

# CHAPTER 9

## The Cost of Capital

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**Need to Absorb** - All of the general material to estimate Cost of Capital, including after-tax cost of debt, cost of preferred stock, and the two methods of calculating the cost of common equity. Understand how to calculate all of the components of equation 9-2 on page 359. You should be able to convert a book value balance sheet to a market value balance sheet. You should be able to calculate the Weights in the equation using a market value balance sheet. Pay particular attention to the concepts related to risk and return, as this topic is often the source of concept questions. Section 11b discusses how to make project and division WACC adjustments, and is often a source of exam questions. Section 12 is a good source of concept questions. I will use this chapter to relate Risk and Return for Capital Budgeting problems, so expect to see this again in Chapter 10 and 11 materials in the quizzes.

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**Do not need to Absorb** - Section 10 on WACC for small and private companies. Section 11a on factors the firm cannot control. It is highly unlikely we will ask Final Exam questions where the firm needs to issue new common equity, thus calculating the Cost of Common Equity with adjustments for flotation costs should have a low priority. Flotation costs could appear in quiz questions.

**Need to Read** - Read the Chapter.

**Need to Do** - Make 100 on the quiz. Be able to solve Concept Review Questions 1-5 (all of them), and Problems 1-12, 15-17 (ignoring issues related to flotation costs). For my face to face classes, my Final Exam questions are often similar to Self-Test 1 and Problems 15 or 16. For my online classes, the questions are more likely to be 3-4 separate questions, such as Problems 3, 5, 6, 7, 8, 9.

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## Topics in Chapter

- Cost of capital components
  - Debt
  - Preferred stock
  - Common equity
- WACC
- Factors that affect WACC
- Adjusting cost of capital for risk

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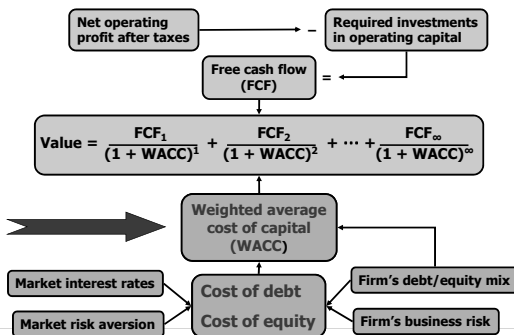
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### Determinants of Intrinsic Value: The Weighted Average Cost of Capital



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## What's the WACC using the target weights?

$$WACC = w_d r_d (1 - T) + w_{ps} r_{ps} + w_s r_s$$

$$w_d = \frac{\$d}{(\$d + \$ps + \$s)}, r_d = \text{Yield to Maturity}, T = \text{Tax Rate}$$

$$w_{ps} = \frac{\$ps}{(\$d + \$ps + \$s)}, r_{ps} = \frac{\text{dividend}_{ps}}{\text{Price}_{ps}}$$

$$w_s = \frac{\$s}{(\$d + \$ps + \$s)}, r_s = \frac{D1}{P0} + g = r_f + B(\text{MRP})$$

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## What types of long-term capital do firms use?

- Long-term debt
  - Some firms also use permanent short-term debt
  - Other firms have temporary short-term debt for seasonal fluctuations in inventory, but this is usually not part of the capital structure
- Preferred stock
- Common equity

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## Before-tax vs. After-tax Capital Costs

- Tax effects associated with financing can be incorporated either in capital budgeting cash flows or in cost of capital.
- Most firms incorporate tax effects in the cost of capital. Therefore, focus on after-tax costs.
- Only cost of debt is affected.

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## Capital Components

- Capital components are sources of funding that come from investors.
- Accounts payable, accruals, and deferred taxes are not sources of funding that come from investors, so they are not included in the calculation of the cost of capital.
- We do adjust for these items when calculating the cash flows of a project, but not when calculating the cost of capital.

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## Historical (Embedded) Costs vs. New (Marginal) Costs

- The cost of capital is used primarily to make decisions which involve raising and investing new capital. So, we should focus on marginal costs.

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## Cost of Debt

- Method 1: Ask an investment banker what the coupon rate would be on new debt.
- Method 2: Find the bond rating for the company and use the yield on other bonds with a similar rating.
- Method 3: Find the yield on the company's debt, if it has any.

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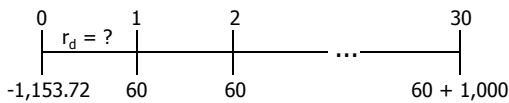
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A 15-year, 12% semiannual bond sells for \$1,153.72. What's  $r_d$ ?



