assume that the 13% yield to maturity represents the before-tax cost of debt after considering both the flotation cost as well as bond discounting. Let $k_b = 13\%$. Then, we compute the after-tax cost of debt as follows:

$$(0.13)(1-0.38) = 8.06\%$$

15.7 Cost of retaining earnings:

$$k_r = \frac{\$1}{\$18} + 0.12 = 17.56\%$$

15.8

(a) Flotation costs in percentage:

$$f_c = 1 - \frac{15}{18} = 16.67\%$$

(b) Cost of new common stock:

$$k_e = \frac{\$1.10}{\$15(1-0.1667)} + 0.10 = 18.80\%$$

15.9

$$i_e = 0.22$$
$$i_d = (0.13)(1-0.40) = 0.078$$
$$k = (0.078)(0.45) + (0.22)(0.55)$$
$$= 0.1561$$

15.10 Given: $k_e = 0.30$, $k_p = 0.12$

(a)

$$i_e = (55/70)(0.30) + (15/70)(0.12) = 0.2614$$
$$i_d = (1-0.40)[(0.3333)(0.14) + (1-0.3333)(0.12)] = 0.07602$$
$$k = (0.07602)(0.30) + (0.2614)(0.70)$$
$$= 0.2058$$

(b)

$$i_e = 0.06 + 1.2[0.12 - 0.06] = 13.20\%$$

(c)

$$k = (0.07602)(0.30) + (0.132)(0.70) = 11.52\%$$

15.11 Given: $i_e = 18\%$, $i_d = (0.12)(1-0.36) = 0.0768$

$$k = (0.4)(0.0768) + (0.6)(0.18) = 13.87\%$$

(a) Net equity flow method: $PW(18\%) = \$35,848 > 0$, accept the project.

Income Statement	0	1	2	3	4	5
Revenue		$90,000	$90,000	$90,000	$90,000	$90,000
Expenses						
O&M		$10,000	$10,000	$10,000	$10,000	$10,000
Depreciation		$28,580	$48,980	$34,980	$24,980	$8,930
Interest		$9,600	$8,089	$6,396	$4,501	$2,378
Taxable Income		$41,820	$22,931	$38,624	$50,519	$68,692
Income Taxes		$15,055	$8,255	$13,904	$18,187	$24,729
Net Income		$26,765	$14,676	$24,719	$32,332	$43,963
Cash Flow Statement						
Cash from operation						
Net Income		$26,765	$14,676	$24,719	$32,332	$43,963
Depreciation		$28,580	$48,980	$34,980	$24,980	$8,930
Investment/Salvage	($200,000)					$50,000
Gains Tax						$1,278
Loan Repayment	$80,000	($12,593)	($14,104)	($15,796)	($17,692)	($19,815)
Net cash flow	($120,000)	$42,752	$49,552	$43,903	$39,620	$84,356
PW(18%) =	$35,847					

(b) Cost of capital method: $PW(13.87\%) = \$41,300 > 0$, accept the project.

Income Statement	0	1	2	3	4	5
Revenue		$90,000	$90,000	$90,000	$90,000	$90,000
Expenses						
O&M		$10,000	$10,000	$10,000	$10,000	$10,000
Depreciation		$28,580	$48,980	$34,980	$24,980	$8,930
Taxable Income		$51,420	$31,020	$45,020	$55,020	$71,070
Income Taxes		$18,511	$11,167	$16,207	$19,807	$25,585
Net Income		$32,909	$19,853	$28,813	$35,213	$45,485
Cash Flow Statement						
Cash from operation						
Net Income		$32,909	$19,853	$28,813	$35,213	$45,485
Depreciation		$28,580	$48,980	$34,980	$24,980	$8,930
Investment/Salvage	($200,000)					$50,000
Gains Tax						$1,278
Net cash flow	($200,000)	$61,489	$68,833	$63,793	$60,193	$105,693
PW(13.87%) =	$41,300					

15.12

(a) Net equity flow method:

