

Chapter 9

The Cost of Capital

ANSWERS TO END-OF-CHAPTER QUESTIONS

- 9-1
- The weighted average cost of capital, WACC, is the weighted average of the after-tax component costs of capital—debt, preferred stock, and common equity. Each weighting factor is the proportion of that type of capital in the optimal, or target, capital structure. The after-tax cost of debt, $r_d(1 - T)$, is the relevant cost to the firm of *new* debt financing. Since interest is deductible from taxable income, the after-tax cost of debt to the firm is less than the before-tax cost. Thus, $r_d(1 - T)$ is the appropriate component cost of debt (in the weighted average cost of capital).
 - The cost of preferred stock, r_{ps} , is the cost to the firm of issuing new preferred stock. For perpetual preferred, it is the preferred dividend, D_{ps} , divided by the net issuing price, P_n . Note that no tax adjustments are made when calculating the component cost of preferred stock because, unlike interest payments on debt, dividend payments on preferred stock are not tax deductible. The cost of new common equity, r_e , is the cost to the firm of equity obtained by selling new common stock. It is, essentially, the cost of retained earnings adjusted for flotation costs. Flotation costs are the costs that the firm incurs when it issues new securities. The amount actually available to the firm for capital investment from the sale of new securities is the sales price of the securities less flotation costs. Note that flotation costs consist of (1) direct expenses such as printing costs and brokerage commissions, (2) any price reduction due to increasing the supply of stock, and (3) any drop in price due to informational asymmetries.
 - The target capital structure is the relative amount of debt, preferred stock, and common equity that the firm desires. The WACC should be based on these target weights.
 - There are considerable costs when a company issues a new security, including fees to an investment banker and legal fees. These costs are called flotation costs. The cost of new external common equity is higher than that of common equity raised internally by reinvesting earnings. Projects financed with external equity must earn a higher rate of return, since the project must cover the flotation costs.
- 9-2
- The WACC is an average cost because it is a weighted average of the firm's component costs of capital. However, each component cost is a marginal cost; that is, the cost of new capital. Thus, the WACC is the weighted average *marginal* cost of capital.

9-3

	Effect On		
	$r_d(1 - T)$	r_s	WACC
a. The corporate tax rate is lowered.	+	0	+
b. The Bank of Canada tightens credit.	+	+	+
c. The firm uses more debt.	+	+	0
d. The firm doubles the amount of capital it raises during the year.	0 or +	0 or +	0 or +
e. The firm expands into a risky new area.	+	+	+
f. Investors become more risk averse.	+	+	+

9-4 Stand-alone risk views a project's risk in isolation, hence without regard to portfolio effects; within-firm risk, also called corporate risk, views project risk within the context of the firm's portfolio of assets; and market risk (beta) recognizes that the firm's shareholders hold diversified portfolios of stocks. In theory, market risk should be most relevant because of its direct effect on stock prices.

9-5 If a company's composite WACC estimate were 10%, its managers might use 10% to evaluate average-risk projects, 12% for those with high-risk, and 8% for low-risk projects. Unfortunately, given the data, there is no completely satisfactory way to specify exactly how much higher or lower we should go in setting risk-adjusted costs of capital.

SOLUTIONS TO END-OF-CHAPTER PROBLEMS

9-1 a. $r_d(1 - T) = 7\%(1 - 0) = 7.0\%$.

b. $r_d(1 - T) = 7\%(0.80) = 5.6\%$.

c. $r_d(1 - T) = 7\%(0.65) = 4.6\%$.

9-2 $r_d(1 - T) = 0.095(0.70) = 6.7\%$.

9-3 $V_{ps} = \$25$; $D_{ps} = \$1.75$; $F = 0\%$; $r_{ps} = ?$

$$\begin{aligned} r_{ps} &= \frac{D_{ps}}{V_{ps}(1 - F)} \\ &= \frac{\$1.75}{\$25(1 - 0.0)} \\ &= 7\%. \end{aligned}$$

9-4 $r_{ps} = \frac{\$50(0.06)}{\$60.00(1 - 0.05)} = \frac{\$3.00}{\$57.00} = 5.26\%$.

9-5 $P_0 = \$36$; $D_1 = \$3.00$; $g = 5\%$; $r_s = ?$

$$r_s = \frac{D_1}{P_0} + g = (\$3.00/\$36.00) + 0.05 = 13.33\%.$$

9-6 $r_s = r_{RF} + b_i(RP_M) = 0.06 + 0.8(0.055) = 10.4\%$.

