

Solution to Question Book for Lecture Note 9

Capital Structure Decision

ST-1

$$\begin{aligned} \text{a. } S &= P(n) = \$30(600,000) = \$18,000,000 \\ V &= D + S = \$2,000,000 + \$18,000,000 = \$20,000,000 \end{aligned}$$

$$\begin{aligned} \text{b. } w_d &= D/V = \$2,000,000/\$20,000,000 = 0.10 \\ w_s &= S/V = \$18,000,000/\$20,000,000 = 0.90 \\ \text{WACC} &= w_d r_d(1 - T) + w_s r_s \\ &= (0.10)(10\%)(0.60) + (0.90)(15\%) = 14.1\% \end{aligned}$$

$$\begin{aligned} \text{c. } \text{WACC} &= (0.50)(12\%)(0.60) + (0.50)(18.5\%) = 12.85\% \\ \text{Since } g &= 0, \text{ it follows that } \text{FCF} = \text{NOPAT}. \end{aligned}$$

$$\begin{aligned} V_{\text{opNew}} &= \text{FCF}/\text{WACC} = \text{EBIT}(1-T)/0.1285 = \$4,700,000(0.60)/0.1285 \\ &= \$21,945,525.292 \end{aligned}$$

$$D = w_d(V_{\text{op}}) = 0.50(\$21,945,525.292) = \$10,972,762.646$$

Since it started with \$2 million debt, it will issue

$$D_{\text{New}} - D_{\text{Old}} = \$8,972,762.646 = \$10,972,762.646 - \$2,000,000.$$

$$S_{\text{Post}} = V_{\text{opNew}} - D_{\text{New}} = \$21,945,525.292 - \$10,972,762.646 = \$10,972,762.646$$

$$(\text{Alternatively, } S_{\text{Post}} = w_s(V_{\text{opNew}}) = 0.50(\$21,945,525.292) = \$10,972,762.646)$$

$$\begin{aligned} n_{\text{Post}} &= n_{\text{Prior}} \left[\frac{V_{\text{opNew}} - D_{\text{New}}}{V_{\text{opNew}} - D_{\text{Old}}} \right] \\ &= 600,000 \left[\frac{\$21,945,525.292 - \$10,972,762.646}{\$21,945,525.292 - \$2,000,000} \right] \\ &= 600,000 \left[\frac{\$10,972,762.646}{\$19,945,525.292} \right] \\ &= 330,082 \end{aligned}$$

$$\begin{aligned} P_{\text{Post}} &= (V_{\text{opNew}} - D_{\text{Old}})/n_{\text{Prior}} \\ &= (\$21,945,525.292 - \$2,000,000)/600,000 \\ &= \$33.2425 \end{aligned}$$

Alternatively, after issuing debt and before repurchasing stock, the firm's equity, S_{Prior} , is worth $V_{\text{opNew}} + (D_{\text{New}} - D_{\text{Old}}) - D_{\text{New}} = \$21,945,525.292 + \$8,972,762.646 - \$10,972,762.646 = \$19,945,525.29$. The stock price prior to the repurchase is $P_{\text{Prior}} = S_{\text{Prior}}/n_{\text{Prior}} = \$19,945,525.29/600,000 = \33.242542 . The firm used the proceeds of the new debt, \$8,972,762.646, to repurchase X shares of stock at a price of \$33.242542 per share. The number of shares it will repurchase is $X = \$8,972,762.646/\$33.242542 = 269,918.07$. Thus, there are $600,000 - 269,918.07 = 330,082$ shares remaining. As a check, the stock price should equal the market value of equity (S) divided by the number of shares: $P_0 = \$10,972,762.646/330,082 = \33.2425 .

ST-2

- a. LIC's current cost of equity is

$$r_s = 6\% + 1.5(4\%) = 12\%$$

- b. LIC's unlevered beta is

$$b_U = 1.5/[1 + (1 - 0.40)(25\%/75\%)] = 1.5/1.2 = 1.25$$

- c. LIC's levered beta at D/S = 60%/40% = 1.5 is

$$b = 1.25[1 + (1 - 0.40)(60/40)] = 2.375$$

LIC's new cost of capital will be

$$r_s = 6\% + (2.375)(4\%) = 15.5\%$$

15-1 20,000.**15-2** 1.0.**15-3** 3.6%.**15-4** \$300 million.**15-5** \$30.**15-6** 40 million.**15-7** a. $\Delta \text{Profit} = \$850,000$;
Return = 21.25% > $r_s = 15\%$.b. $Q_{BE, \text{Old}} = 40$; $Q_{BE, \text{New}} = 45.45$.**15-8** a. $V = \$3,348,214$.

b. \$16.74.

c. \$1.84.

d. 10%.

15-9 30% debt:

WACC = 11.14%;

 $V = \$101.023$ million.

50% debt:

WACC = 11.25%;

 $V = \$100$ million.

70% debt:

WACC = 11.94%;

 $V = \$94.255$ million.**15-10** a. 0.870.b. $b = 1.218$; $r_s = 10.872\%$.

c. WACC = 8.683%;

 $V = \$103.188$ million.**15-11** 11.45%.