Income Statement	0	1	2	3	4	5
Revenue		$45,000	$45,000	$45,000	$45,000	$45,000
Expenses						
Depreciation		$20,000	$32,000	$19,200	$11,520	$5,760
Interest (15%)		$9,000	$7,665	$6,130	$4,365	$2,335
Taxable Income		$16,000	$5,335	$19,670	$29,115	$36,905
Income Taxes (30%)		$4,800	$1,600	$5,901	$8,735	$11,072
Net Income		$11,200	$3,734	$13,769	$20,381	$25,834
Cash Flow Statement						
Cash from operation						
Net Income		$11,200	$3,734	$13,769	$20,381	$25,834
Depreciation		$20,000	$32,000	$19,200	$11,520	$5,760
Investment/Salvage	($100,000)					$30,000
Gains Tax						($5,544)
Loan Repayment	$60,000	($8,899)	($10,234)	($11,769)	($13,534)	($15,564)
Net cash flow	($40,000)	$22,301	$25,501	$21,200	$18,366	$40,485

PW(20%) = $33,689

(b) Cost of capital method: $i_e = 20\%, i_d = (0.15)(1-0.30) = 0.105$

$k = (0.60)(0.105) + (0.40)(0.20) = 14.30\%$

Income Statement	0	1	2	3	4	5
Revenue		$45,000	$45,000	$45,000	$45,000	$45,000
Expenses						
Depreciation		$20,000	$32,000	$19,200	$11,520	$5,760
Taxable Income		$25,000	$13,000	$25,800	$33,480	$39,240
Income Taxes		$7,500	$3,900	$7,740	$10,044	$11,772
Net Income		$17,500	$9,100	$18,060	$23,436	$27,468
Cash Flow Statement						
Cash from operation						
Net Income		$17,500	$9,100	$18,060	$23,436	$27,468
Depreciation		$20,000	$32,000	$19,200	$11,520	$5,760
Investment/Salvage	($100,000)					$30,000
Gains Tax						($5,544)
Net cash flow	($100,000)	$37,500	$41,100	$37,260	$34,956	$57,684

PW(14.3%) = $39,268

15.13

(a) Using $i_e = 15\%$: Select Machine B.

Machine A

Income Statement	0	1	2	3	4	5	6
Revenue		$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Expenses							
O&M		$8,000	$8,000	$8,000	$8,000	$8,000	$8,000
Depreciation		$8,000	$12,800	$7,680	$4,608	$4,608	$2,304
Interest (10%)		$1,200	$1,044	$873	$685	$478	$250
Taxable Income		$2,800	($1,844)	$3,447	$6,707	$6,914	$9,446
Income Taxes (35%)		$980	($646)	$1,206	$2,347	$2,420	$3,306
Net Income		$1,820	($1,199)	$2,240	$4,359	$4,494	$6,140
Cash Flow Statement							
Cash from operation							
Net Income		$1,820	($1,199)	$2,240	$4,359	$4,494	$6,140
Depreciation		$8,000	$12,800	$7,680	$4,608	$4,608	$2,304
Investment/Salvage	($40,000)						$4,000
Gains Tax							($1,400)
Loan Repayment	$12,000	($1,555)	($1,711)	($1,882)	($2,070)	($2,277)	($2,505)
Net cash flow	($28,000)	$8,265	$9,890	$8,038	$6,897	$6,825	$8,539
PW(15%) =	$2,979						

