

Chapter 19

Questions

1. The difference between secured debt and unsecured debt is that secured debt is backed by specific assets whereas unsecured debt is not.
2. Debt covenants impose restrictions, intended to protect bondholders, on the firm that issued the bonds. Debt covenants may limit the issuance of additional debt, the payment of dividends, liens, subsidiary borrowing, asset disposition, mergers, and sale and leaseback.
3. Ideally, a firm would choose a debt maturity that causes its cash outflows to match its expected cash inflows.
4. A sinking fund requires the firm to repay debt in installments rather than in a lump sum. The sinking fund payments shorten the effective maturity of the debt issue.
5. Deep-discount bonds are bonds with coupon rates well below market interest rates that are issued at prices well below face value to compensate investors for the small coupon payments.
6. A call option is commonly included in a corporate bond issue to give the issuing firm the ability to refinance. If interest rates decline, the firm can call the bonds away from the bondholders for a premium above par and refinance the issue at a lower interest rate.
7. Commodity-linked bonds are bonds where the principal repayment and perhaps the coupon payments are tied to the price of a particular commodity such as gold, silver, or oil. The commodity-linked bonds shift some of the risk of commodity price changes from commodity producers to bondholders.
8. Floating-rate notes are notes with interest payments that adjust to changes in the market interest rates. Floating-rate notes shift interest-rate risk from the issuer to the bondholder.
9. A Eurobond is a bond issued outside the country in which currency it is denominated. For instance, a firm headquartered in the United States may issue dollar-denominated bonds to investors in Japan.
10. A high-coupon bond refunding is when a firm calls its bonds from investors in order to reissue them at a lower interest rate. This may occur when interest rates have fallen and the costs of calling the bonds are lower than the advantage of reissuing the bonds at lower interest rates.

Challenging Questions

11. The debt service parity approach computes the present value of the incremental after-tax cash flows using the after-tax cost of the new debt issue as the discount rate.
12. A firm should not refund an outstanding debt issue the instant the net advantage becomes positive because of the high transaction costs associated with refinancing. If interest rates continued to decline, the firm would have benefited by waiting and refinancing at lower interest rates.
13. The firm issuing the bonds benefits from the call provision as the call provision allows the firm to refinance the bond at a lower interest rate. A call provision increases the bond's coupon rate as investors demand a higher return to compensate for the call provision.
14. Bondholders benefit from a bond put option as it allows them to put the bond to the issuers to limit claim dilution in the event of a leveraged buyout or an increase in debt. A bond put option decreases the bond's coupon rate as investors are willing to receive a lower return in exchange for the put option.

15. The difference between average life and duration is that average life only accounts for principal repayments while duration accounts for principal payments, interest payments and the time value of money.
16. Zero-coupon bonds have a longer duration than bonds of equivalent maturity and yield because the only cash flow that occurs is at maturity. Normal bonds make payments throughout the remaining maturity, thus lower average time when payments are received.

Problem Set A

- A1. 1. Interest Coverage Ratio = EBIT / Interest Expense = \$90 million / \$20 million = 4.5
4.5 < 5, Montgomery Business Products is not in compliance.
2. Tangible Assets / Long-Term Debt = \$500 million / \$210 million = 2.38
2.38 > 2, Montgomery Business Products is in compliance.
3. Cumulative Dividends and Share Repurchases = \$60 million + \$2 million = \$62 million
\$62 million < \$150 million x 50%, Montgomery Business Products is in compliance.
Because of the first covenant, Montgomery Business Products is not in compliance.
- A2. 1. Interest Coverage Ratio = EBIT / Interest Expense = \$70 million / \$14 million = 5
5 > 4, Dallas Instruments is in compliance.
2. Tangible Assets / Long-Term Debt = \$400 million / \$175 million = 2.29
2.29 > 1.5, Dallas Instruments is in compliance.
3. Cumulative Dividends and Share Repurchases = \$40 million + \$40 million = \$80 million
\$80 million < \$200 million x 60%, Montgomery Business Products is in compliance.
Montgomery Business Products meets all of the covenants and is therefore in compliance.
- A3. 1. $n = 40$ $r = ?$ $PV = -(\$50 - \$1) = -\$49$ $PMT = 9\% / 2 \times \$50 = \2.25 $FV = \$50$ $r = \mathbf{4.61\%}$
 $APY = (1 + 0.0461)^2 - 1 = 9.4334\%$
2. $n = 20$ $r = ?$ $PV = -(\$50 - \$0.5) = -\$49.5$ $PMT = 9.25\% \times \$50 = \4.625 $FV = \$50$ $r = \mathbf{9.36\%}$
 $APY = 9.36\%$
Choice 2 has the lower APY.
- A4. 1. $n = 40$ $r = ?$ $PV = -(\$75 - \$1) = -\$74$ $PMT = 8\% / 2 \times \$75 = \3 $FV = \$75$ $r = \mathbf{4.068\%}$
 $APY = (1 + 0.04068)^2 - 1 = 8.3016\%$
2. $n = 20$ $r = ?$ $PV = -(\$75 - \$0.5) = -\$74.5$ $PMT = 8.125\% \times \$75 = \6.09375 $FV = \$75$
 $r = \mathbf{8.19\%}$
 $APY = 8.19\%$
Choice 2 has the lower APY.
- A5. Average Life = $(S_t \times A_t) / (S A_t)$
Average Life = $(14 \times 1 + 15 \times 1 + 16 \times 1 + 17 \times 1 + 18 \times 1 + 19 \times 1 + 20 \times 1) / 7 = 119 / 7 = 17$ years
- A6. a. Year 1 interest = $(5\% + 3\%) \times \$1$ million = \$80,000
Year 2 interest = $(6\% + 3\%) \times \$1$ million = \$90,000
Year 3 interest = $(9\% + 3\%) \times \$1$ million = \$120,000
Year 4 interest = $(7\% + 3\%) \times \$1$ million = \$100,000
Year 5 interest = $(7\% + 3\%) \times \$1$ million = \$100,000
b. Year 1 interest = $\text{Max}[(5\% + 3.25\%), 9\%] \times \1 million = \$82,500
Year 2 interest = $\text{Max}[(6\% + 3.25\%), 9\%] \times \1 million = \$90,000
Year 3 interest = $\text{Max}[(9\% + 3.25\%), 9\%] \times \1 million = \$90,000
Year 4 interest = $\text{Max}[(7\% + 3.25\%), 9\%] \times \1 million = \$90,000
Year 5 interest = $\text{Max}[(7\% + 3.25\%), 9\%] \times \1 million = \$90,000

