

10.12: Problem

? Problem 10.12.1

Assume our company has a bond outstanding with 20-years remaining until maturity. This bond has a 7.5% coupon rate. Our marginal tax rate is 35%. Find our after-tax cost of debt if the bond price is:

- a. \$1135
- b. \$875

Answer

First we must find the YTM and then plug it into the formula:

$$k_i = \text{YTM}(1 - T)$$

Remember that bonds pay interest semi-annually so that we must set our calculators to 2 Periods per Year and adjust the N and PMT to reflect the semi-annual framework.

Part a

40 N
-1135 PV
37.50 PMT
1000 FV
I/Y \Rightarrow 6.30%

$$k_i = 6.30\%(1 - 0.35) = 4.10\%$$

Part b

40 N
-875 PV
37.50 PMT
1000 FV
I/Y \Rightarrow 8.84%

$$k_i = 8.86\%(1 - 0.35) = 5.75\%$$

? Problem 10.12.2

If the par value of our preferred stock is \$30 and the dividend rate is 5% of par while the current price is \$16.50, what is the cost of preferred stock?

Answer

$$k_p = D/P = (0.05)(30)/16.50 = 1.50/16.50 = 9.09\%$$

? Problem 10.12.3

The price of our common stock is \$25. The constant growth rate in dividends is 8% and our current dividend (D_0) is \$0.75. Also, the risk-free rate of interest is 5% and the expected return on the market is 12%. Beta for this stock is 0.8. Finally, we estimate a risk premium of 5% for stocks relative to bonds and the current YTM on our long-term debt is 9%. Find the estimated cost of capital for common stock under each of the 3 methods.

Answer

Dividend Valuation Approach

$$k_s = (D_1/P) + g = [(0.75) \times (1.08)/25] + 0.08 = 11.24\%$$

Security Market Line Approach

$$k_s = k_{rf} + \beta(k_m - k_{rf}) = 5\% + 0.8(12\% - 5\%) = 5\% + 5.6\% = 10.60\%$$

Bond Yield plus Risk Premium Approach

$$k_s = YTM + RP = 9\% + 5\% = 14.00\%$$

$$\text{Average } k_s = (11.24\% + 10.60\% + 14.00\%)/3 = 11.95\%$$

? Problem 10.12.4

You have the following information about XYZ Corp:

Asset	Book Value	Market Value
Bonds	\$20,000,000	\$24,000,000
Preferred Stock	\$4,000,000	\$5,000,000
Common Stock	\$10,000,000	\$35,000,000

Constant growth on common	6.5%
YTM on bonds	11%
Beta	1.35
Treasury bond yield	5%
Price of common stock	\$34
Tax rate	40%
Coupon rate on bonds	10%
Risk prem. stocks over bonds	5%
Expected market return (k_m)	12%
Expected Common Dividend (D_1)	2.75
Number of pref. shares	100,000
Per share dividend on preferred	\$6.50

- What is the marginal cost of capital for this firm?
- If you have a capital budgeting project that will generate after tax cash flows of \$25,000 per year for the next four years and costs \$75,000, should you take it?

Answer

Part a

Step 1 \Rightarrow Solve for Market Value Weights

$$MV_{\text{debt}} = 24,000,000$$

$$MV_{\text{pref}} = 5,000,000$$

$$MV_{\text{com}} = 35,000,000$$

$$MV_{\text{total}} = 64,000,000$$

$$W_{\text{debt}} = 24,000,000/64,000,000 = 0.38$$

$$W_{\text{pref}} = 5,000,000/64,000,000 = 0.08$$

$$W_{\text{com}} = 35,000,000/64,000,000 = 0.55$$

Step 2 \Rightarrow Solve for After-tax Cost of Debt

$$k_i = \text{YTM}(1 - T) = 11\%(1 - 0.40) = 6.60\%$$

Step 3 \Rightarrow Solve for Cost of Preferred Stock

$$k_p = D/P = 6.50/50 = 13\%$$

Note that the price per share for preferred stock is found by taking the total market value of preferred stock divided by the number of shares $\Rightarrow \$5,000,000/100,000 = \50

