Chapter 16
Financial Distress, Managerial Incentives, and Information

16-1.

a. \[0.25 \times \frac{150 + 135 + 95 + 80}{1.05} = \$109.52 \text{ million}\]

b. \[0.25 \times \frac{100 + 100 + 95 + 80}{1.05} = \$89.28 \text{ million}\]

c. \[\text{YTM} = \frac{100}{89.29} - 1 = 12\%\]
   
   expected return = 5%

d. \[\text{equity} = 0.25 \times \frac{50 + 35 + 0 + 0}{1.05} = \$20.24 \text{ million}\]
   
   total value = 89.28 + 20.24 = \$109.52 \text{ million}\]

16-2.

a. \[\frac{81 - 36}{10} = \$4.5 \text{/share}\]

b. \[\frac{36}{4.5} = 8 \text{ million shares}\]

c. \[\frac{81}{18} = \$4.5 \text{/share}\]

16-3. No. Some of these losses are due to declines in the value of the assets that would have occurred whether or not the firm defaulted. Only the incremental losses that arise from the bankruptcy process are bankruptcy costs.

16-4.

a. Intuit Inc. – its customers will care about their ability to receive upgrades to their software.

b. Allstate Corporation – its customers rely on the firm being able to pay future claims.
16-5.
   a. Office building—there are many alternate users who would be likely to value the property similarly.
   b. Raw materials—they are easier to reuse.
   c. Patent rights—they would be easier to sell to another firm.

16-6.
   a. \[ \frac{0.25 \times (150 + 135 + 95 + 80)}{1.05} = \$109.52 \text{ million} \]
   b. \[ \frac{0.25 \times (100 + 100 + 95 \times 0.75 + 80 \times 0.75)}{1.05} = \$78.87 \text{ million} \]
   c. \[ \text{YTM} = \frac{100}{78.87} - 1 = 26.79\% \]
      expected return = 5%
   d. \[ \text{equity} = \frac{0.25 \times (50 + 35 + 0 + 0)}{1.05} = \$20.24 \text{ million} \]
      total value \[ = \frac{0.25 \times (150 + 135 + 95 \times 0.75 + 80 \times 0.75)}{1.05} = \$99.11 \text{ million} \]
      ( or \( 78.87 + 20.24 = \$99.11 \text{ million} \))
   e. \[ \frac{109.52}{10} = \$10.95 \text{/share} \]
   f. \[ \frac{99.11}{10} = \$9.91 \text{/share} \]
      Bankruptcy cost lowers share price.

Note that Gladstone will raise \$78.87 million from the debt, and repurchase \( \frac{78.87}{9.91} = 7.96 \) million shares. Its equity will be worth \$20.24 million, for a share price of \[ \frac{20.24}{10 - 7.96} = \$9.91 \] after the transaction is completed.

16-7.
   a. \[ \frac{10}{0.08} - 50 = \$75 \text{ million} \]
   b. \[ \frac{75}{5} = \$15 \text{/share} \]
   c. \[ \frac{75 + 0.4 \times 50}{5} = \$19 \text{/share} \]
   
   \[ \frac{9}{0.08} - 50 + 0.4 \times 50 \]
   d. \[ \frac{5}{16} = \$16 \text{/share} \]
16-8.
   a. The same price, $5.50/share, because financial transactions do not create value.
      Suppose that Hawar pays a corporate tax rate of 30%, and that shareholders expect the change in debt to be
      permanent.
   b. $0.3 \times \frac{20}{10} + 5.5 = $6.10/\text{share}$
   c. $(6.1 - 5.75) \times 10 = $3.5 \text{ million}$

16-9.
   a. $r = 5\% + 1.1 \times (15\% - 5\%) = 16\%$
      $V = \frac{16}{0.16} = $100 \text{ million}$
   b. $r = 5\% + 1.1 \times (15\% - 5\%) = 16\%$
      $V = \frac{15}{0.16} + 0.35 \times 40 = $107.75 \text{ million}$

16-10. According to tradeoff theory, tax shield adds value while financial distress costs reduce a firm’s value. The
   financial distress costs for a real estate investment are likely to be low, because the property can generally be
   easily resold for its full market value. In contrast, corporations generally face much higher costs of financial
   distress. As a result, corporations choose to have lower leverage.

16-11. If Dynron has no debt or if in all scenarios Dynron can pay the debt in full, equity holders will only consider
   the project’s NPV in making the decision. If Dynron is heavily leveraged, equity holders will also gain from
   the increased risk of the new investment.

16-12.
   a. $\text{equity} = 0$
      $\text{debt} = \frac{10}{1.1} = $9.09 \text{ million}$
   b. $\text{NPV} = \frac{3.5}{1.1} - 20 = $11.82 \text{ million}$
   c. $\text{debt} = \frac{15}{1.1} = $13.64 \text{ million}$
      $\text{equity} = \frac{35 - 15}{1.1} = $18.18 \text{ million}$
   d. Equity holders will not be willing to accept the deal, because for them it is a negative NPV investment
      ($18.18 - 20 < 0$).
16-13.

a. $E(A) = $75 million
   
   $E(B) = 0.5 \times 140 = $70 million$
   
   $E(C) = 0.1 \times 300 + 0.9 \times 40 = $66 million$
   
   Project A has the highest expected payoff.

b. $E(A) = 75 – 40 = $35 million$
   
   $E(B) = 0.5 \times (140 – 40) = $50 million$
   
   $E(C) = 0.1 \times (300 – 40) + 0.9 \times (40 – 40) = $26 million$
   
   Project B has the highest expected payoff for equity holders.

c. $E(A) = $0 million$
   
   $E(B) = 0.5 \times (140 – 110) = $15 million$
   
   $E(C) = 0.1 \times (300 – 110) = $19 million$
   
   Project C has the highest expected payoff for equity holders.

d. With $40 million in debt, management will choose project B, which has an expected payoff for the firm that is $75 – 70 = $5 million less than project A. Thus, the expected agency cost is $5 million.
   