INPUTS    30            -1153.72    60    1000  
          N    I/YR    PV    PMT    FV  
OUTPUT    5.0% x 2 =  $r_d$  = 10%

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## Component Cost of Debt

- Interest is tax deductible, so the after tax (AT) cost of debt is:  
$$r_d \text{ AT} = r_d \text{ BT}(1 - T)$$
$$r_d \text{ AT} = 10\%(1 - 0.40) = 6\%.$$
- Use nominal rate.
- Flotation costs small, so ignore.

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Cost of preferred stock:  $P_{ps} = \$116.95$ ;  
 $10\%Q$ ; Par = \$100;  $F = 5\%$

Use this formula:

$$r_{ps} = \frac{D_{ps}}{P_{ps}(1-F)} = \frac{0.1(\$100)}{\$116.95(1-0.05)}$$

$$= \frac{\$10}{\$111.10} = 0.090 = 9.0\%$$

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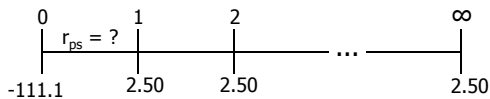
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### Time Line of Preferred



$$\$111.10 = \frac{D_Q}{r_{Per}} = \frac{\$2.50}{r_{Per}}$$

$$r_{Per} = \frac{\$2.50}{\$111.10} = 2.25\%; r_{ps(Nom)} = 2.25\%(4) = 9\%$$

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### Note:

- Flotation costs for preferred are significant, so are reflected. Use net price.
- Preferred dividends are not deductible, so no tax adjustment. Just  $r_{ps}$ .
- Nominal  $r_{ps}$  is used.

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## Is preferred stock more or less risky to investors than debt?

- More risky; company not required to pay preferred dividend.
- However, firms want to pay preferred dividend. Otherwise, (1) cannot pay common dividend, (2) difficult to raise additional funds, and (3) preferred stockholders may gain control of firm.

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## Why is yield on preferred lower than $r_d$ ?

- Corporations own most preferred stock, because 70% of preferred dividends are nontaxable to corporations.
- Therefore, preferred often has a lower B-T yield than the B-T yield on debt.
- The A-T yield to investors and A-T cost to the issuer are higher on preferred than on debt, which is consistent with the higher risk of preferred.

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## Example:

$$r_{ps} = 9\%, r_d = 10\%, T = 40\%$$

$$\begin{aligned} r_{ps, AT} &= r_{ps} - r_{ps}(1 - 0.7)(T) \\ &= 9\% - 9\%(0.3)(0.4) = 7.92\% \end{aligned}$$

$$r_{d, AT} = 10\% - 10\%(0.4) = \underline{6.00\%}$$

$$\text{A-T Risk Premium on Preferred} = \underline{\underline{1.92\%}}$$

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## What are the two ways that companies can raise common equity?

- Directly, by issuing new shares of common stock.
- Indirectly, by reinvesting earnings that are not paid out as dividends (i.e., retaining earnings).

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## Why is there a cost for reinvested earnings?

- Earnings can be reinvested or paid out as dividends.
- Investors could buy other securities, earning a return.
- Thus, there is an opportunity cost if earnings are reinvested.

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## Cost for Reinvested Earnings (Continued)

- Opportunity cost: The return stockholders could earn on alternative investments of equal risk.
- They could buy similar stocks and earn  $r_{sr}$  or company could repurchase its own stock and earn  $r_s$ . So,  $r_{sr}$  is the cost of reinvested earnings and it is the cost of common equity.

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## Three ways to determine the cost of equity, $r_s$ :

1. CAPM:  $r_s = r_{RF} + (r_M - r_{RF})b$   
 $= r_{RF} + (RP_M)b.$
2. DCF:  $r_s = D_1/P_0 + g.$
3. Own-Bond-Yield-Plus-Judgmental-Risk Premium:  $r_s = r_d + \text{Bond RP}.$

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CAPM Cost of Equity:  $r_{RF} = 5.6\%$ ,  
 $RP_M = 6\%$ ,  $b = 1.2$

$$r_s = r_{RF} + (RP_M)b$$
$$= 5.6\% + (6.0\%)1.2 = 12.8\%.$$

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## Issues in Using CAPM

- Most analysts use the rate on a long-term (10 to 20 years) government bond as an estimate of  $r_{RF}$ .

(More...)

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## Issues in Using CAPM (Continued)

- Most analysts use a rate of 3.5% to 6% for the market risk premium ( $RP_M$ )
- Estimates of beta vary, and estimates are "noisy" (they have a wide confidence interval).