Step 4 \Rightarrow Solve for Cost of Common Stock

Dividend Valuation Approach

$$k_s = (D_1/P) + g = (2.75/34) + 0.065 = 14.59\%$$

Security Market Line Approach

$$k_s = k_{rf} + \beta(k_m - k_{rf}) = 5\% + 1.35(12\% - 5\%) = 14.45\%$$

Bond Yield Plus Risk Premium Approach

$$k_s = \text{YTM} + \text{RP} = 11\% + 5\% = 16.00\%$$

Cost of Common Stock Financing

$$(14.59\% + 14.45\% + 16.00\%)/3 = 15.01\%$$

Step 5 \Rightarrow Solve for Marginal Cost of Capital (MCC)

$$\begin{aligned} \text{MCC} &= W_{\text{debt}}(k_i) + W_{\text{pref}}(k_p) + W_{\text{com}}(k_s) \\ &= (0.38)(6.60\%) + (0.08)(13.00\%) + (0.55)(15.01\%) \\ &= 11.80\% \end{aligned}$$

Part b

Solve for IRR $\Rightarrow \text{IRR} = 12.59\% > 11.80\% \Rightarrow$ Accept Project

Solve for NPV @ 11.80% $\Rightarrow \$1254.70 > \$0 \Rightarrow$ Accept Project

Note – Since there is no crossover problem and it is a single project instead of mutually exclusive, we can use either IRR or NPV to make our decision.

? Problem 10.12.5

The following information is available about ACME Inc.

Balance Sheet:

LT 10% Coupon Bonds (10,000 bonds)	\$10,000,000
Preferred Stock (40,000 shares) (\$50 par with a 10% dividend)	2,000,000
Common Stock (1,000,000 shares)	20,000,000

The market values are \$1060 for each \$1000 par value bond, \$53 for each share of preferred, and \$41.25 for each share of common. The bonds are recorded on the balance sheet at their par value and mature in 10 years.

Beta	1.3
Current Treasury bond rate	6%
Risk Premium for stocks over bonds	5%
Tax Rate	40%
Growth rate in dividends	10%
Expected market return	13%
Dividend (D_0)	2.25

- a. What are the appropriate weights for the opportunity cost of capital?
- b. What are the appropriate costs of debt, preferred, and common (use an average of the 3 methods for common)?
- c. What is the marginal cost of capital?

Answer**Part a**

$$MV_{\text{debt}} = 10,000 \times 1060 = \$10,600,000$$

$$MV_{\text{pref}} = 40,000 \times 53 = \$2,120,000$$

$$MV_{\text{com}} = 1,000,000 \times 41.25 = \$41,250,000$$

$$MV_{\text{total}} = \$53,970,000$$

$$W_{\text{debt}} = 0.20$$

$$W_{\text{pref}} = 0.04$$

$$W_{\text{com}} = 0.76$$

Part b

$$k_i = YTM(1 - T) = 9.07\%(1 - 0.40) = 5.44\%$$

Find YTM

20 N

-1060 PV

50 PMT

1000 FV

I/Y \Rightarrow 9.07%

$$k_p = D/P = \$5/\$53 = 9.43\%$$

$$\text{Div Val Approach} \Rightarrow k_s = (D_1/P) + g = [(2.25)(1.10)/41.25] + 0.10 = 16.00\%$$

$$\text{SML Approach} \Rightarrow k_s = k_{rf} + \beta(k_m - k_{rf}) = 6\% + 1.3(13\% - 6\%) = 15.10\%$$

$$\text{BY + RP Approach} \Rightarrow k_s = YTM + RP = 9.06\% + 5\% = 14.06\%$$

$$\text{Average of Three Approaches} \Rightarrow (16.00\% + 15.10\% + 14.06\%)/3 = 15.05\%$$

Part c

$$MCC = W_{\text{debt}}(k_i) + W_{\text{pref}}(k_p) + W_{\text{com}}(k_s)$$

$$= (0.20)(5.44\%) + (0.04)(9.43\%) + 0.76(15.05\%)$$

$$= 12.90\%$$

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