9-7 30% Debt; 5% Preferred Stock; 65% Equity; $r_d = 6\%$; $T = 30\%$; $r_{ps} = 5.8\%$; $r_s = 12\%$.

$$\begin{aligned} WACC &= (w_d)(r_d)(1 - T) + (w_{ps})(r_{ps}) + (w_{ce})(r_s) \\ WACC &= 0.30(0.06)(1 - 0.30) + 0.05(0.058) + 0.65(0.12) = 9.35\%. \end{aligned}$$

9-8 40% Debt; 60% Equity; $r_d = 9\%$; $T = 30\%$; $WACC = 10.32\%$; $r_s = ?$

$$\begin{aligned} WACC &= (w_d)(r_d)(1 - T) + (w_{ce})(r_s) \\ 10.32\% &= (0.4)(9\%)(1 - 0.3) + (0.6)r_s \\ 10.32\% &= 2.52\% + 0.6r_s \\ 7.8\% &= 0.6r_s \\ r_s &= 13\%. \end{aligned}$$

9-9 $N = 60$, $PV = -821.97$, $PMT = 30$, and $FV = 1000$, to get $I = 3.75\%$ = periodic rate. The nominal rate is $3.75\%(2) = 7.50\%$, and the after-tax component cost of debt is $7.50\%(0.70) = 5.25\%$.

9-10 a. $r_s = \frac{D_1}{P_0} + g = \frac{\$2.91}{\$38} + 4\% = 7.7\% + 4\% = 11.7\%$.

b. $r_s = r_{RF} + (r_M - r_{RF})b$
 $= 5.0\% + (9.0\% - 5.0\%)1.3 = 5\% + (4.0\%)1.3 = 5\% + 5.2\% = 10.2\%$.

c. $r_s = \text{Bond rate} + \text{Risk premium} = 8\% + 4\% = 12\%$.

d. The bond-yield-plus-risk-premium approach and the DCF method both resulted in higher cost of equity values than the CAPM method. The firm's cost of equity should be estimated to be about 11.3 percent, which is the average of the three methods.

9-11 a. $\$6.50 = \$4.42(1+g)^5$
 $(1+g)^5 = 6.50/4.42 = 1.471$
 $(1+g) = 1.471^{(1/5)} = 1.080$
 $g = 8\%$.

Alternatively, with a financial calculator, input $N = 5$, $PV = -4.42$, $PMT = 0$, $FV = 6.50$, and then solve for $I = 8.02\% \approx 8\%$.

b. $D_1 = D_0(1 + g) = \$2.60(1.08) = \2.81 .

c. $r_s = D_1/P_0 + g = \$2.81/\$36.00 + 8\% = 15.81\%$.

9-12 a. $r_s = \frac{D_1}{P_0} + g$
 $0.11 = \frac{\$0.72}{\$18.00} + g$
 $0.11 = 0.04 + g$
 $g = 7\%$.

b. Current EPS	\$ 1.980
Less: Dividends per share	<u>0.720</u>
Retained earnings per share	\$ 1.260
Rate of return	\times <u>0.110</u>
Increase in EPS	\$0.139
Current EPS	<u>1.980</u>
Next year's EPS	<u>\$2.119</u>

Alternatively, $EPS_1 = EPS_0(1 + g) = \$1.98(1.07) = \2.119 .

9-13 $P_0 = \$30$; $D_1 = \$3.00$; $g = 5\%$; $F = 10\%$; $r_e = ?$

$$R_e = [D_1/(1-F) P_0] + g = [3/(1-0.10)(30)] + 0.05 = 16.1\%$$

9-14 Enter these values: $N = 20$, $PV = 1000(1-0.02) = 980$, $PMT = -90(1-.35)=-58.50$, and $FV = -1000$, to get $I = 6.02\%$, which is the after-tax component cost of debt.

