1. 15-1(p427)。Alpha Corporation and Beta Corporation are identical in every way except their capital structures. Alpha Corporation, an all-equity firm, has 5,000 shares of stock outstanding, currently worth $20 per share. Beta Corporation uses leverage in its capital structure. The market value of Beta’s debt is $25,000. The cost of this debt is 12 percent per annum. Each firm is expected to have earnings before interest of $350,000 in perpetuity. Neither firm pays taxes. Assume that every investor can borrow at 12 percent per annum.

a. What is the value of Alpha Corporation?
b. What is the value of Beta Corporation?
c. What is the market value of Beta Corporation’s equity?
d. How much will it cost to purchase 20 percent of each firm’s equity?
e. Assuming each firm meets its earnings estimates, what will be the dollar return to each position in part (d) over the next year?
f. Construct an investment strategy in which an investor purchases 20 percent of Alpha’s equity and replicates both the cost and dollar return of purchasing 20 percent of Beta’s equity.
g. Is Alpha’s equity more or less risky than Beta’s equity? Explain.

【解】

(a) \( V_{\text{Alpha}} = \text{股價} \times \text{股數} = 20 \times 5,000 = 100,000 \)

(b) \( V_{\text{Beta}} = V_{\text{Alpha}} + T_e \times B = V_{\text{Alpha}} = 100,000 \)

(c) \( S_{\text{Beta}} = V_{\text{Beta}} - B = 100,000 - 25,000 = 75,000 \)

\( S_{\text{Alpha}} = V_{\text{Alpha}} = 100,000 \)

(d) \( (S_{\text{Alpha}} + S_{\text{Beta}}) \times 20% = (100,000 + 75,000) \times 20% = 35,000 \)

(e) \( \text{Alpha}: EBIT \times 20% = 350,000 \times 20% = 70,000 \)

\( \text{Beta}: (EBIT - B \times 12%) \times 20% = (350,000 - 3,000) \times 20% = 69,400 \)

(f) 方案 A：投資現金$15,000，並以 12%年利率借貸$5,000，

共$20,000 買 20%之 Alpha 股票。

方案 B：投資現金$15,000 買 20%之 Beta 股票。

兩方案皆有$15,000投資，並且一年後有$69,400收入。

(g) Beta公司有負債故風險較高。(Beta公司無論收入多少，都需付利息，故風險較高。)

或者 Alpha公司的權益報酬率低於 Beta公司：

\( r_s, \text{Alpha} = \frac{EBIT}{S_{\text{Alpha}}} = \frac{350,000}{100,000} = 350% < r_s, \text{Beta} = \frac{EBIT - B \times 12%}{S_{\text{Beta}}} = \frac{347,000}{75,000} = 463% \)

故 Beta公司風險較高。

2. 15-6(p429)。15.6 Rayburn Manufacturing, Inc., is currently an all-equity firm that pays
no taxes. The market value of the firm’s equity is $2 million. The cost of this unlevered equity is 18 percent per annum. Rayburn plans to issue $400,000 in debt and use the proceeds to repurchase stock. The cost of debt is 10 percent per annum.

a. After Rayburn repurchases the stock, what will the firm’s weighted average cost of capital be?

b. After the repurchase, what will the cost of equity be? Explain.

c. Use your answer to (b) to compute Rayburn’s weighted average cost of capital after the repurchase. Is this answer consistent with (a)?

【解】
(a) 加權平均資金成本 $r_{WACC}$ 可以看成是資產的報酬率 $r_{asset}$，即
$$r_{WACC} = r_{asset}$$
因舉債與否不會影響資產報酬率，因此也不會影響加權平均資金成本 $r_{WACC}$。

(b) 利用 $r_s = r_o + \frac{B}{S}(r_o - r_B)$ 求（舉債公司）權益報酬率
$$r_o = r_{WACC} = 18\%, \quad r_B = 10\%,$$
$$B = $400,000, \quad V = $2,000,000, \quad S = V - B = $1,600,000, \quad \frac{B}{S} = \frac{1}{4}$$
$$r_s = 18\% + \frac{1}{4} \times (18\% - 10\%) = 20\%$$

(c) \[ \frac{B}{S} = \frac{1}{4} \quad \Rightarrow \quad \frac{S}{S+B} = \frac{4}{5} \quad \frac{B}{S+B} = \frac{1}{5} \]
$$r_{WACC} = \frac{S}{S+B} \times r_s + \frac{B}{S+B} \times r_B = \frac{4}{5} \times 20\% + \frac{1}{5} \times 10\% = 18\%$$

3. 15-11(p430)。Digital Sound, Inc., is an all-equity firm with 1 million shares of common stock outstanding at $10 per share. Digital is expected to generate $1.5 million of annual earnings in perpetuity. Michael Lefton is interested in acquiring a 1 percent stake in the firm’s equity. He will either borrow 20 percent, 40 percent, or 60 percent of the purchase price at an interest rate of 10 percent per annum. Assume that Digital Sound does not pay any taxes and that the firm immediately distributes all of its earnings as dividends.

a. How much will it cost for Michael to purchase 1 percent of Digital’s equity, net of debt, given each financing choice?

b. What is the expected return on Michael’s investment given each financing choice?