   With $110 million in debt, management will choose project C, resulting in an expected agency cost of $75 – 66 = $9 million.

16-14.

a. Market value of firm $\frac{\text{Assets}}{2/3} = $45 million. With debt of $20 million, equity is worth $45 – 20 = 25$, so you will need to sell $\frac{10}{25} = 40\%$ of the equity.

b. Given debt D, equity is worth $45 – D$. Selling 50% of equity, together with debt must raise $30 million: $5 \times (45 – D) + D = 30$. Solve for $D = $15 million.
16-15.

a. In addition to tax benefits of leverage, debt financing can benefit Empire by reducing wasteful investment.

b. Net income will fall by $1 \times 0.65 = $0.65

Because 10% of net income will be wasted, dividends and share repurchases will fall by $0.65 \times (1 - .10) = $0.585

c. Pay $1 in interest, give up $0.585 in dividends and share repurchases ⇒ Increase of 1 – 0.585 = $0.415 per $1 of interest.

16-16.

a. Without personal spending, there is a 1% chance of bankruptcy.

With $10 million personal spending, there is a 7% chance—so the probability of bankruptcy, increased by 6%.

b. Debt between $90 and $100 million will provide the CEO with the biggest incentive not to proceed with personal spending because by doing so the chance of bankruptcy would increase by 38%.

16-17.

da. \[\frac{50 + 100 + 150}{3} = \$100 \text{ million}\]

b. i. Empire building: value = 100 – 5 = $95 million

ii. Value = $100 million

iii. Empire building and increased risk: value = .5(50) + .1(100) + .4(150) – 5 = $90 million

iv. Increased risk: value = $95 million

c. i. $95 + 10%(44) = $99.4 million

ii. $100 + 10%(49) = $104.9 million

iii. $90 + 10% (0.5 \times 50 + 0.5 \times 90) = $97

iv. $95 + 10% (.5 \times 50 + .5 \times 99) = $102.45

Therefore, $49 million in debt is optimal.
16-18.  
a. Tobacco firms  
   high optimal debt level—high free cash flow, low growth opportunities  
b. Accounting firms  
   low optimal debt level—high distress costs  
c. Mature restaurant chains  
   high optimal debt level—stable cash flows, low growth, low distress costs  
d. Lumber companies  
   high optimal debt level—stable cash flows, low growth, low distress costs  
e. Cell phone manufacturers  
   low optimal debt level—high growth opportunities, high distress costs

16-19.  
Unlevered Value = \( \frac{90}{0.10} = $900 \).

Levered Value with Raider = \( 900 + 40\% \times 750 = $1.2 \text{ billion} \)

To prevent successful raid, current management must have a levered value of at least  
\( \frac{$1.2 \text{ billion}}{1.20} = $1 \text{ billion} \).

Thus, the minimum tax shield is $1 billion – 900 million = $100 million, which requires  
\( \frac{100}{0.40} = $250 \text{ million in debt.} \)

16-20.  
a.  
   i. Borrowing has a net cost of $20 million, or \( \frac{20}{100} = 0.20 \text{ per share.} \) Selling \( \frac{500}{13.50} = 37 \text{ million shares} \)

   at a premium of $1 per share has a benefit of $37 million, or \( \frac{37}{137} = 0.27 \text{ per share.} \) (I.e.  
   \[ \frac{12.50 \times 100 + 500}{100 + 500} = 12.77 = 12.50 + 0.27. \] Therefore, issue equity.

   ii. Borrowing has a net cost of $20 million, or \( \frac{20}{100} = 0.20 \text{ per share.} \) Selling \( \frac{500}{13.50} = 37 \text{ million shares} \)

   at a discount of $1 per share has a cost of $37 million, or \( \frac{37}{137} = 0.27 \text{ per share.} \) Therefore, issue debt.

b. If IST issues equity, investors would conclude IST is overpriced, and the share price would decline to $12.50.
c. If IST issues debt, investors would conclude IST is undervalued, and the share price would rise to $14.50.

d. If there are no costs from issuing debt, then equity is only issued if it is over-priced. But knowing this, investors would only buy equity at the lowest possible value for the firm. Because there would be no benefit to issuing equity, all firms would issue debt.

16-21. If the firm must pay 10% more than the target firm was worth, but can do the purchase using shares that were over-valued by more than 10%, in the long run the firm will gain from the acquisition.

16-22.

a. NPV of expansion = \(20 \times \frac{0.65}{0.1} - 50 = 80\) million

Equity value = \(\frac{500 + 80}{10} = 58\) / share

b. NPV of expansion = \(4 \times \frac{0.65}{0.1} - 50 = -24\) million

share price = \(\frac{500 - 24}{10} = 47.6\) / share

new shares = \(\frac{50}{47.6} = 1.05\) million shares

c. share price = \(\frac{500 + 50 + 80}{11.05} = 57\) / share

The share price is now lower than the answer from part (a), because in part (a), share price is fairly valued, while here shares issued in part (b) are undervalued. New shareholders’ gain of \((57 - 47.6) \times 1.05 = 10\) million = old shareholders’ loss of \((58 - 57) \times 10\).

d. Tax shield = \(35\% \times 50 = 17.5\) million

Share price = \(\frac{500 + 50 + 80 + 17.50 - 50}{10} = 59.75\) per share.

Gain of $2.75 per share compared to case (c). $1 = avoid issuing undervalued equity, and $1.75 from interest tax shield.