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## DCF Cost of Equity, $r_s$ :

$$D_0 = \$3.26; P_0 = \$50; g = 5.8\%$$

$$\begin{aligned} r_s &= \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g \\ &= \frac{\$3.12(1.058)}{\$50} + 0.058 \\ &= 6.6\% + 5.8\% \\ &= 12.4\% \end{aligned}$$

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## Estimating the Growth Rate

- Use the historical growth rate if you believe the future will be like the past.
- Obtain analysts' estimates: Value Line, Zacks, Yahoo!Finance.
- Use the earnings retention model, illustrated on next slide.

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## Earnings Retention Model

- Suppose the company has been earning 15% on equity (ROE = 15%) and has been paying out 62% of its earnings.
- If this situation is expected to continue, what's the expected future  $g$ ?

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## Earnings Retention Model (Continued)

- Growth from earnings retention model:  
 $g = (\text{Retention rate})(\text{ROE})$   
 $g = (1 - \text{Payout rate})(\text{ROE})$   
 $g = (1 - 0.62)(15\%) = 5.7\%$

This is close to  $g = 5.8\%$  given earlier.

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## Could DCF methodology be applied if $g$ is not constant?

- YES, nonconstant  $g$  stocks are expected to have constant  $g$  at some point, generally in 5 to 10 years.
- But calculations get complicated. See the *Web 09A* worksheet in the file *Ch09Tool Kit.xls*.

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## The Own-Bond-Yield-Plus-Judgmental-Risk-Premium Method: $r_d = 10\%$ , $RP = 3.2\%$

- $r_s = r_d + \text{Judgmental risk premium}$
- $r_s = 10.0\% + 3.2\% = 13.2\%$
  
- This judgmental-risk premium  $\neq$  CAPM equity risk premium,  $RP_M$ .
- Produces ballpark estimate of  $r_s$ . Useful check.

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## What's a reasonable final estimate of $r_s$ ?

Method	Estimate
CAPM	12.8%
DCF	12.4%
$r_d + \text{judgment}$	<u>13.2%</u>
Average	<u>12.8%</u>

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## Determining the Weights for the WACC

- The weights are the percentages of the firm that will be financed by each component.
- If possible, always use the target weights for the percentages of the firm that will be financed with the various types of capital.

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## Estimating Weights for the Capital Structure

- If you don't know the targets, it is better to estimate the weights using current market values than current book values.
- If you don't know the market value of debt, then it is usually reasonable to use the book values of debt, especially if the debt is short-term.

(More...)

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## Estimating Weights (Continued)

- Suppose the stock price is \$50, there are 3 million shares of stock, the firm has \$25 million of preferred stock, and \$75 million of debt.

(More...)

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## Estimating Weights (Continued)

- $V_s = \$50(3 \text{ million}) = \$150 \text{ million.}$
- $V_{ps} = \$25 \text{ million.}$
- $V_d = \$75 \text{ million.}$
- Total value =  $\$150 + \$25 + \$75 = \$250 \text{ million.}$

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## Estimating Weights (Continued)

- $w_s = \$150/\$250 = 0.6$
- $w_{ps} = \$25/\$250 = 0.1$
- $w_d = \$75/\$250 = 0.3$
  
- The target weights for this company are the same as these market value weights, but often market weights temporarily deviate from targets due to changes in stock prices.

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## What's the WACC using the target weights?

$$WACC = w_d r_d (1 - T) + w_{ps} r_{ps} + w_s r_s$$

$$WACC = 0.3(10\%)(1 - 0.4) + 0.1(9\%) + 0.6(12.8\%)$$

$$WACC = 10.38\% \approx 10.4\%$$

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## What factors influence a company's WACC?

- Uncontrollable factors:
  - Market conditions, especially interest rates.
  - The market risk premium.
  - Tax rates.
- Controllable factors:
  - Capital structure policy.
  - Dividend policy.
  - Investment policy. Firms with riskier projects generally have a higher cost of equity.

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## Is the firm's WACC correct for each of its divisions?

- NO! The composite WACC reflects the risk of an average project undertaken by the firm.
- Different divisions may have different risks. The division's WACC should be adjusted to reflect the division's risk and capital structure.

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## The Risk-Adjusted Divisional Cost of Capital

- Estimate the cost of capital that the division would have if it were a stand-alone firm.
- This requires estimating the division's beta, cost of debt, and capital structure.

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## Pure Play Method for Estimating Beta for a Division or a Project

- Find several publicly traded companies exclusively in project's business.
- Use average of their betas as proxy for project's beta.
- Hard to find such companies.