【解】
(a) 公司（權益）值 $V = 股價 \times 股數 = $10 \times 1,000,000 = $10,000,000

1%股權值 $10,000,000 \times 1\% = $100,000

令融資比例為 $p\%$，則
$$\text{舉債額度} B = $100,000 \times p\% \quad \text{自有資金} = $100,000 \times (1 - p\%)$$
狀況一（融資 20%）：自有資金為 $100,000 \times (1 - 20\%) = $80,000
狀況二（融資 40%）：自有資金為 $100,000 \times (1 - 40\%) = $60,000
狀況三（融資 60%）：自有資金為 $100,000 \times (1 - 60\%) = $40,000

(b) 權益收益為

\[
EBIT \times 1\% - B \times r_p = \$1,500,000 \times 1\% - \$100,000 \times p\% \times 10\%
\]
\[
= \$15,000 - \$10,000 \times p\%
\]

權益報酬率為

\[
\text{權益報酬率} = \frac{\$15,000 - \$10,000 \times p\%}{\$100,000 \times (1 - p\%)}
\]

狀況一（融資 20%）：報酬率為\[
\frac{\$15,000 - \$10,000 \times 20\%}{\$100,000 \times (1 - 20\%)} = 16.25\%
\]
狀況二（融資 40%）：報酬率為\[
\frac{\$15,000 - \$10,000 \times 40\%}{\$100,000 \times (1 - 40\%)} = 18.33\%
\]
狀況三（融資 60%）：報酬率為\[
\frac{\$15,000 - \$10,000 \times 60\%}{\$100,000 \times (1 - 60\%)} = 22.5\%
\]

4. 15-13(p431) 15.13 The market value of a firm with $500,000 of debt is $1.7 million.

The pretax interest rate on debt is 10 percent per annum, and the company is in the 34 percent tax bracket. The company expects $306,000 of earnings before interest and taxes every year in perpetuity.

a. What would the value of the firm be if it were financed entirely with equity?

b. What amount of the firm’s annual earnings is available to stockholders?

【解】

(a) \[
V_L = V_U + T_c \times B \quad V_U = V_L - T_c \times B
\]

題目給：\[
V_L = \$1,700,000, \quad T_c = 34\%, \quad B = \$500,000
\]
\[
V_U = V_L - T_c \times B = \$1,700,000 - \$500,000 \times 34\% = \$1,530,000
\]

(b)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$306,000</td>
</tr>
<tr>
<td>Interest</td>
<td>$50,000</td>
</tr>
<tr>
<td>Pre-Tax Earnings</td>
<td>$256,000</td>
</tr>
<tr>
<td>Taxes at 34%</td>
<td>$87,040</td>
</tr>
<tr>
<td>After-Tax Earnings</td>
<td>$168,960</td>
</tr>
</tbody>
</table>

5. 15-16(p431) Gibson, Inc., expects perpetual earnings before interest and taxes of $1.2 million per year. The firm’s pretax cost of debt is 8 percent per annum, and its annual interest expense is $200,000. Company analysts estimate that the unlevered cost of Gibson’s equity is 12 percent. Gibson is subject to a 35 percent corporate tax rate.

a. What is the value of this firm?

b. If there are no costs of financial distress or bankruptcy, what percentage of the firm’s
c. Is the conclusion in (b) applicable to the real world?

【解】

題目給：\( EBIT = 1,200,000 \) \( r_b = 8\% \) \( B \times r_b = 200,000 \) \( r_0 = 12\% \) \( T_C = 35\% \)

(a)

\[
V_L = V_U + B \times T_c = \frac{EBIT \times (1-T_C)}{r_0} + B \times T_c \\
= \frac{1,200,000 \times (1-35\%)}{12\%} + \frac{200,000 \times 35\%}{8\%} \\
= \$7,375,000
\]

(b)

沒有財務危機成本，舉債額度越高，公司價值越大。故沒有舉債上限。

6. 15-19(p431) Williamson, Inc., has a debt-to-equity ratio of 2.5. The firm’s weighted average cost of capital (\( r_{wacc} \)) is 15 percent, and its pretax cost of debt is 10 percent. Williamson is subject to a corporate tax rate of 35 percent.

a. What is Williamson’s cost of equity capital (\( r_s \))?

b. What is Williamson’s unlevered cost of equity capital (\( r_0 \))?

c. What would Williamson’s weighted average cost of capital (\( r_{wacc} \)) be if the firm’s debt-to-equity ratio were 0.75? What if it were 1.5?

【解】

題目給：\( \frac{B}{S} = 2.5 = \frac{5}{2} \) \( r_{wacc} = 15\% \) \( r_b = 10\% \) \( T_C = 35\% \)

(a)

\[
r_{wacc} = \frac{S}{S+B} r_s + \frac{B}{S+B} r_b (1-T_C) \Rightarrow r_s = \left(1 + \frac{B}{S}\right) r_{wacc} - \frac{B}{S} r_b (1-T_C) \\
= (1+2.5) \times 15\% - 2.5 \times 10\% \times (1-35\%) = 36.25\%
\]