A7. Interest Coverage Ratio = EBIT / Interest Expense = \$25 million / Interest Expense = 2.5
 Interest Expense = \$25 million / 2.5 = \$10 million
 Current Interest Expense = \$7 million
 Additional Interest Expense = \$10 million - \$7 million = \$3 million
 8% x Additional Debt = \$3 million
 Additional Debt = \$3 million / 8% = \$37.5 million

A8. Interest Coverage Ratio = EBIT / Interest Expense = \$40 million / Interest Expense = 2.0
 Interest Expense = \$40 million / 2.0 = \$20 million
 Current Interest Expense = \$15 million
 Additional Interest Expense = \$20 million - \$15 million = \$5 million
 10% x Additional Debt = \$5 million
 Additional Debt = \$5 million / 10% = \$50 million

A9. Duration = $1 / P \times S (t \times CF_t) / (1 + y)^t$
 YTM = 8.50%

Year	CF	PV (CF)	t x CF	PV (t x CF)
1	\$ 3.60	\$ 3.32	\$ 3.60	\$ 3.32
2	\$ 3.60	\$ 3.06	\$ 7.20	\$ 6.12
3	\$ 3.60	\$ 2.82	\$ 10.80	\$ 8.46
4	\$ 3.60	\$ 2.60	\$ 14.40	\$ 10.39
5	\$ 23.60	\$ 15.70	\$ 118.00	\$ 78.48
6	\$ 23.60	\$ 14.47	\$ 141.60	\$ 86.79
	P =	\$ 41.95	Total =	\$ 193.55

Duration = \$193.54 / \$41.95

Duration = 4.61

A10. Duration = $1 / P \times S (t \times CF_t) / (1 + y)^t$

YTM = 10.00%

Year	CF	PV (CF)	t x CF	PV (t x CF)
1	\$ 12.00	\$ 10.91	\$ 12.00	\$ 10.91
2	\$ 12.00	\$ 9.92	\$ 24.00	\$ 19.83
3	\$ 87.00	\$ 65.36	\$ 261.00	\$ 196.09
4	\$ 87.00	\$ 59.42	\$ 348.00	\$ 237.69
	P =	\$ 145.61	Total =	\$ 464.53

Duration = \$464.53 / \$145.61

Duration = 3.19

A11.

Year	Call Price
1	N/A
2	N/A
3	N/A
4	N/A
5	N/A
6	N/A
7	N/A
8	N/A
9	N/A
10	N/A
11	\$1,100
12	\$1,075
13	\$1,050
14	\$1,025
15	\$1,000

A12. Domestic: $n = 16$ $r = ?$ $PV = -\$1,000$ $PMT = 11\% / 2 \times \$1,000 = \55 $FV = \$1,000$ $r = \mathbf{5.50\%}$
 APY = 11.30%

Eurobond: $n = 8$ $r = ?$ $PV = -\$1,000$ $PMT = 11.25\% \times \$1,000 = \112.5 $FV = \$1,000$

$r = \mathbf{11.25\%}$

APY = 11.25%

The Eurobond offers the lower borrowing cost.

Problem Set B

B1. a.