9-15 a. Cost of debt:

-930 PV, 10 N, 80 PMT, 1000 FV and CPT I/Y = 9.10%

-1000(1 - 0.03) PV, 10 N, 91 PMT, 1000 FV and CPT I/Y = 9.58%

Cost of equity: $r_s = 5.0\% + 1.5(4.0\%) = 11\%$

$$\frac{D}{E} = 2 \therefore D = 2E$$

$$D + E = 100\%$$

$$2E + E = 100\%$$

$$3E = 33.3\% \approx 33\%$$

$$\therefore D = 100\% - 33.3\% = 66.7\% \approx 67\%$$

$$WACC: 0.33(11\%) + 0.67(9.58\%)(1 - 0.30) = 8.12\%$$

b. Cost of preferred stock:

$$\$25 \times 7\% = \$1.75/\$25(1 - 0.05) = 7.37\%$$

$$WACC: 0.33(11\%) + 0.20(7.37\%) + 0.47(9.58\%)(1 - 0.30) = 8.26\%$$

c. WACC rises because the company is substituting more expensive financing (preferred shares at 7.37%), with its cheaper debt costs (at 6.71%).

9-16 a. Common equity needed:

$$\frac{D}{E} = 1.8 \therefore D = 1.8E$$

We also know that the $\Delta D + \Delta E = \Delta \text{Investment}$
 substitute 1.8E for D : $1.8E + E = \$42 \text{ M}$
 $\Delta E = \$15 \text{ M}$

b. Cost using r_s :

$$\frac{D}{E} = 1.8 \therefore D = 1.8E$$

$$\begin{aligned} D + E &= 100\% \\ 1.8E + E &= 100\% \\ E &= 35.7\% \\ \therefore D &= 100\% - 35.7\% = 64.3\% \end{aligned}$$

	After-Tax		
	<u>Percent</u>	×	<u>Cost</u> = <u>Product</u>
Debt	0.643		4.9%* 3.15%
Common equity	0.357		8 <u>2.86</u>
			WACC = <u>6.01%</u>

$$*7\%(1 - T) = 7\%(0.7) = 4.9\%$$

c. r_s and the WACC will increase due to the flotation costs of new equity.

- 9-17 a. There are two methods for determining the market value weights: (1) use the target capital structure or (2) take the market value of both debt and equity. Since the target capital structure is given, that should be used. Also, the fact that the stock price is valued very high and may not be sustainable provides another justification for using the target weightings.
- b. Short-term debt should not be included in the WACC since it is not part of the permanent capital structure, that is, it is paid off during the year.

Long-term debt cost:

$$-1050 \text{ PV}, 30 \text{ N}, 55 \text{ PMT}, 1000 \text{ FV and CPT I/Y} = 5.17 \times 2 = 10.34\%$$

$$-1,000(1 - 0.03) \text{ PV}, 30 \text{ N}, 103.4/2 \text{ PMT}, 1000 \text{ FV and CPT I/Y} = 5.37 \times 2 = 10.75\%$$

$$R_{d(\text{long term})} (1-T) = 10.75(1 - 0.30) = 7.52\% \approx 7.5\%$$

Cost of equity:

$$\text{CAPM: } r_s = 5.0\% + 1.4(9.0\% - 5.0\%) = 10.6\%$$

The current 10-year bond rate should be used as the question provides data on expected market returns (not historical returns).

$$\text{DCF: } r_s = [D_1/P_0] + g = [\$0.65(1 + 0.03)/\$10] + 0.03 = 9.7\%$$

$$\text{Average } r_s = (10.6\% + 9.7\%)/2 = 10.2\%$$

The issue here is what growth rate “g” to use. Since g represents the expected long-term growth rate going forward, and the problem states that the company is entering a maturity phase, using a past growth rate of 12% is not appropriate. Given that company growth is expected to mirror the economy, the expected overall economic growth rate of 3% is probably most appropriate. $g = \text{ROE}(\text{RR})$ can also be calculated since we have the data. $g = 18\%(1 - 0.20) = 14.4\%$. 14.4% is also based on past growth and is also much higher than a standard long-run growth rate for a mature company, so it too should not be used.

$$\begin{aligned} \text{WACC} &= (D_{\text{long term}}/V)(r_{d \text{ long term AT}}) + (S/V)(r_s) \\ &= 0.30(7.5\%) + 0.70(10.2\%) = 9.39\% \approx \underline{9.4\%} \end{aligned}$$

- 9-18 The book and market value of the current liabilities are both \$22,000,000.
 Using a financial calculator, input $N = 20$, $I = 6$, $PMT = 90$, and $FV = 1000$ to arrive at a $PV = \$1,344.10$.
 The total market value of the long-term debt is $47,000(\$1,344.10) = \$63,172,700$.
 There are 3 million shares of stock outstanding, and the stock sells for \$75 per share.
 Therefore, the market value of the equity is \$225,000,000.