考慮公司賦稅時，\( r_{wacc} \) 與 \( r_0 \) 的關係：

\[
\begin{align*}
V_L &= EBIT \times (1-T_C) \\
V_{wacc} &= \frac{r_{wacc}}{r_0} \\
V_U &= EBIT \times (1-T_C) \\
\end{align*}
\Rightarrow
\begin{align*}
V_L \times r_{wacc} &= V_U \times r_0 \\
(S+B) \times r_{wacc} &= (S+BT_C) \times r_0 \Rightarrow r_{wacc} = \left(1 - \frac{B}{S+B} \times T_C\right) r_0
\end{align*}
\]

【注意】考慮公司稅時，\( r_{wacc} \neq r_0 \)

本題也可以用 \( r_s = r_0 + \frac{B}{S} (r_0 - r_b) (1-T_C) \) 來求解。

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財務管理—資本結構 4/17
7. 16-1(p468)。Good Time Company is a regional chain department store. It will remain in business for one more year. The probability of a boom year is 60 percent and a recession is 40 percent. It is projected that Good Time will generate a total cash flow of $250 million in a boom year and $100 million in a recession. The firm’s required debt payment at the end of the year is $150 million. The market value of Good Time’s outstanding debt is $108.93 million. Assume a one-period model, risk neutrality, and an annual discount rate of 12 percent for both the firm’s debt and equity. Good Time pays no taxes.

a. What is the value of the firm’s equity?

b. What is the promised return on Good Time’s debt?

c. What is the value of the firm?

d. How much would Good Time’s debt be worth if there were no bankruptcy costs?

e. What payoff, after bankruptcy costs, do bondholders expect to receive in the event of a recession?

f. What cost do bondholders expect Good Time to incur should bankruptcy arise at the end of the year?

【解】

<table>
<thead>
<tr>
<th></th>
<th>景气</th>
<th>不景气</th>
<th>期望值</th>
</tr>
</thead>
<tbody>
<tr>
<td>公司收益</td>
<td>$250</td>
<td>$100</td>
<td>$190</td>
</tr>
<tr>
<td>债权收益</td>
<td>$150</td>
<td>$100</td>
<td>$190</td>
</tr>
<tr>
<td>權益收益</td>
<td>$100</td>
<td>$0</td>
<td>$60</td>
</tr>
</tbody>
</table>

(a) 權益價值：
b.  

\[
\text{承諾收益} = 1 + \text{債務承諾報酬率} \quad \Rightarrow \quad \text{債務承諾報酬率} = \frac{\text{承諾收益}}{\text{債務價值}} - 1
\]

\[
\text{債務承諾報酬率} = \frac{\$150}{\$108.93} - 1 = 37.7\%
\]

c.  

\[V_L = S + B = \$53.57 + \$108.93 = \$162.5\]

d.  

沒有財務危機成本的債務價值：

\[
B = \frac{\text{期望債權收益} \times \text{1 + 折現率}}{\text{1 + 折現率}} = \frac{0.6 \times \$150 + 0.4 \times \$100}{1 + 12\%} = \$116.07
\]

e.  

有財務危機成本的債務價值：

\[
B = \frac{\text{期望債權收益} \times \text{1 + 折現率}}{\text{1 + 折現率}} = \frac{0.6 \times \$150 + 0.4 \times x}{1 + 12\%} = \$108.93 \quad \Rightarrow \quad x = \$80
\]

其中 \(x\) 為不景氣時債權人的收益。

f.  

不景氣時債權人收益 = 不景氣時公司收益 - 財務危機成本

財務危機成本 = \$100 - \$80 = \$20

8. 16-2(p468)。Steinberg Corporation and Dietrich Corporation are identical firms except that Dietrich is more levered. Both companies will remain in business for one more year. The companies’ economists agree that the probability of a recession next year is 20 percent and the probability of a continuation of the current expansion is 80 percent. If the expansion continues, each firm will generate earning before interest and taxes (EBIT) of $2 million. If a recession occurs, each firm will generate earnings before interest and taxes (EBIT) of $8 million. Steinberg’s debt obligation requires the firm to pay $750,000 at the end of the year. Dietrich’s debt obligation requires the firm to pay $1 million at the end of the year. Neither firm pays taxes. Assume a one-period model, risk neutrality, and a annual discount rate of 15 percent.

a. Assuming there are no costs of bankruptcy, what is the market value of each firm’s debt and equity?

b. What is the value of each firm?

c. Steinberg’s CEO recently stated that Steinberg’s value should be higher than Dietrich’s since the firm has less debt, and, therefore, less bankruptcy risk. Do you agree or disagree with this statement?
Steinberg Corporation

<table>
<thead>
<tr>
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<th>景氣 (0.8)</th>
<th>不景氣 (0.2)</th>
<th>期望值</th>
</tr>
</thead>
<tbody>
<tr>
<td>公司收益</td>
<td>$2,000,000</td>
<td>$800,000</td>
<td>$1,760,000</td>
</tr>
<tr>
<td>債權收益</td>
<td>$750,000</td>
<td>$750,000</td>
<td>$750,000</td>
</tr>
<tr>
<td>權益收益</td>
<td>$1,250,000</td>
<td>$50,000</td>
<td>$1,010,000</td>
</tr>
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</table>

Dietrich Corporation

<table>
<thead>
<tr>
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<th>景氣 (0.8)</th>
<th>不景氣 (0.2)</th>
<th>期望值</th>
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<td>$1,760,000</td>
</tr>
<tr>
<td>債權收益</td>
<td>$1,000,000</td>
<td>$800,000</td>
<td>$960,000</td>
</tr>
<tr>
<td>權益收益</td>
<td>$1,000,000</td>
<td>$0</td>
<td>$800,000</td>
</tr>
</tbody>
</table>

