Chapter 14
Capital Structure in a Perfect Market

14-1.

a. \[ E[C(1)] = \frac{1}{2} \left( 130,000 + 180,000 \right) = 155,000, \]
   \[ NPV = \frac{155,000}{1.20} - 100,000 = 129,167 - 100,000 = 29,167 \]

b. Equity value = \[ PV(C(1)) = \frac{155,000}{1.20} = 129,167 \]

c. Debt payments = 100,000, equity receives 20,000 or 70,000.

Initial value, by MM, is 129,167 – 100,000 = 29,167.

14-2.

a. Total value of equity = 2×$2m = $4m

b. MM says total value of firm is still $4 million. $1 million of debt implies total value of equity is $3 million. Therefore, 33% of equity must be sold to raise $1 million.

c. In (a), 50% × $4M = $2M. In (b), 2/3 × $3M = $2M. Thus, in a perfect market the choice of capital structure does not affect the value to the entrepreneur.

14-3.

a. \[ E[\text{Value in one year}] = 0.8(50) + 0.2(20) = 44. \quad E = \frac{44}{1.10} = 40m. \]

b. \[ D = \frac{20}{1.05} = 19.048. \quad \text{Therefore, } E = 40 - 19.048 = 20.952m. \]

c. Without leverage, \( r = \frac{44}{40} - 1 = 10\% \), with leverage, \( r = \frac{44 - 20}{20.952} - 1 = 14.55\% \).

d. Without leverage, \( r = \frac{20}{40} - 1 = -50\% \), with leverage, \( r = \frac{0}{20.952} - 1 = -100\% \).

14-4.

<table>
<thead>
<tr>
<th></th>
<th>ABC</th>
<th>XYZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCF</td>
<td>Debt Payments</td>
<td>Equity Dividends</td>
</tr>
<tr>
<td>$800</td>
<td>0</td>
<td>800</td>
</tr>
<tr>
<td>$1,000</td>
<td>0</td>
<td>1000</td>
</tr>
</tbody>
</table>
b. Unlevered Equity = Debt + Levered Equity. Buy 10% of XYZ debt and 10% of XYZ Equity, get 50 + (30, 50) = (80, 100)
c. Levered Equity = Unlevered Equity + Borrowing. Borrow $500, buy 10% of ABC, receive (80, 100) – 50 = (30, 50)

14-5.
a. \( V(\alpha) = 10 \times 22 = 220 \text{m} = V(\omega) = D + E \Rightarrow E = 220 - 60 = 160 \text{m} \Rightarrow p = 8 \text{ per share.} \)
b. Omega is overpriced. Sell 20 Omega, Buy 10 alpha and borrow 60. Initial = 220 – 220 + 60 = 60. Assumes we can trade shares at current prices & Assumes we can borrow at same terms as Omega (or own Omega debt and can sell at same price).

14-6.
a. Assets = cash + non-cash, Liabilities = equity + options. non-cash assets = equity + options – cash = 12 \times 5 + 8 - 5 = 63 \text{ billion}
b. Equity = 60 – 5 = 55. Repurchase \( \frac{5b}{12} \) = 0.417b shares \( \Rightarrow \) 4.583 b shares remain.

Per share value = \( \frac{55}{4.583} = \$12. \)

14-7.
a. i. \( A = 50 \text{ cash} + 700 \text{ non-cash} \)
   \( L = 750 \text{ equity} \)
ii. \( A = 350 \text{ cash} + 700 \text{ non-cash} \)
   \( L = 750 \text{ equity} + 100 \text{ short-term debt} + 100 \text{ long-term debt} + 100 \text{ preferred stock} \)
iii. \( A = 700 \text{ non-cash} \)
   \( L = 400 \text{ equity} + 100 \text{ short-term debt} + 100 \text{ long-term debt} + 100 \text{ preferred stock} \)
b. Repurchase \( \frac{350}{7.50} = 46.67 \) shares \( \Rightarrow \) 53.33 remain. Value is \( \frac{400}{53.33} = 7.50 \)

14-8. Any leverage raises the equity cost of capital. In fact, risk-free leverage raises it the most (because it does not share any of the risk).