The market value capital structure is thus:

Short-term debt	\$22,000,000	7.1%
Long-term debt	63,172,700	20.4
Common equity	<u>225,000,000</u>	<u>72.5</u>
	<u>\$310,172,700</u>	<u>100.0%</u>

9-19

Establish a set of market value capital structure weights.

The short-term debt is taken at par value; therefore its market value is \$3,300,000.
 The long-term debt trades at 102 of par, therefore its market value is $102\% \times \$1,000 \times 35,700 = \$36,414,000$.

The market value of the equity is $25,000,000 \text{ shares} \times \$11/\text{share} = \$275,000,000$.

Short-term debt	\$ 3,300,000	1%
Long-term debt	36,414,000	11.6%
Common equity	<u>275,000,000</u>	<u>87.4%</u>
	<u>\$314,714,000</u>	<u>100.0%</u>

Establish the cost rates for the various capital structure components:

Since short-term debt is valued at par and no changes in interest costs are expected:

Short-term debt: $r_{d(\text{short-term})}(1-T) = 6\%(1 - 0.35) = 3.9\%$

Long-term debt: To find the market yield on long-term debt enter into a financial calculator:

-1020 PV, 24 N, 37.5 PMT, 1000 FV and CPT I/Y = $3.62 \times 2 = 7.24\%$

$R_{d(\text{long term})}(1-T) = 7.24(1 - 0.35) = 4.71\% \approx 4.7\%$.

Common equity:

Information is provided to estimate r_s two ways: CAPM and DCF. Both are estimates.

CAPM:

We use $r_{rf} = 10\text{-year government bond rate} = 5.5\%$. For RP_M , we use 5% . The beta given is 1.2 . Using these values we estimate r_s :

$$r_s = 5.5\% + (5)(1.2) = 11.5\%.$$

DCF:

We first calculate this year's earnings per share: $\$20,000,000/25,000,000 = \0.80 . Since the growth in earnings is expected to be 8% and 40% of earnings will be paid out in dividends we can estimate r_s :

$$r_s = \frac{(0.80)(0.40)(1.08)}{11} + 0.08 = 11.1\%$$

Based on an average, we estimate r_s to be $(11.5\% + 11.1\%)/2 = 11.3\%$.

Calculate the WACC:

$$\begin{aligned} \text{WACC} &= (D_{\text{short term}}/V)(r_{d \text{ short term AT}}) + (D_{\text{long term}}/V)(r_{d \text{ long term AT}}) + (S/V)(r_s) \\ &= 0.01(3.9\%) + 0.116(4.7\%) + 0.874(11.3\%) = 10.46\% \approx \underline{10.5\%}. \end{aligned}$$

9-20 Several steps are involved in the solution of this problem. Our solution follows:

Step 1.

Establish a set of market value capital structure weights. In this case, A/P and accruals should be disregarded because they are not sources of financing from investors. Instead of being incorporated into the WACC, they are accounted for when calculating cash flows. For this firm, short-term debt is used to finance seasonal goods, and the balance is reduced to zero in off-seasons. Therefore, this is not a source of permanent financing, and should be disregarded when calculating the WACC.

Debt:

The long-term debt has a market value found as follows:

$$V_0 = \sum_{t=1}^{40} \frac{\$40}{(1.035)^t} + \frac{\$1,000}{(1.035)^{40}} = \$1,106.78,$$

or $1,106.78(\$20,000,000) = \$22,135,507$ in total. Notice that short-term debt is not included in the capital structure for this company. We usually include short-term debt in the total debt figure for calculating weights because in the absence of any other information, we assume the short-term debt will be rolled over from year to year. In this case, however, the company does not use short-term debt as a permanent source of financing. Indeed, as stated in the problem, the short-term debt balance is zero off-season. In such a situation neither the lender nor the company believes that the debt balance will be rolled over from year to year as the loan is closed out each off-season and so it is not considered a component of the capital structure.

Preferred Stock:

The preferred has a value of

$$P_{ps} = \frac{\$0.45}{0.065/4} = \$27.69.$$

There are $\$3,000,000/\$25 = 120,000$ shares of preferred outstanding, so the total market value of the preferred is

$$120,000(\$27.69) = \$3,322,800.$$

Common Stock:

The market value of the common stock is

$$4,000,000(\$20) = \$80,000,000.$$

Therefore, here is the firm's market value capital structure, which we assume to be optimal:

Long-term debt	\$ 22,135,507	20.99%
Preferred stock	3,322,800	3.15
Common equity	<u>80,000,000</u>	<u>75.86</u>
	<u>\$105,458,307</u>	<u>100.00%</u>

We would round these weights to 21 percent debt, 3 percent preferred, and 76 percent common equity.