期望值

(a) 期望收益 = 期望收益 × 預期收益

\[
S_{\text{Steinberg}} = \frac{1,250,000 \times 0.8 + 50,000 \times 0.2}{1 + 15\%} = 878,261
\]

\[
B_{\text{Steinberg}} = \frac{750,000 \times 0.8 + 750,000 \times 0.2}{1 + 15\%} = 652,174
\]

\[
S_{\text{Dietrich}} = \frac{1,000,000 \times 0.8 + 0 \times 0.2}{1 + 15\%} = 695,652
\]

\[
B_{\text{Dietrich}} = \frac{1,000,000 \times 0.8 + 800,000 \times 0.2}{1 + 15\%} = 834,783
\]

(b) \( V = S + B \)

\[
V_{\text{Steinberg}} = 878,261 + 652,174 = 1,530,435
\]

\[
V_{\text{Dietrich}} = 695,652 + 834,783 = 1,530,435
\]

(c) 公司的價值與(1)營收、(2)稅盾、(3)財務危機成本有關。本問題不考慮後兩者，營收兩者完全相同，故有相同價值是合理的。

9. 16-6(p468)

Fountain Corporation economists estimate that a good business environment and a bad business environment are equally likely for the coming year. The managers of Fountain must choose between two mutually exclusive projects. Assume that the project Fountain chooses will be the firm’s only activity and that the firm will close one year from today. Fountain is obligated to make a $500 payment to bondholders at the end of the year. Assume the firm’s stockholders are risk-neutral. Consider the following information pertaining to the two projects:

<table>
<thead>
<tr>
<th>Economy</th>
<th>Probability</th>
<th>Project Payoff</th>
<th>Value of Firm</th>
<th>Value of Equity</th>
<th>Value of Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>bad</td>
<td>0.5</td>
<td>$500</td>
<td>$500</td>
<td>$0</td>
<td>$500</td>
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<tr>
<td>good</td>
<td>0.5</td>
<td>$700</td>
<td>$700</td>
<td>$200</td>
<td>$500</td>
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<tr>
<td>Economy</td>
<td>Probability</td>
<td>Project Payoff</td>
<td>Value of Firm</td>
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<td>Value of Debt</td>
</tr>
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</tr>
<tr>
<td>bad</td>
<td>0.5</td>
<td>$100</td>
<td>$100</td>
<td>$0</td>
<td>$100</td>
</tr>
<tr>
<td>good</td>
<td>0.5</td>
<td>$800</td>
<td>$800</td>
<td>$300</td>
<td>$500</td>
</tr>
</tbody>
</table>

a. What is the expected value of the firm if the firm if the low-risk project is undertaken? What if the high-risk project is undertaken? Which of the two strategies maximizes the expected value of the firm?

b. What is the expected value of the firm’s equity if the low-risk project is undertaken? What if the high-risk project is undertaken?

c. Which project do Fountain’s stockholders prefer?

d. Suppose bondholders are fully aware that stockholders might choose to maximize equity value rather than total firm value and opt for the high-risk project. To minimize this agency cost, the firm’s bondholders decide to use a bond covenant to stipulate that the bondholders can demand a higher payment if Fountainhead chooses to take on the high-risk project. By how much would bondholders need to raise the debt payment so that stockholders would be indifferent between the two projects?

【解】

低風險投資案

<table>
<thead>
<tr>
<th>景氣</th>
<th>不景氣</th>
<th>期望值</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

公司收益 | $700 | $500 | $600 |
資金收益 | $500 | $500 | $500 |
權益收益 | $200 | $0   | $100 |

期望值

高風險投資案

<table>
<thead>
<tr>
<th>景氣</th>
<th>不景氣</th>
<th>期望值</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

公司收益 | $800 | $100 | $450 |
資金收益 | $500 | $100 | $300 |
權益收益 | $300 | $0   | $150 |

(a)

價值 = 期望收益 
1 + 折現率

\[ V_{\text{低風險}} = \frac{700 \times 0.5 + 500 \times 0.5}{1 + r} = \frac{600}{1 + r} \]

\[ V_{\text{高風險}} = \frac{800 \times 0.5 + 100 \times 0.5}{1 + r} = \frac{450}{1 + r} \]

\[ V_{\text{低風險}} > V_{\text{高風險}} \]

(b)

\[ S_{\text{低風險}} = \frac{200 \times 0.5 + 0 \times 0.5}{1 + r} = \frac{100}{1 + r} \]

\[ S_{\text{高風險}} = \frac{300 \times 0.5 + 0 \times 0.5}{1 + r} = \frac{150}{1 + r} \]

\[ S_{\text{低風險}} < S_{\text{高風險}} \]

(c)
再增加自己價值為優先考量下，股東應該會選擇高風險投資案。(d)
令選高風險投資案時，支付債權人的金額從$500調整到$x，則
$$S_{\text{高風險}} = \frac{($800 - x) \times 0.5 + 0 \times 0.5}{1 + r} = \frac{400 - 0.5x}{1 + r}$$
令$$S_{\text{高風險}} = S_{\text{低風險}} \Rightarrow \frac{100}{1 + r} = \frac{400 - 0.5x}{1 + r} \Rightarrow x = $600