Machine B

Income Statement	0	1	2	3	4	5	6
Revenue		$28,000	$28,000	$28,000	$28,000	$28,000	$28,000
Expenses							
O&M		$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Depreciation		$12,000	$19,200	$11,520	$6,912	$6,912	$3,456
Interest (10%)		$1,800	$1,567	$1,310	$1,028	$717	$376
Taxable Income		$4,200	($2,767)	$5,170	$10,060	$10,371	$14,168
Income Taxes (35%)		$1,470	($968)	$1,809	$3,521	$3,630	$4,959
Net Income		$2,730	($1,798)	$3,360	$6,539	$6,741	$9,209
Cash Flow Statement							
Cash from operation							
Net Income		$2,730	($1,798)	$3,360	$6,539	$6,741	$9,209
Depreciation		$12,000	$19,200	$11,520	$6,912	$6,912	$3,456
Investment/Salvage	($60,000)						$8,000
Gains Tax							($2,800)
Loan Repayment	$18,000	($2,333)	($2,566)	($2,823)	($3,105)	($3,416)	($3,757)
Net cash flow	($42,000)	$12,397	$14,835	$12,058	$10,346	$10,237	$14,108
PW(15%) =	$5,030						

(b) Using $k = 12.45\%$: Select machine B.

Machine A

Income Statement	0	1	2	3	4	5	6
Revenue		$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Expenses							
O&M		$8,000	$8,000	$8,000	$8,000	$8,000	$8,000
Depreciation		$8,000	$12,800	$7,680	$4,608	$4,608	$2,304
Taxable Income		$4,000	($800)	$4,320	$7,392	$7,392	$9,696
Income Taxes (35%)		$1,400	($280)	$1,512	$2,587	$2,587	$3,394
Net Income		$2,600	($520)	$2,808	$4,805	$4,805	$6,302
Cash Flow Statement							
Cash from operation							
Net Income		$2,600	($520)	$2,808	$4,805	$4,805	$6,302
Depreciation		$8,000	$12,800	$7,680	$4,608	$4,608	$2,304
Investment/Salvage	($40,000)						$4,000
Gains Tax							($1,400)
Net cash flow	($40,000)	$10,600	$12,280	$10,488	$9,413	$9,413	$11,206

PW(12.45%) = $3,178

Machine B

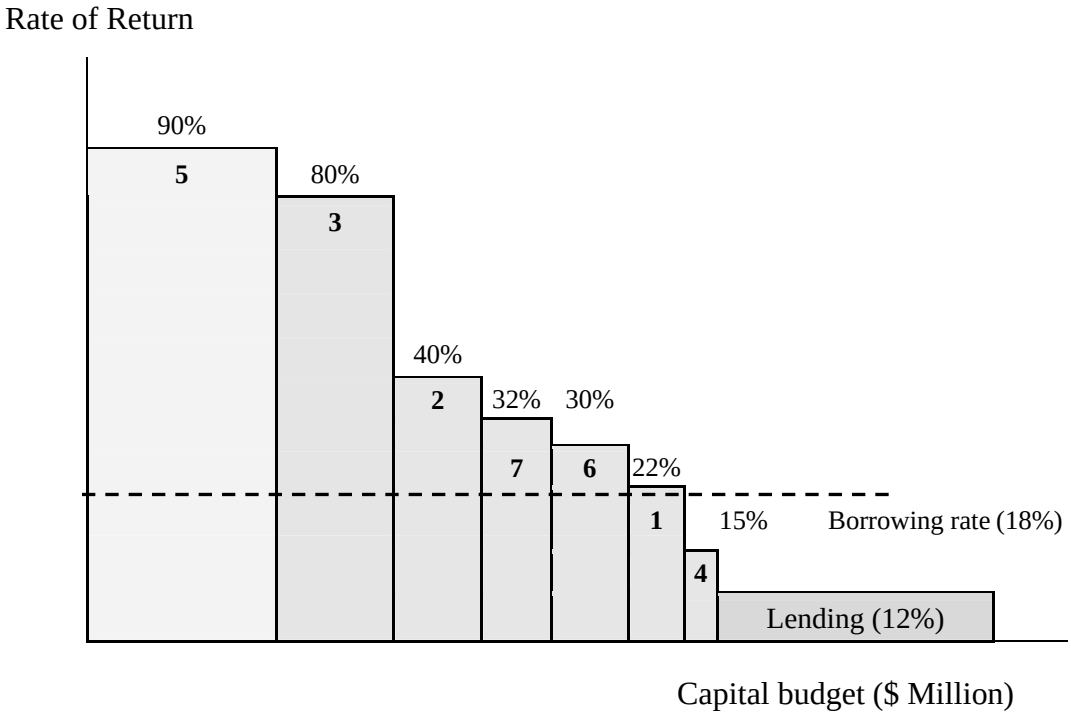
Income Statement	0	1	2	3	4	5	6
Revenue		$28,000	$28,000	$28,000	$28,000	$28,000	$28,000
Expenses							
O&M		$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Depreciation		$12,000	$19,200	$11,520	$6,912	$6,912	$3,456
Taxable Income		$6,000	($1,200)	$6,480	$11,088	$11,088	$14,544
Income Taxes (35%)		$2,100	($420)	$2,268	$3,881	$3,881	$5,090
Net Income		$3,900	($780)	$4,212	$7,207	$7,207	$9,454
Cash Flow Statement							
Cash from operation							
Net Income		$3,900	($780)	$4,212	$7,207	$7,207	$9,454
Depreciation		$12,000	$19,200	$11,520	$6,912	$6,912	$3,456
Investment/Salvage	($60,000)						$8,000
Gains Tax							($2,800)
Net cash flow	($60,000)	$15,900	$18,420	$15,732	$14,119	$14,119	$18,110