Period	1	2	3	4	5	6	7	8	9	10
CF	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$550	\$25	\$525

b. $CF_0 = -\$950$ CF_1 to $CF_7 = \$50$ $CF_8 = \$550$ $CF_9 = \$25$ $CF_{10} = \$525$

IRR = 5.7282%

Effective annual cost = $(1 + 0.057282)^2 - 1 = 11.78\%$

B2. a. The after-tax cash flows will be:

<u>Time</u>	<u>Item</u>	<u>BTCF</u>	<u>ATCF</u>
0	net proceeds	980	980
1-20	interest payments	-60	-30.00
1-20	flotation expense	0	0.50
20	principle repayment	-1000	-1000.00

$n = 20$ $r = ?$ $PV = -980$ $PMT = 29.50$ $FV = 1000$ $r = \mathbf{3.0855\%}$

Effective annual cost = $(1 + 0.030855)^2 - 1 = 6.27\%$

b. If the company is not a taxpayer and expects never to be one, the cash flows are the BTCFs given above, and

$n = 20$ $r = ?$ $PV = -980$ $PMT = 60.00$ $FV = 1000$ $r = \mathbf{6.1769\%}$

Effective annual cost = $(1 + 0.061769)^2 - 1 = 12.735\%$

- c. The effective rate would be between the answers to parts a and b. The precise answer would depend on the particulars of the situation, such as whether and how the firm might be allowed to carry losses forward to capture the tax deduction on interest and flotation cost.

B3. a.

Period	1	2	3	4	5
CF	\$100	\$102.50	\$105	\$107.50	\$1,110

b. $CF_0 = -\$1,000$ $CF_1 = \$100$ $CF_2 = \$102.50$ $CF_3 = \$105$ $CF_4 = \$107.50$ $CF_5 = \$1,110$

IRR = 10.45%

c. $10.45\% \times (1 - 0.34) = 6.90\%$

B4. Average Life = $(\sum t \times A_t) / (\sum A_t)$

Average Life = $(7 \times \$20 + 8 \times \$20 + 9 \times \$20 + 10 \times \$40) / \$100 = \$880 / \$100 = 8.80$

B5. a. Public Offering: ATCF yearly cost = $-4.5(1-0.34) + (0.34)(1/20) = -2.953$

$n = 20$ $r = ?$ $PV = -\$99$ $PMT = \$2.953$ $FV = \$100$ **$r = 3.020\%$**

$APY = (1 + 0.0302)^2 - 1 = 6.13\%$

Private Placement: ATCF yearly cost = $-4.5625(1-0.34) + (0.34)(0.75/20) = -2.9985$

$n = 20$ $r = ?$ $PV = -\$99.25$ $PMT = \$2.9985$ $FV = \$100$ **$r = 3.049\%$**

$APY = (1 + 0.03049)^2 - 1 = 6.19\%$

Eurobond: ATCF yearly cost = $-9.125(1-0.34) + (0.34)(1.25/20) = -5.98$

$n = 10$ $r = ?$ $PV = -\$98.75$ $PMT = \$5.98$ $FV = \$100$ **$r = 6.15\%$**

$APY = 6.15\%$

b. The U.S. public offering has the lowest cost of borrowing.

c. The firm needs to consider any differences in debt covenants and marketability.

B6. a. Public Offering: ATCF yearly cost = $-4.0(1-0.34) + (0.34)(0.9/14) = -2.618143$

$n = 14$ $r = ?$ $PV = -\$99.1$ $PMT = \$2.618143$ $FV = \$100$ **$r = 2.696\%$**

$APY = (1 + 0.02696)^2 - 1 = 5.465\%$

Private Placement: ATCF yearly cost = $-4.1875(1-0.34) + (0.34)(0.5/14) = -2.751607$

$n = 14$ $r = ?$ $PV = -\$99.5$ $PMT = \$2.751607$ $FV = \$100$ **$r = 2.795\%$**

$APY = (1 + 0.02795)^2 - 1 = 5.669\%$

Eurobond: ATCF yearly cost = $-8.125(1-0.34) + (0.34)(1.1/7) = -5.309071$

$n = 7$ $r = ?$ $PV = -\$98.9$ $PMT = \$5.309071$ $FV = \$100$ **$r = 5.503\%$**

$APY = 5.503\%$

b. The U.S. public offering has the lowest cost of borrowing.

B7. a. Cumulative Dividends = \$25 million + 0.60 x Cumulative Net Income

Cumulative Dividends = \$15 million + \$20 million + \$25 million = \$60 million

Cumulative Net Income = \$50 million + \$50 million + \$50 million = \$150 million

Cumulative Dividends = \$25 million + 0.60 x \$150 million = \$115 million

Maximum Year End Dividend = \$115 million - \$60 million = \$55 million

B8. Interest Coverage Ratio = $EBIT / \text{Interest Expense} = \$100 \text{ million} / \text{Interest Expense} = 2.5$

Interest Expense = $\$100 \text{ million} / 2.5 = \40 million

Additional Interest = $\$40 \text{ million} - \$25 \text{ million} = \$15 \text{ million}$

Additional Debt x 10% = \$15 million

Maximum Additional Debt = $\$15 \text{ million} / 10\% = \150 million