10. 16-10(p469)。 Fortune Enterprises is an all-equity firm that is considering issuing $13.5 million of perpetual 10 percent debt. The firm will use the proceeds of the bond sale to repurchase equity. Fortune distributes all earnings available to stockholders immediately as dividends. The firm will generate $3 million of earnings before interest and taxes (EBIT) every year into perpetuity. Fortune is subject to a corporate tax rate of 40 percent.

a1. If personal tax rates on dividend and interest are both 30 percent, which plan does stockholders prefer?
a2. Which plan does IRS prefer?
a3. Suppose stockholders demand a 20% return after taxes. What is the value of the firm under each plan?
b. Suppose $T_s = 0.2$ and $T_g = 0.55$. What are the investors’ returns under each plan?

【解】

$$B = $13,500,000, \ r_g = 10\% , \ EBIT = $3,000,000, \ T_c = 40\%$$

$$V_L = V_U + \left[1 - (1 - T_c) \times \frac{1 - T_g}{1 - T_s}\right] \times B$$

(a)(1)

$$T_g = T_s = 30\%$$

股東關心公司價值：
$$V_L = V_U + \left[1 - (1 - 40\%) \times \frac{1 - 30\%}{1 - 30\%}\right] \times $13,500,000 = V_U + $5,400,000$$

舉債會增加公司$5,400,000 價值，股東會喜歡舉債方案。

(a)(2)

國稅局（IRS）關心稅收總額：

稅額 = 公司應稅收入 × $T_c + 利息 × $T_g + 股利 × $T_s$

$$TAX_U = $3,000,000 \times 40\% + $0 \times 30\% + $1,800,000 \times 30\% = $1,740,000$$

$$TAX_L = $1,650,000 \times 40\% + $1,350,000 \times 30\% + $990,000 \times 30\% = $1,362,000$$

因$$TAX_U > TAX_L$$，國稅局會喜歡不舉債方案。

(a)(3)

$$r_0 = 20\%$$

$$V_U = \frac{股東收益}{折現率} = \frac{EBIT \times (1 - T_c) \times (1 - T_g)}{r_0}$$

（永續年金現值公式）
Overnight Publishing Company (OPC) has $2 million in excess cash. The firm plans to use this cash either to retire all of its outstanding debt or to repurchase equity. The firm’s debt is held by one institution that is willing to sell it back to OPC for $2 million. The institution will not charge OPC any transaction costs. Once OPC becomes an all-equity firm, it will remain unlevered forever. If OPC does not retire the debt, the company will use the $2 million in cash to buy back some of its stock on the open market. Repurchasing stock also has no transaction costs. The company will generate $1,000,000 of annual earnings before interest and taxes in perpetuity regardless of its capital structure. The firm immediately pays out all earnings as dividends at the end of each year. OPC is subject to a corporate tax rate of 35 percent, and the required rate of return on the firm’s unlevered equity (ro) is 20 percent. The personal tax rate on interest income (TB) is 25 percent and the personal tax rate on equity distribution (TS) is 10 percent. Ignore bankruptcy costs.

a. What is the value of OPC if it chooses to retire all of its debt and become an unlevered firm?

b. What is the value of OPC if it decides to repurchase stock instead of retire its debt?

【解】

\[ B = \$2,000,000 \times EBIT = \$1,100,000 \times T_c = 35\% \times r_o = 20\% \times T_B = 25\% \times T_S = 10\% \]

(a) 
\[ V_U = \frac{EBIT \times (1 - T_c) \times (1 - T_S)}{r_o} = \frac{\$1,100,000 \times (1 - 35\%) \times (1 - 10\%)}{20\%} = \$3,217,500 \]

(b)
Sid Whitehead, CEO of the Weinberg Corporation, is evaluating his firm’s capital structure. He expects that Weinberg will have perpetual earnings before interest and taxes of $800,000. The after-tax required return on Weinberg’s equity if it were an all-equity firm is 10 percent. Currently, the firm has $1.2 million in debt outstanding and is subject to a corporate tax rate of 35 percent. The personal tax rate on interest income is 15 percent, and the personal tax rate on equity distributions is zero. The combined financial distress and agency costs associated with the debt are approximately 5 percent of the total value of the debt.

a. What is the value of the firm?

b. What is the added value of Weinberg’s debt?

【解】

\[ EBIT = \$800,000 \cdot r_o = 10\% \cdot B = \$1,200,000 \cdot T_c = 35\% \cdot T_B = 15\% \cdot T_S = 0\% \]

財務危機成本 \( C(B) = 0.05B \)

\[ V_U = \frac{EBIT \times (1 - T_c) \times (1 - T_s)}{r_o} \]

\[ V_L = V_U + \left[ 1 - (1 - T_c) \times \frac{1 - T_s}{1 - T_B} \right] \times B + C(B) \]

(a)

\[ V_U = \frac{\$800,000 \times (1 - 35\%) \times (1 - 0\%) \times 10\%}{10\%} = \$5,200,000 \]

\[ V_L = \$5,200,000 + \left[ 1 - (1 - 35\%) \times \frac{1 - 0\%}{1 - 15\%} \right] \times \$1,200,000 + 0.05 \times \$1,200,000 \]

\[ = \$5,422,353 \]