PW(12.45%) = $5,410

(c) Both methods provide the consistent solution.

Capital Budgeting

15.14 Based on the investment opportunity curve below, the firm's optimal capital budget would be \$177 million, with no restriction on the firm's debt limit. However, with a budget limit of \$100 million, the firm may select projects 5 and 3 first. Since these two projects alone consume \$95 million, the firm may have two choices about utilizing the remaining \$5 million funds. First choice is to find any projects whose rates of return exceed the cost of capital. Project 4 comes close to meeting this requirement. However, the firm's borrowing rate is 18%, which is greater than the rate of return from project 4. Therefore, the projects that should be included in the \$100 million budget would be projects 5 and 3. If money has to be raised from outside, the firm should raise only \$95 million



15.15

(a) Present worth analysis: With no budget restriction, select alternatives 1,2,3,4,7,13, and 14. The total NPW from the projects is \$2,194.

j	PW(8%)	*j*	PW(8%)
1	\$303	8	-\$208
2	\$500	9	-\$165
3	\$661	10	-\$27
4	\$46	11	-\$1,017
5	-\$66	12	-\$248
6	-\$814	13	\$126
7	\$47	14	\$512

(b) With a budget limit of $1,800, select alternatives 1, 2, 3,4,13, and 14. The total amount of investment required is $1,756.

Short Case Studies

ST 15.1 Their financial data for Year 2003:

Number of shares	1,000,000
Long-term Debts	12,000,000
Interest paid	1,200,000
Assets	5,000,000
Earning before Tax	3,500,000

* Stock Price per share	18	Total Equity	18,000,000
* Earning per share	2.1	Total Earning	2,100,000
* Dividends per share	1.9	Total Dividend	1,900,000

(a) From the table, the future net cash flow is

$$\$18,000,000 - \$5,000,000 = \$13,000,000$$

(b) From the table, tax rate is

$$1 - \frac{\$2,100,000}{\$3,500,000} = 0.4$$

(c)

- MARR with known source of financing = Cost of equity

$$i_e = \left[\frac{(18-8)+1.1+1.2+1.5+1.9}{8}\right]^{\frac{1}{4}} - 1 = 18.36\%$$

- MARR with unknown source of financing = Cost of capital

Cost of Debt	10%	(40% of assets)
Cost of Equity	18.36%	(60% of assets)
Tax rate	40%	

$$\therefore\ k = (0.1\cdot(1-0.4)\times 0.4) + (0.1836\times 0.6) = 13.42\%$$

(d) Assuming that the company funds the new project by maintaining the same debt to equity ratio. They have to borrow $4,032,000 and issue 336,000 stocks which will increase their equity $6,048,000 for the project.