Step 2.

Establish cost rates for the various capital structure components.

Debt cost:

$$r_d(1 - T) = 7\%(0.7) = 4.9\%.$$

Preferred cost:

Annual dividend on new preferred = 6.5%(\$25) = \$1.625. Therefore,

$$r_{ps} = \$1.625/\$25(1 - 0.05) = \$1.625/\$23.75 = 6.8\%.$$

Common equity cost:

There are three basic ways of estimating r_s : CAPM, DCF, and risk premium over own bonds. None of the methods is very exact.

CAPM:

We would use r_{RF} = government bond rate = 5%. For RP_M , we would use 2.5% to 3.5%. For beta, we would use a beta in the 1.3 to 1.7 range. Combining these values, we obtain this range of values for r_s :

$$\text{Highest: } r_s = 5\% + (3.5)(1.7) = 10.95\%.$$

$$\text{Lowest: } r_s = 5\% + (2.5)(1.3) = 8.25\%.$$

$$\text{Average: } r_s = (10.95\% + 8.25\%)/2 = 9.6\%.$$

DCF:

The company seems to be in a rapid, nonconstant growth situation, but we do not have the inputs necessary to develop a nonconstant r_s . Therefore, we will use the constant growth model but temper our growth rate; that is, think of it as a long-term average g that may well be higher in the immediate than in the more distant future.

Data exist that would permit us to calculate historic growth rates, but problems would clearly arise, because the growth rate has been variable and also because $g_{EPS} \neq g_{DPS}$. For the problem at hand, we would simply disregard historic growth rates, except for a discussion about calculating them as an exercise.

We could use as a growth estimator this method:

$$g = \text{ROE}(\text{Retention ratio}) = 0.5(24\%) = 12\%.$$

It would not be appropriate to base g on the 30% ROE, because investors do not expect that rate.

Finally, we could use the analysts' forecasted g range, 4 to 8 percent. The dividend yield is D_1/P_0 . Assuming $g = 6\%$,

$$\frac{D_1}{P_0} = \frac{\$1(1.06)}{\$20} = 5.3\%.$$

One could look at a range of yields, based on P in the range of \$17 to \$23, but because we believe in efficient markets, we would use $P_0 = \$20$. Thus, the DCF model suggests an r_s in the range of 9.3 to 13.3 percent:

$$\text{Highest: } r_s = 5.3\% + 8\% = 13.3\%.$$

$$\text{Lowest: } r_s = 5.3\% + 4\% = 9.9\%.$$

$$\text{Midpoint: } r_s = 5.3\% + 6\% = 11.3\%.$$

Generalized risk premium.

$$\text{Highest: } r_s = 7\% + 5\% = 12\%.$$

$$\text{Lowest: } r_s = 7\% + 3\% = 10\%.$$

$$\text{Average: } r_s = (12\% + 10\%)/2 = 11\%.$$

Based on the three midpoint estimates, we have r_s in this range:

$$\text{CAPM} \quad 9.6\%$$

$$\text{DCF} \quad 11.3\%$$

$$\text{Risk Premium} \quad 11\%$$

$$\text{Average: } (9.6\% + 11.3\% + 11\%)/3 = 10.6\%$$

Step 3.

Calculate the WACC:

$$\begin{aligned} \text{WACC} &= (D/V)(r_{dAT}) + (P/V)(r_{ps}) + (S/V)(r_s \text{ or } r_e) \\ &= 0.21(r_{dAT}) + 0.03(r_{ps}) + 0.76(r_s \text{ or } r_e). \end{aligned}$$

It would be appropriate to calculate a range of WACCs based on the ranges of component costs, but to save time, we shall assume $r_{dAT} = 4.9\%$, $r_{ps} = 6.8\%$, and $r_s = 10.6\%$. With these cost rates, here is the WACC calculation:

$$\text{WACC} = 0.21(4.9\%) + 0.03(6.8\%) + 0.76(10.6\%) = 9.3\%.$$

SOLUTION TO SPREADSHEET PROBLEM

9-21 The detailed solution for the spreadsheet problem is in the file *Ch 09 Build a Model Solution.xlsx* and is available on the textbook's website.