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## Accounting Beta Method for Estimating Beta

- Run regression between project's ROA and S&P Index ROA.
- Accounting betas are correlated (0.5 – 0.6) with market betas.
- But normally can't get data on new projects' ROAs before the capital budgeting decision has been made.

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## Divisional Cost of Capital Using CAPM

- Target debt ratio = 10%.
- $r_d = 12\%$ .
- $r_{RF} = 5.6\%$ .
- Tax rate = 40%.
- $\text{beta}_{\text{Division}} = 1.7$ .
- Market risk premium = 6%.

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## Divisional Cost of Capital Using CAPM (Continued)

Division's required return on equity:

$$r_s = r_{RF} + (r_M - r_{RF})b_{\text{Div.}}$$

$$r_s = 5.6\% + (6\%)1.7 = 15.8\%$$

$$\begin{aligned} \text{WACC}_{\text{Div.}} &= w_d r_d(1 - T) + w_s r_s \\ &= 0.1(12\%)(0.6) + 0.9(15.8\%) \\ &= 14.94\% \approx 14.9\% \end{aligned}$$

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## Division's WACC vs. Firm's Overall WACC?

- Division WACC = 14.9% versus company WACC = 10.4%.
- "Typical" projects within this division would be accepted if their returns are above 14.9%.

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## What are the three types of project risk?

- Stand-alone risk
- Corporate risk
- Market risk

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## How is each type of risk used?

- Stand-alone risk is easiest to calculate.
- 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.

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## A Project-Specific, Risk-Adjusted Cost of Capital

- Start by calculating a divisional cost of capital.
- Use judgment to scale up or down the cost of capital for an individual project relative to the divisional cost of capital.

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## Costs of Issuing New Common Stock

- When a company issues new common stock they also have to pay flotation costs to the underwriter.
- Issuing new common stock may send a negative signal to the capital markets, which may depress stock price.

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Cost of New Common Equity:  $P_0 = \$50$ ,  
 $D_0 = \$3.12$ ,  $g = 5.8\%$ , and  $F = 15\%$

$$\begin{aligned} r_e &= \frac{D_0(1 + g)}{P_0(1 - F)} + g \\ &= \frac{\$3.12(1.058)}{\$50(1 - 0.15)} + 5.8\% \\ &= \frac{\$3.30}{\$42.50} + 5.8\% = 13.6\% \end{aligned}$$

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Cost of New 30-Year Debt: Par = \$1,000, Coupon = 10% paid annually, and F = 2%

- Using a financial calculator:
  - $N = 30$
  - $PV = 1,000(1 - 0.02) = 980$
  - $PMT = -(0.10)(1,000)(1 - 0.4) = -60$
  - $FV = -1,000$
- Solving for I/YR: 6.15%

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## Comments about flotation costs:

- Flotation costs depend on the risk of the firm and the type of capital being raised.
- The flotation costs are highest for common equity. However, since most firms issue equity infrequently, the per-project cost is fairly small.
- We will frequently ignore flotation costs when calculating the WACC.

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## Four Mistakes to Avoid

- Current vs. historical cost of debt
  - Mixing current and historical measures to estimate the market risk premium
  - Book weights vs. Market Weights
  - Incorrect cost of capital components
- See next slides for details. (More...)

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## Current vs. Historical Cost of Debt

- When estimating the cost of debt, don't use the coupon rate on existing debt, which represents the cost of past debt.
- Use the current interest rate on new debt.

(More...)

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## Estimating the Market Risk Premium

- When estimating the risk premium for the CAPM approach, don't subtract the current long-term T-bond rate from the historical average return on common stocks.
- For example, if the historical  $r_M$  has been about 12.2% and inflation drives the current  $r_{RF}$  up to 10%, the current market risk premium is not  $12.2\% - 10\% = 2.2\%$ !

(More...)

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## Estimating Weights

- Use the target capital structure to determine the weights.
- If you don't know the target weights, then use the current market value of equity.
- If you don't know the market value of debt, then the book value of debt often is a reasonable approximation, especially for short-term debt.

(More...)

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## Capital components are sources of funding that come from investors.

- Accounts payable, accruals, and deferred taxes are not sources of funding that come from investors, so they are not included in the calculation of the WACC.
- We do adjust for these items when calculating project cash flows, but not when calculating the WACC.

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## Contact Charles Hodges

- Email in D2L or email listed in Syllabus
- Chat Sessions
- Skype (bufordshighway), LinkedIn and Facebook (Charles Hodges).
- Office Phone (678)839-4816 and Cell Phone (770)301-8648, target is under 24 hours

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