EOY	0	1	2
Income Statement			
Revenue		44,000,000	44,000,000
Cost of Goods Sold		35,200,000	26,400,000
Depreciation		1,440,432	1,234,296
Interest		403,200	403,200
Taxable income		6,956,368	15,962,504
Tax (40%)		2,782,547	6,385,002
Net income		4,173,821	9,577,502
Cash Flow Statement			
Cash from operation			
Net income		4,173,821	9,577,502
Depreciation		1,440,432	1,234,296
Investment	(10,080,000)		
Salvage			3,600,000
Gains Tax			1,522,109
Finance	4,032,000		(4,032,000)
Stock issue fee	(665,280)		
Net Cash Flow	(6,713,280)	5,614,253	11,901,907
NPW (18.36%)	6,525,936		

$$\therefore \text{ Most likely stock price} = \frac{(18,000,000 + 6,525,936)}{(1,000,000 + 366,000)\text{shares}} = \$18.36/\text{share}$$

Comments: When inflation is considered, and using the inflation adjusted MARR of 30.2%, the likely stock price is $18.21.

(e) Three different ways to finance the project are considered. In case of debt financing, the interests are at the end of each year and the principal is fully repaid in a lump sum at the end of 5^{th} year. The potential stock price of each case would be as follows:

Methods	100% Equity Financing	Current Mixed Financing	100% Debt Financing
Stock price	$39.93	$48.11	$67.26
Comments	Pessimistic	Most likely	Optimistic

- 100% Equity Financing

EOY	0	1	2	3	4	5	6	7	8
Income Statement									
Income		44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000
Cost of Goods Sold		35,200,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000
Depreciation		1,440,432	2,468,592	1,762,992	1,762,992	900,144	899,136	900,144	449,568
Interest									
Taxable income		7,359,568	15,131,408	15,837,008	15,837,008	16,699,856	16,700,864	16,699,856	17,150,432
Tax (40%)		2,943,827	6,052,563	6,334,803	6,334,803	6,679,942	6,680,346	6,679,942	6,860,173
Net income		4,415,741	9,078,845	9,502,205	9,502,205	10,019,914	10,020,518	10,019,914	10,290,259
Cash Flow Statement									
Cash from operation									
Net income		4,415,741	9,078,845	9,502,205	9,502,205	10,019,914	10,020,518	10,019,914	10,290,259
Depreciation		1,440,432	2,468,592	1,762,992	1,762,992	900,144	899,136	900,144	449,568
Investment	(10,080,000)								
Salvage									
Gains Tax									
Finance				-	-				
Stock issue fee	(1,108,800)								
Net Cash Flow	(11,188,800)	5,856,173	11,547,437	11,265,197	11,265,197	10,920,058	10,919,654	10,920,058	10,739,827
Discounted	(11,188,800)	4,947,763	8,242,817	6,793,975	5,740,093	4,701,107	3,971,725	3,355,755	17,721,572
PW(18.36%)	44,286,008								

$$\therefore \text{ Stock price} = \frac{(18,000,000 + 44,286,008)}{(1,000,000 + 560,000)\text{shares}} = \$39.93/\text{share}$$

- Current Mixed Financing

EOY	0	1	2	3	4	5	6	7	8
Income Statement									
Income		44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000
Cost of Goods Sold		35,200,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000
Depreciation		1,440,432	2,468,592	1,762,992	1,762,992	900,144	899,136	900,144	449,568
Interest		403,200	403,200	403,200	403,200	403,200			
Taxable income		6,956,368	14,728,208	15,433,808	15,433,808	16,296,656	16,700,864	16,699,856	17,150,432
Tax(40%)		2,782,547	5,891,283	6,173,523	6,173,523	6,518,662	6,680,346	6,679,942	6,860,173
Net income		4,173,821	8,836,925	9,260,285	9,260,285	9,777,994	10,020,518	10,019,914	10,290,259
Cash Flow Statement									
Cash from operation									
Net income									
Depreciation		1,440,432	2,468,592	1,762,992	1,762,992	900,144	899,136	900,144	449,568
Investment	(10,080,000)								
Salvage									
Gains Tax									
Finance	4,032,000					(4,032,000)			
Stock issue fee	(665,280)								
Net Cash Flow	(6,713,280)	5,614,253	11,305,517	11,023,277	11,023,277	6,646,138	10,919,654	10,920,058	10,739,827
Discounted	(6,713,280)	4,743,370	8,070,130	6,648,074	5,616,825	2,861,176	3,971,725	3,355,755	17,721,572
PW(18.36%)	46,275,346								