MINI CASE

During the past few years, Harry Davis Industries has been too constrained by the high cost of capital to make many capital investments. Recently, though, capital costs have been declining, and the company has decided to look seriously at a major expansion program that has been proposed by the marketing department. Assume that you are an assistant to Leigh Jones, the financial vice president. Your first task is to estimate Harry Davis' cost of capital. Jones has provided you with the following data, which she believes may be relevant to your task:

1. The firm's tax rate is 35%.
2. The current price of Harry Davis' 8% coupon, semiannual payment, noncallable bonds with 15 years remaining to maturity is \$1,091.96. Harry Davis does not use short-term interest-bearing debt on a permanent basis. New bonds would be privately placed with no flotation cost.
3. The current price of the firm's 6%, \$25 par value, quarterly dividend, perpetual preferred stock is \$19.74. Harry Davis would incur flotation costs equal to 5% of the proceeds on a new issue.
4. Harry Davis' common stock is currently selling at \$50 per share. Its last dividend (D_0) was \$2.00, and dividends are expected to grow at a constant rate of 5% in the foreseeable future. Harry Davis' beta is 1.2, the yield on government bonds is 4%, and the market risk premium is estimated to be 5%. For the bond-yield-plus-risk-premium approach, the firm uses a 4 percentage point risk premium.
5. Harry Davis' target capital structure is 30% long-term debt, 10% preferred stock, and 60% common equity.

To structure the task somewhat, Jones has asked you to answer the following questions.

a. 1. What sources of capital should be included when you estimate Harry Davis' weighted average cost of capital (WACC)?

Answer: The WACC is used primarily for making long-term capital investment decisions, i.e., for capital budgeting. Thus, the WACC should include the types of capital used to pay for long-term assets, and this is typically long-term debt, preferred stock (if used), and common stock. Short-term sources of capital consist of (1) spontaneous, noninterest-bearing liabilities such as accounts payable and accruals and (2) short-term interest-bearing debt, such as notes payable. If the firm uses short-term interest-bearing debt to acquire fixed assets rather than just to finance working capital needs, then the WACC should include a short-term debt component. Noninterest-bearing debt is generally not included in the cost of capital estimate because these funds are netted out when determining investment needs, that is, net rather than gross working capital is included in capital expenditures.

a. 2. Should the component costs be figured on a before-tax or an after-tax basis?

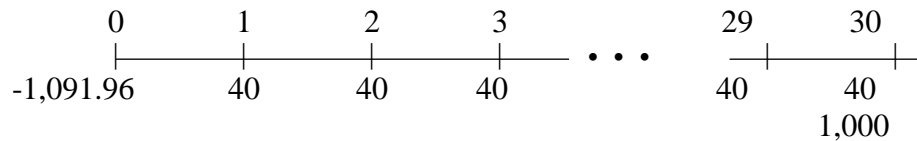
Answer: Shareholders are concerned primarily with those corporate cash flows that are available for their use, namely, those cash flows available to pay dividends or for reinvestment. Since dividends are paid from and reinvestment is made with after-tax dollars, all cash flow and rate of return calculations should be done on an after-tax basis.

a. 3. Should the costs be historical (embedded) costs or new (marginal) costs?

Answer: In financial management, the cost of capital is used primarily to make decisions which involve raising new capital. Thus, the relevant component costs are today's marginal costs rather than historical costs.

b. What is the market interest rate on Harry Davis' debt and its component cost of debt?

Answer: Harry Davis' 18% bond with 15 years to maturity is currently selling for \$1,091.96. Thus, its yield to maturity is 7%:



Enter $n = 30$, $PV = -1091.96$, $pmt = 40$, and $FV = 1000$, and then press the I button to find $r_d/2 = i = 3.5\%$. Since this is a semiannual rate, multiply by 2 to find the annual rate, $r_d = 7\%$, the pre-tax cost of debt.

Since interest is tax deductible, the government, in effect, pays part of the cost, and Harry Davis' relevant component cost of debt is the after-tax cost:

$$r_d(1 - T) = 7.0\%(1 - 0.35) = 7.0\%(0.65) = 4.55\%.$$

Optional Question: Should flotation costs be included in the estimate?

Answer: The actual component cost of new debt will be somewhat higher than 4.55 percent because the firm will incur flotation costs in selling the new issue. However, flotation costs are typically small on public debt issues and, more important, most debt is placed directly with banks, insurance companies, and the like, and in this case flotation costs are almost nonexistent.