14-9. 
a. \( E = 1000 – 750 = 250. \ CF = (1400,900) – 787.5 = (612.5,112.5) \)
b. \( R_e = (145\%, -55\%), E[R_e] = 45\%, \text{ Risk premium} = 45\% - 5\% = 40\% \)
c. Return sensitivity = 145\% – (-55\%) = 200\%. This sensitivity is 4x the sensitivity of unlevered equity (50%). Its risk premium is also 4x that of unlevered equity (40% vs. 10%).
d. \( \frac{750}{250} = 3x \)
e. \( 25\%(45\%) + 75\%(5\%) = 15\% \)

14-10.
a. \( r_e = r_u + \frac{d}{e}(r_u - r_d) = 12\% + 0.50(12\% - 6\%) = 15\% \)
b. \( r_e = 12\% + 1.50(12\% - 8\%) = 18\% \)
c. Returns are higher because risk is higher—the return fairly compensates for the risk. There is no free lunch.

14-11.
a. \( \text{wacc} = \frac{2(15\%)}{3} + \frac{6\%}{3} = 12\% = r_u \).
b.
   i. \( r_e = r_u + \frac{d}{e}(r_u - r_d) = 12 + \frac{150(12 - 6)}{150} = 18\% \)
   ii. if \( r_d \) is higher, \( r_e \) is lower. The debt will share some of the risk.

14-12. \( \text{wacc} = r_u = 10\% = \frac{1}{1.6} \rightarrow 13\% + \frac{0.6}{1.6} x \Rightarrow 1.6(10) - 13 = 3 \Rightarrow x = 5\% \)

14-13. \( r_u = \text{wacc} = \frac{1}{2}(11) + \frac{1}{2}(5) = 8\% \).
\( r_e = 8\% + \frac{200}{150}(8\% - 5\%) = 12\% \)

14-14. Indell increases its net debt by $40 million ($30 million in new debt + $10 million in cash paid out). Therefore, the value of its equity decreases to $120 - 40 = $80 million.
If the debt is risk-free:
\( \beta_e = \beta_u \left(1 + \frac{D}{E}\right) = \frac{\beta_u (E + D)}{E} = \beta_u \frac{EV}{E} \),
where \( D \) is net debt, and \( EV \) is enterprise value. The only change in the equation is the value of equity. Therefore
\( \beta_e' = \beta_e \frac{E}{E'} = 1.50 \frac{120}{80} = 2.25 \)
14-15.

a. \( \beta_e = \beta_u \left( 1 + \frac{d}{e} \right) = 1.2 \left( 1 + \frac{40}{60} \right) = 2 \)

b. \( \frac{r_e - r_f}{r_m - r_f} = 6.25 \Rightarrow r_e = 5 + 2 \left( 6.25 \right) = 17.5\% \) from the CAPM, or

\[
\frac{r_e}{12.5 - 5} = \frac{40 \left( 12.5 - 5 \right)}{60} = 17.5
\]

c. \( p = 14(1.50) = \$21 \). Borrow 40\%(21) = 8.4, interest = 5\%(8.4) = 0.42. Earnings = 1.50 – 0.42 = 1.08, per

\[
\text{share} = \frac{1.08}{0.60} = 1.80
\]

No benefit; risk is higher. The stock price does not change.

d. \( \text{PE} = \frac{21}{1.80} = 1.67 \). It falls due to higher risk.

14-16.

a. Issue \( \frac{180}{90} = 2 \) million new shares \( \Rightarrow \) 12 million shares outstanding.

New EPS = \( \frac{24}{12} = \$2.00 \) per share.

b. Interest on new debt = \( 180 \times 5\% = \$9 \) million. The interest expense will reduce earnings to \( 24 - 9 = \$15 \)

\( \text{million. With 10 million shares outstanding, } EPS = \frac{15}{10} = \$1.50 \) per share.

c. By MM, share price is \$90 in either case. PE ratio with equity issue is \( \frac{90}{2} = 45 \).

PE ratio with debt is \( \frac{90}{1.50} = 60 \).

The higher PE ratio is justified because with leverage, EPS will grow at a faster rate.

14-17.

a. Assets = 850m. New shares = 110. \( \Rightarrow \) price = \( \frac{850}{110} = \$7.73 \)

b. Cost = \( 100(8.50 - 7.73) = 77 \text{ m} = 10(7.73) \). Issuing equity at below market price is costly.