$$\therefore \text{ Stock price} = \frac{(18,000,000 + 46,275,346)}{(1,000,000 + 336,000)\text{shares}} = \$48.11/\text{share}$$

- 100% Debt Financing

EOY	0	1	2	3	4	5	6	7	8
Income Statement									
Income		44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000	44,000,000
Cost of Goods Sold		35,200,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000	26,400,000
Depreciation		1,440,432	2,468,592	1,762,992	1,762,992	900,144	899,136	900,144	449,568
Interest		1,008,000	1,008,000	1,008,000	1,008,000	1,008,000			
Taxable income		6,351,568	14,123,408	14,829,008	14,829,008	15,691,856	16,700,864	16,699,856	17,150,432
Tax(40%)		2,540,627	5,649,363	5,931,603	5,931,603	6,276,742	6,680,346	6,679,942	6,860,173
Net income		3,810,941	8,474,045	8,897,405	8,897,405	9,415,114	10,020,518	10,019,914	10,290,259
Cash Flow Statement									
Cash from operation									
Net income									
Depreciation		1,440,432	2,468,592	1,762,992	1,762,992	900,144	899,136	900,144	449,568
Investment	(10,080,000)								
Salvage									
Gains Tax									
Finance	10,080,000					(10,080,000)			
Stock issue fee									
Net Cash Flow		5,251,373	10,942,637	10,660,397	10,660,397	235,258	10,919,654	10,920,058	10,739,827
Discounted		4,436,780	7,811,098	6,429,223	5,431,922	101,279	3,971,725	3,355,755	17,721,572
PW(18.36%)	49,259,354								

$$\therefore \text{ Stock price} = \frac{(18,000,000 + 49,259,354)}{(1,000,000)\text{shares}} = \$67.26/\text{share}$$

ST 15.2

(a) There are 58 alternatives.

(b) There are 10 feasible alternatives:

j	Projects	j	Projects
1	1	6	1, 7
2	2	7	1, 4, 7
3	1, 2	8	1, 5, 7
4	1, 4	9	2, 6
5	1, 5	10	2, 7

(c) Without knowing the exact cash flow sequences for each project over the project life, it is not feasible to determine the optimal capital budget.

ST 15.3

(a) Select A and C with FW(10%) = \$4,894. Since there are \$500 left over after selecting A and C, we could lend out the left-over funds at 10% for 3 periods. Therefore, the total amount available for lending at the end of period 3 is calculated as follows:

$$F = \$4,894 + \$500(F/P, 10\%, 3)$$
$$= \boxed{\$5,559.60}$$

(b) Select B and C. the total amount available for lending at the end of period 3 is \$5,740.

(c) With a budget limit of \$3,500, the reasonable MARR should be the lending rate of 10%. (You select A and C and have \$500 available for lending.)

ST 15.4

(a) The debt repayment schedule for the loan from the equipment manufacturer:

n	Loan Repayment		Loan Balance
	Interest	Principal	
0			\$2,000,000
1	\$200,000	\$125,491	\$1,874,509
2	\$187,451	\$138,040	\$1,736,469
3	\$173,647	\$151,844	\$1,584,625
4	\$158,463	\$167,028	\$1,417,597
5	\$141,760	\$183,731	\$1,233,866
6	\$123,387	\$202,104	\$1,031,762
7	\$103,176	\$222,315	\$809,447
8	\$80,945	\$244,546	\$564,901
9	\$56,490	\$269,001	\$295,901
10	\$29,590	\$295,901	\$0