Optional Question: Should you use the nominal cost of debt or the effective annual cost?

Answer: Our 7 percent pre-tax estimate is the nominal cost of debt. Since the firm's debt has semiannual coupons, its effective annual rate is:

$$(1.035)^2 - 1.0 = 1.0712 - 1.0 = 0.0712 = 7.12\%.$$

However, nominal rates are generally used. The reason is that the cost of capital is used in capital budgeting, and capital budgeting cash flows are generally assumed to occur at year-end. Therefore, using nominal rates makes the treatment of the capital budgeting discount rate and cash flows consistent.

c. What is the firm's cost of preferred stock?

Answer: Since the preferred issue is perpetual, its cost is estimated as follows:

$$r_{ps} = \frac{D_{ps}}{P_{ps}(1-F)} = \frac{0.06(\$25)}{\$19.74(1-0.05)} = \frac{\$1.50}{\$18.75} = 0.080 = 8.0\%.$$

Note that (1) flotation costs for preferred are significant, so they are included here, (2) since preferred dividends are not deductible to the issuer, there is no need for a tax adjustment, and (3) we could have estimated the effective annual cost of the preferred, but as in the case of debt, the nominal cost is generally used.

d. 1. What are the two primary ways companies raise common equity?

Answer: A firm can raise common equity in two ways: (1) by retaining earnings and (2) by issuing new common shares.

d. 2. Why is there a cost associated with reinvested earnings?

Answer: Management may either pay out earnings in the form of dividends or else retain earnings for reinvestment in the business. If part of the earnings is retained, an opportunity cost is incurred: shareholders could have received those earnings as dividends and then invested that money in stocks, bonds, real estate, and so on.

d. 3. Harry Davis doesn't plan to issue new shares of common stock. Using the CAPM approach, what is Harry Davis' estimated cost of equity?

Answer: $r_s = 0.04 + (0.05)1.2 = 10\%$.

e. 1. What is the estimated cost of equity using the discounted cash flow (DCF) approach?

Answer: $\hat{r}_s = \frac{D_1}{P_0} = \frac{D_0(1+g)}{P_0} + g = \frac{\$2.00(1.05)}{\$50} + 0.05 = 9.2\%$.

e. 2. Suppose the firm has historically earned 15% on equity (ROE) and retained 35% of earnings, and investors expect this situation to continue in the future. How could you use this information to estimate the future dividend growth rate, and what growth rate would you get? Is this consistent with the 5% growth rate given earlier?

Answer: Another method for estimating the growth rate is to use the retention growth model:

$$g = \text{ROE}(1 - \text{Payout Ratio})$$

In this case $g = 0.15(0.35) = 5.25\%$. This is consistent with the 5% rate given earlier.

e. 3. Could the DCF method be applied if the growth rate was not constant? How?

Answer: Yes, you could use the DCF using nonconstant growth. You would find the PV of the dividends during the nonconstant growth period and add this value to the PV of the series of inflows when growth is assumed to become constant.

f. What is the cost of equity based on the bond-yield-plus-risk-premium method?

Answer: $r_s = \text{company's own bond yield} + \text{risk premium}$.

First find the YTM of the bond:

Enter $n = 30$, $PV = -1,091.96$, $PMT = 40$, and $FV = 1000$, and then press the I button to find $r/2 = I = 3.5\%$. Since this is a semiannual rate, multiply by 2 to find the annual rate, $r = 7\%$.

The assumed risk premium is 4%, thus

$$r_s = 0.07 + 0.04 = 11\%.$$

g. What is your final estimate for the cost of equity, r_s ?

Answer: The final estimate for the cost of equity would simply be the average of the values found using the above three methods.

CAPM	10 %
DCF	9.2
BOND YIELD + R.P.	<u>11</u>
AVERAGE	<u>10.1%</u>

h. What is Harry Davis' weighted average cost of capital (WACC)?

Answer:
$$\begin{aligned} \text{WACC} &= w_d r_d (1 - T) + w_{ps} r_{ps} + w_{ce} (r_s) \\ &= 0.3(0.07)(0.65) + 0.1(0.08) + 0.6(0.101) \\ &= 0.082 = 8.2\% \end{aligned}$$

i. What factors influence a company's WACC?

Answer: There are factors that the firm cannot control and those that they can control that influence WACC.