(b) 

稅盾效益 = \( V_L - V_U = \$5,422,353 - \$5,200,000 = \$222,353 \)

Honda and GM are competing to sell a fleet of 25 cars to Hertz. Hertz fully depreciates all of its rental cars over five years using the straight-line method. The firm expects the fleet of 25 cars to generate $100,000 per year in earnings before taxes and depreciation for five years. Hertz is an all-equity firm in the 34-percent tax bracket. The required return on the firm’s unlevered equity is 10 percent, and the new fleet will not add to the risk of the firm.

a. What is the maximum price that Hertz should be willing to pay for the new fleet of cars if it remains an all-equity firm?

b. Suppose Hertz purchases the fleet from GM for $325,000. and Hertz is able to issue
$200,000 of five year, 8 percent debt in order to finance the project. All principal will be repaid in one balloon payment at the end of the fifth year. What is the adjusted present value (APV) of the project?

現值因子： \( P^n_r = \frac{1}{(1+r)^n} \)

終值因子： \( F^n_r = (1+r)^n \)

永續年金（現值）因子： \( A^n_r = \frac{1}{r} \)

年金因子： \( A^n_r = A^n_r - A^n_r \frac{1}{r} \left[ 1 - \frac{1}{(1+r)^n} \right] \)

永續成長年金（現值）因子： \( G^n_{r,g} = \frac{1}{r - g} \)

成長年金因子： \( G^n_{r,g} = G^n_{r,g} - F^n_g \frac{1}{r - g} \left[ 1 - \frac{(1+g)^n}{(1+r)^n} \right] \)

【解】

(a)

每年稅後現金流量 = 稅前折舊前淨利 \( \times (1 - T_C) \) + 折舊 \( \times T_C \)

\( EBDT \times (1 - T_C) + D \times T_C \)

\( EBDT = $100,000 \; , \; T_C = 34\% \; , \; D = \frac{P}{5} \) (其中 \( P \) 為車隊價格) 、 \( I = 0 \; , \; r_0 = 10\% \)

\( UCF = $100,000 \times (1 - 34\%) + \frac{P}{5} \times 34\% \)

\( NPV = -P + UCF \times A^5_r \)

\( = -P + \left[ $100,000 \times (1 - 34\%) + \frac{P}{5} \times 34\% \right] \times \frac{1}{10\%} \times \left[ 1 - \frac{1}{(1+10\%)^5} \right] \)

\( NPV = 0 \Rightarrow P = $337,095 \)

(b)

\( P = $325,000 \; , \; B = $200,000 \; , \; r_B = 8\% \)

\( NPV = -P + \left[ $100,000 \times (1 - 34\%) + \frac{P}{5} \times 34\% \right] \times \frac{1}{10\%} \times \left[ 1 - \frac{1}{(1+10\%)^5} \right] \)

\( P = $325,000 \Rightarrow NPV = $8,968 \)

借貸 $200,000 的影響 = 期初現金增加 – 每期支付利息 – 期末支付本金

\( PV_{借貸影響} = $200,000 - $200,000 \times 8\% \times (1 - 34\%) \times A^5_{10\%} - $200,000 \times P^5_{10\%} \)

\( = $21,720 \)

修正淨現值： \( APV = NPV + PV_{借貸影響} = $8,960 + $21,720 = $30,688 \)
14. 17-5(p494) Milano Pizza Club owns three identical restaurants popular for their specialty pizzas. Each restaurant has a debt-to-equity ratio of 30 percent and makes interest payments of $25,650 at the end of each year. The cost of the firm’s levered equity ($r_s$) is 21 percent. Each Milano store estimates that annual sales will be $1 million, annual cost of goods sold will be $400,000, and annual general and administrative costs will be $300,000. These cash flows are expected to remain the same forever. The corporate tax rate is 40 percent.

a. Use the flow-to-equity approach to determine the value of Milano Pizza Club’s equity.
b. What is the total value of Milano Pizza Club?

【解】

(a) | One Restaurant Milano Pizza Club |
---|---|
Sales | $1,000,000 | $3,000,000 |
Cost of Goods Sold | ($400,000) | ($1,200,000) |
General and Administrative Costs | ($300,000) | ($900,000) |
Interest Expense | ($25,650) | ($76,950) |
Pre-Tax Income | $274,350 | $823,050 |
Taxes at 40% | ($109,740) | ($329,220) |
Cash Flow Available to Equity Holders | $164,610 | $493,830 |

$493,830 = CF_{flow to equity}$

$S = \frac{CF_{flow to equity}}{r_s} = \frac{493,830}{21\%} = 2,351,571$

(b) $B = S \times 30\%$

公司價值 : $V_L = S + B = S + S \times 30\% = 2,351,571 \times 1.3 = 3,057,042$

15. 17-6(p494) If Wild Widgets, Inc. (WWI) were an all-equity firm, it would have a beta of 0.9. WWI has a target debt-to-equity ratio of 0.50. The expected return on the market portfolio is 16 percent, and Treasury bills currently yield 8 percent per annum. WWI one-year, $1,000 par value bonds carry a 7 percent annual coupon and are currently selling for $972.73. The yield on WWI’s longer term debt is equal to the yield on its one-year bonds. The corporate tax rate is 34 percent.

a. What is WWI’s cost of debt?
b. What is WWI’s cost of equity?
c. What is WWI’s weighted average cost of capital?