(b) The floatation costs and the number of common stocks to raise $8,500,000:

$$\text{Flotation cost} = \frac{\$8,500,000}{1-0.081} - \$8,500,000 = \$749,184$$

$$\text{Number of shares} = \frac{\$8,500,000}{(1-0.081)(\$45)} = 205,537 \text{ shares}$$

(c) The floatation costs and the number of $1,000 bonds to raise $10.5 million:

$$\text{Flotation cost} = \frac{\$10,500,000}{1-0.019} - \$10,500,000 = \$203,364$$

$$\text{Number of bonds} = \frac{\$10,500,000}{(1-0.019)(\$900)} = 11,893 \text{ units}$$

ST 15.5 (a) The net cash flow from the cogeneration project with bond financing

Income Statement	0	1	2	3	4	5	6	7 - 11	12
Revenue									
Electricity Bill		$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000
Excess power		$480,000	$480,000	$480,000	$480,000	$480,000	$480,000	$480,000	$480,000
Expenses									
O&M		$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000
Misc.		$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Standby power		$6,400	$6,400	$6,400	$6,400	$6,400	$6,400	$6,400	$6,400
Overhead		$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000
Depreciation									
Unit		$500,000	$950,000	$855,000	$770,000	$693,000	$623,000	$590,500	$295,000
Inter Equipment		$100,000	$160,000	$96,000	$57,600	$57,600	$28,800		
Interest (9%)		$1,070,370	$1,070,370	$1,070,370	$1,070,370	$1,070,370	$1,070,370	$1,070,370	$1,070,370
Taxable Income		$2,143,230	$1,633,230	$1,792,230	$1,915,630	$1,992,630	$2,091,430	$2,152,730	$2,448,230
Income Taxes (36%)		$771,563	$587,963	$645,203	$689,627	$717,347	$752,915	$774,983	$881,363
Net Income		$1,371,667	$1,045,267	$1,147,027	$1,226,003	$1,275,283	$1,338,515	$1,377,747	$1,566,867
Cash Flow Statement									
Cash from operation									
Net Income		$1,371,667	$1,045,267	$1,147,027	$1,226,003	$1,275,283	$1,338,515	$1,377,747	$1,566,867
Depreciation									
Unit		$500,000	$950,000	$855,000	$770,000	$693,000	$623,000	$590,500	$295,000
Inter Equipment		$100,000	$160,000	$96,000	$57,600	$57,600	$28,800		
Investment/Salvage									
Unit	($10,000,000)								$1,000,000
Inter Equipment	($500,000)								
Gains Tax									$490,140
Loan Repayment	$10,500,000								($11,893,000)
Net cash flow	$0	$1,971,667	$2,155,267	$2,098,027	$2,053,603	$2,025,883	$1,990,315	$1,968,247	($8,540,993)

PW(27%) = $6,516,321

(b) The maximum annual lease amount that ACC is willing to pay is $933,358. (By Excel solver.)

Income Statement	0	1	2	3	4	5	6	7 - 11	12
Revenue									
Electricity Bill		$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000	$6,120,000
Excess power		$480,000	$480,000	$480,000	$480,000	$480,000	$480,000	$480,000	$480,000
Expenses									
O&M		$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000
Misc.		$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Standby power		$6,400	$6,400	$6,400	$6,400	$6,400	$6,400	$6,400	$6,400
Overhead		$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000	$1,280,000
Lease		$933,358	$933,358	$933,358	$933,358	$933,358	$933,358	$933,358	$933,358
Taxable Income		$2,880,242	$2,880,242	$2,880,242	$2,880,242	$2,880,242	$2,880,242	$2,880,242	$2,880,242
Income Taxes (36%)		$1,036,887	$1,036,887	$1,036,887	$1,036,887	$1,036,887	$1,036,887	$1,036,887	$1,036,887
Net Income		$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355
Cash Flow Statement									
Cash from operation									
Net Income		$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355
Net cash flow	$0	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355	$1,843,355

PW(27%) = $6,516,321