Factors The Firm Cannot Control:

Level Of Interest Rates
Tax Rates } Market Conditions

Factors The Firm Can Control:

Capital Structure Policy
Dividend Policy
Investment Policy

j. Should the company use the composite WACC as the hurdle rate for each of its divisions?

Answer: No. The composite WACC reflects the risk of an average project undertaken by the firm. Therefore, the WACC only represents the "hurdle rate" for a typical project with average risk. Different projects have different risks. The project's WACC should be adjusted to reflect the project's risk.

k. What procedures are used to determine the risk-adjusted cost of capital for a particular division? What approach is used to measure a division's beta?

Answer: The following procedures can be used to determine a division's risk-adjusted cost of capital:

- (1) Subjective adjustments to the firm's composite WACC.
- (2) Attempt to estimate what the cost of capital would be if the division were a stand-alone firm. This requires estimating the division's beta.

The following approach can be used to measure a division's beta:

Pure play approach. Find several publicly traded companies exclusively in the project's business. Then, use the average of their betas as a proxy for the project's beta. (It's hard to find such companies.)

l. What are three types of project risk? How is each type of risk used?

Answer: The three types of project risk are:

Stand-Alone Risk
Corporate Risk
Market Risk

Market risk is theoretically best in most situations. However, creditors, customers, suppliers, and employees are more affected by corporate risk. Therefore, corporate risk is also relevant. Stand-alone risk is the easiest type of risk to measure.

Taking on a project with a high degree of either stand-alone or corporate risk will not necessarily affect the firm's market risk. However, if the project has highly uncertain returns, and if those returns are highly correlated with returns on the firm's other assets and with most other assets in the economy, the project will have a high degree of all types of risk.

m. Explain in words why new common stock that is raised externally has a higher percentage cost than equity that is raised internally by reinvesting earnings.

Answer: The company is raising money in order to make an investment. The money has a cost, and this cost is based primarily on the investors' required rate of return, considering risk and alternative investment opportunities. So, the new investment must provide a return at least equal to the investors' opportunity cost.

If the company raises capital by selling stock, the company doesn't get all of the money that investors put up. For example, if investors put up \$100,000, and if they expect a 15 percent return on that \$100,000, then \$15,000 of profits must be generated. But if flotation costs are 20 percent (\$20,000), then the company will receive only \$80,000 of the \$100,000 investors put up. That \$80,000 must then produce a \$15,000 profit, or a $15/80 = 18.75\%$ rate of return versus a 15 percent return on equity raised as retained earnings.

n. 1. Harry Davis estimates that if it issues new common stock, the flotation cost will be 15%. Harry Davis incorporates the flotation costs into the DCF approach. What is the estimated cost of newly issued common stock, taking into account the flotation cost?

Answer:

$$\begin{aligned}r_e &= \frac{D_0(1+g)}{P_0(1-F)} + g \\ &= \frac{\$2.00(1.05)}{\$50(1-0.15)} + 5.0\% \\ &= \frac{\$2.10}{\$42.50} + 5.0\% = 9.9\%.\end{aligned}$$

n. 2. Suppose Harry Davis issues 30-year debt with a par value of \$1,000 and a coupon rate of 7%, paid annually. If flotation costs are 2%, what is the after-tax cost of debt for the new bond?

Answer: Using a financial calculator, $N = 30$, $PV = (1-0.02)(1000) = 980$, $PMT = -70$, $FV = -1000$. The resulting I is 7.16%, which is the before-tax cost of debt. The after-tax cost = $7.16\%(1 - 0.35) = 4.65\%$.

o. What four common mistakes in estimating the WACC should Harry Davis avoid?

- Answer:**
1. Don't use the coupon rate on a firm's existing debt as the pre-tax cost of debt. Use the current cost of debt.
 2. When estimating the risk premium for the CAPM approach, don't subtract the current long-term government bond rate from the historical average return on stocks.
For example, the historical average return on stocks has been about 12.7%. If inflation has driven the current risk-free rate up to 10%, it would be wrong to conclude that the current market risk premium is $12.7\% - 10\% = 2.7\%$. In all likelihood, inflation would also have driven up the expected return on the market. Therefore, the historical return on the market would not be a good estimate of the current expected return on the market.
 3. Don't use book weights to estimate the weights for the capital structure. Use the target capital structure to determine the weights for the WACC. If you don't have the target weights, then use market value rather than book value to obtain the weights. Use the book value of debt only as a last resort.
 4. Always remember that capital components are sources of funding that come from investors. If it's not a source of funding from an investor, then it's not a capital component.