【解】

利用以下公式:

$\text{公司價值} = 本金 \times \text{票面利率} \times A^n + 本金 \times P^n$

$r_d = r_f + \beta \times (r_m - r_f)$
$$r_s = r_e + \frac{B}{S}(r_e - r_g)(1 - T_c)$$
$$r_{WACC} = \frac{S}{S + B}r_s + \frac{B}{S + B}r_g \times (1 - T_c)$$

(a)

公司債售價 = 本金 × 票面利率 × $A^n + 本金 × P^n$
⇒ $972.73 = 1,000 \times 7\% \times \frac{1}{(1 + r_g)} + 1,000 \times \frac{1}{(1 + r_g)}$
⇒ $r_g = 10\%$

(b)

$$r_s = r_k + \beta \times (r_m - r_k) = 8\% + 0.9 \times (16\% - 8\%) = 15.2\%$$
$$r_s = r_s + \frac{B}{S}(r_s - r_g)(1 - T_c) = 15.2\% + 0.5 \times (15.2\% - 10\%) \times (1 - 34\%) = 16.92\%$$

(c)

$$\frac{B}{S} = 0.5 = \frac{1}{2} \Rightarrow \frac{S}{S + B} = \frac{2}{3}, \quad \frac{B}{S + B} = \frac{1}{3}$$
$$r_{WACC} = \frac{S}{S + B}r_s + \frac{B}{S + B}r_g \times (1 - T_c) = \frac{2}{3} \times 16.92\% + \frac{1}{3} \times 10\% \times (1 - 34\%) = 13.48\%$$

16. 17-10(p495)。ABC, Inc. is an unlevered firm with expected annual earnings before taxes of $30 million in perpetuity. The required return on the firm’s unlevered equity(γ0)is 18 percent, and the firm distributes all of its earnings as dividends at the end of each year. ABC has 1 million shares of common stock outstanding and is subject to a corporate tax rate of 34 percent. The firm is planning a recapitalization under which it will issue $50 million of perpetual 10 percent debt and use the proceeds to buy back shares.

a. Calculate the value of ABC before the recapitalization plan is announced. What is the value of ABC’s equity before the announcement? What is the price per share?

b. Use the APV method to calculate the value of ABC after the recapitalization plan is announced. What is the value of ABC’s equity after the announcement? What is the price per share?

【解】

(a)

$$EBIT = $30,000,000, \quad r_0 = 18\% \quad T_C = 34\% \quad 1,000,000 \text{股流通在外}$$
$$V_U = \frac{CF}{r_0} = \frac{EBIT \times (1 - T_C)}{r_0} = \frac{30,000,000 \times (1 - 34\%)}{18\%} = $110,000,000$$
$$S = V_L = $110,000,000$$
$$股價 = \frac{V_U}{股數} = \frac{110,000,000}{1,000,000} = $110$$

(b)

$$PV_{優先債權} = \text{本金 - 稅後利息} \times A^n = B - \frac{B \times r_g \times (1 - T_c)}{r_B} = B \times T_c$$
\[ V_L = V_L + PV \]

\[ S = V_L - B = \$127,000,000 - \$50,000,000 = \$77,000,000 \]

\[ \text{股價} = \frac{V_L}{\text{股數}} = \frac{\$127,000,000}{1,000,000} = \$127 \]

(c)

\[ \text{買回股數} = \frac{\$50,000,000}{\$127} = 393,701 \]

\[ \text{剩餘股數} = \text{原股數} - \text{買回股數} = 1,000,000 - 393,701 = 606,299 \]

\[ S = V_L - B = \$127,000,000 - \$50,000,000 = \$77,000,000 \]

\[ \frac{S}{\text{股數}} = \frac{\$77,000,000}{606,299} = \$127 \]

(d)

\[ r_S = r_f + \frac{B}{S} \left( r_f - r_f \right) \left( 1 - T_c \right) \]

\[ = 18\% + \frac{\$50,000,000}{\$77,000,000} \times (18\% - 10\%) \times (1 - 34\%) = 21.43\% \]

\[ C_{\text{攞資}} = (EBIT - \text{利息}) \times (1 - T_c) \]

\[ = (\$30,000,000 - \$50,000,000 \times 10\%) \times (1 - 34\%) = \$16,500,000 \]

Cash Flows to Equity

<table>
<thead>
<tr>
<th>EBIT</th>
<th>$30,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Pre-Tax Earnings</td>
<td>25,000,000</td>
</tr>
<tr>
<td>Taxes at 34%</td>
<td>8,500,000</td>
</tr>
<tr>
<td>After-Tax Earnings</td>
<td>16,500,000</td>
</tr>
</tbody>
</table>

\[ S = \frac{CF_{\text{攞資}}}{r_S} = \frac{\$16,500,000}{21.43\%} = \$77,000,000 \]

Blue Angel, Inc., a new firm in the holiday gift industry, is considering a project. To better assess the risk of the project, the firm obtained the following information on 10 other firms in the industry:

<table>
<thead>
<tr>
<th>Target D/E</th>
<th>Industry Average</th>
<th>Blue Angel</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_{\text{equity}} )</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>( r_f )</td>
<td>1.5</td>
<td>?</td>
</tr>
<tr>
<td>( r_S )</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The expected return on the market portfolio is 17 percent, and the risk-free rate is 9 percent. Blue Angel is subject to a corporate tax rate of 40 percent. The project requires an initial outlay of $325,000 and is expected to result in a $55,000 cash inflow at the end of the first year. The project will be financed at Blue Angel’s target debt-equity ratio. Annual cash flow from the project will grow at a constant rate of 5 percent until the end of the fifth year and remain constant forever thereafter. Should Blue Angel invest in the project?
利用以下兩公式：
\[ r_s = r_f + \beta_M \left( r_M - r_f \right) \]
\[ r_s = r_f + \frac{B}{S} (r_e - r_f) (1 - T_c) \]

兩家公司的 \( r_f \) 相等，因此計算邏輯（過程）如下：

(1) 由業界資料（Industry Average）計算 \( r_0 \)，此即為 Blue Angel 之 \( r_f \)

(2) 由 Blue Angel 資料計算其 \( r_s \)

(3) 計算 Blue Angel 的 \( r_{WACC} = \frac{S}{S+B} r_s + \frac{B}{S+B} r_e \times (1-T_c) \)

(4) 以該 \( r_{WACC} \) 爲折現率，計算投資案的凈現值，並判斷是否值得投資

Industry Average:
\[
\frac{D}{E} = 30\% \cdot \beta_E = 1.5 \cdot r_B = 10\% \cdot r_M = 17\% \cdot r_F = 9\% \cdot T_C = 40\% \\
r_s = 9\% + 1.5 \times (17\% - 9\%) = r_0 + 30\% \times (r_0 - 10\%)(1 - 40\%) \Rightarrow r_0 = 19.32\%
\]

Blue Angel:
\[
\frac{D}{E} = 35\% \cdot r_B = 10\% \cdot T_C = 40\% \cdot r_0 = 19.32\%
\]
\[
r_s = 19.32\% + 35\% \times (19.32\% - 10\%) (1 - 40\%) = 21.28\%
\]
\[
\frac{D}{E} = 35\% \Rightarrow \frac{S}{S+B} = \frac{100}{100 + 35} = 0.35, \quad \frac{B}{S+B} = \frac{35}{100 + 35} = 0.29
\]
\[
r_{WACC} = \frac{100}{135} \times 21.28\% + \frac{35}{135} \times 10\% \times (1 - 40\%) = 17.32\%
\]

現金流量為期初投資 $325,000，每年（稅後）營收$55,000，營收前五年以 \( g = 5\% \) 成長，之後無成長：

\[
NPV = -325,000 + 55,000 \times \left( \frac{1}{17.32\% - 5\%} \right) \times \left( 1 - \frac{(1+5\%)^5}{(1+17.32\%)^5} \right)
\]
\[
= \frac{55,000 \times (1+5\%)^5 \times \left( \frac{1}{17.32\% - 5\%} \right)}{(1+17.32\%)^5}
\]
\[
= \frac{55,000}{17.32\% - 5\%} \times \frac{1}{1+17.32\%} = 47,424
\]

North Polo Fishing Equipment Corporation and South Polo Fishing Equipment Corporation would have identical equity betas of 1.2 if both of them were all-equity financed. The capital structures of the two firms are as follow:

<table>
<thead>
<tr>
<th></th>
<th>North Pole</th>
<th>South Pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>$1,000,000</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Equity</td>
<td>$1,500,000</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

The expected return on the market portfolio is 12.75 percent, and the risk-free rate is 4.25
percent. Both firms are subject to a corporate tax rate of 35 percent. Assume the debt beta of each of the two firms equals 0.

a. What is the equity beta of each of the two firms?

b. What is the required rate of return on each of the two firm’s equity?

【解】

(a)

\[ \beta_{ew} = \beta_L + \frac{B}{S}(1-T_c)\left(\beta_L - \beta_B\right) \]

\[ \beta_{ew} = \left[1 + \frac{B}{S}(1-T_c)\right]\beta_L \]

North Pole 公司：

\[ \frac{B}{S} = \frac{1,000,000}{1,500,000} = \frac{2}{3}, \ T_c = 35\% , \ \beta_L = 1.2 \]

\[ \beta_{ew} = \left[1 + \frac{2}{3}(1-35\%)\right] \times 1.2 = 1.72 \]

South Pole 公司：

\[ \frac{B}{S} = \frac{1,500,000}{1,000,000} = \frac{3}{2}, \ T_c = 35\% , \ \beta_L = 1.2 \]

\[ \beta_{ew} = \left[1 + \frac{3}{2}(1-35\%)\right] \times 1.2 = 2.37 \]

(b)

\[ r_s = r_p + \beta_{ew}(r_m - r_p) \]

North Pole 公司：

\[ \beta_{ew} = 1.72 , \ r_p = 4.25\% , \ r_m = 12.75\% \]

\[ r_s = 4.25\% + 1.72 \times (12.75\% - 4.25\%) = 18.87\% \]

South Pole 公司：

\[ \beta_{ew} = 2.37 , \ r_p = 4.25\% , \ r_m = 12.75\% \]

\[ r_s = 4.25\% + 2.37 \times (12.75\% - 4.25\%) = 24.40\% \]